Merced Integrated Regional Water Management
Merced Region Drought Grant Proposal

Attachment 3:
Project Justification

Attachment 3 consists of the following items:

- ✓ **Project Summary Table**
  Table showing for each project the applicable project element(s) from both the Drought Project Element and IRWM Project Element Sections of the table.

- ✓ **Project Description**
  Brief description of each project and discussion of how the project will help alleviate the drought impact(s) identified in Attachment 2 and how the project can be considered as one or more of the four eligible drought project types (Section C), and why expedited funding is needed.

- ✓ **Regional and Project Map**
  A regional map and project maps.

- ✓ **Project Physical Benefits**
  Discussion of physical benefits.

- ✓ **Technical Analysis of Physical Benefits Claimed**
  Narrative description of the primary and secondary expected physical benefits, which must address the following items:

  - Technical basis of the project.
  - Recent and historical conditions that provide background for benefits to be claimed.
  - Estimates of without-project conditions.
  - Description of methods used to estimate physical benefits.
  - Identification of all new facilities, policies, and actions required to obtain the physical benefits.
  - Description of any potential adverse physical effects.

  Technical analysis detail should be commensurate with the size of the project.

- ✓ **Cost Effective Analysis**
  Analysis that evaluates whether physical benefits provided by the project are provided at the least possible cost.

Project Summary Table

Table 3-1: 2014 Merced Region Drought Grant Proposal Summary Table

Table 4 – 2014 IRWM Drought Solicitation Project Summary				
		Highlands Groundwater Conservation Project	Cressey Recharge Basin Project	Water Meter Conservation Project
Drought Project Element				
D.1	Provide immediate regional drought preparedness?	X	X	X
D.2	Increase local water supply reliability and the delivery of safe drinking water?	X	X	X
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost effective?			
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought?	X	X	X
IRWMP Project Element				
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment and management			
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection and restoration of open space and watershed lands			
IR.4	Non-point source pollution reduction, management and monitoring			
IR.5	Groundwater recharge and management projects	X	X	X
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users			
IR.7	Water banking, exchange, reclamation and improvement of water quality	X	X	X
IR.8	Planning and implementation of multipurpose flood management programs			
IR.9	Watershed protection and management			
IR.10	Drinking water treatment and distribution			
IR.11	Ecosystem and fisheries restoration and protection			

Project Description

Highlands Groundwater Conservation Project

Brief Description: This project would deliver surface water to 717 acres in lieu of groundwater pumping in the Highlands area to meet immediate and critical water demands.

Expanded Description: The Highlands Groundwater Conservation Project, sponsored by MID, is an in-lieu groundwater recharge (conjunctive use) project that will allow water to be banked in the groundwater basin by providing surface water to be used instead of pumping groundwater. It will provide immediate relief and drought preparedness for the Highlands area by reducing over pumping that is occurring due to the drought, and limiting the associated impacts of over pumping such as lack of adequate supplies, water quality degradation, and subsidence. It is expected that during most years, sufficient surface water would be provided to meet all agricultural demands of existing customers in the Highlands area, avoiding pumping groundwater entirely. This will allow groundwater to remain in the basin for replenishment and use for potable purposes. During critically dry years when surface water supplies are limited, the existing wells that have been idled would be available for pumping to augment available surface water supplies. It is anticipated that even during critically dry years, 75 percent of the supply would be from surface water, with approximately 25 percent of the water coming from the groundwater basin. The project would directly alleviate the existing drought impacts identified in Attachment 2 by providing additional supply to meet existing demands while simultaneously improving quantity and quality of groundwater supplies. Specifically, once the proposed facilities (modified pump stations, replaced and new pipelines, inlet/outlet structures, tie-ins to existing wells, upgraded SCADA) have been constructed, the project will provide surface water to replace groundwater pumping.

MID has surface water supply that could be provided to its customers in this area, but infrastructure is currently not sufficient to convey supply to the entire area. Because the project would allow water to be left in the Merced Subbasin rather than extracted for use, the project would contribute to recovery of groundwater levels over the long-term, addressing the over draft condition of the entire basin and meeting drinking water needs of the Highlands area DAC as well as other DACs throughout the region. With increasing water levels in the basin, existing and potential impacts including drinking water MCL violations, loss of groundwater wells, and regional subsidence would be substantially reduced. Because in-lieu recharge essentially serves as a bank account for water, the stored water could be extracted under future dry conditions to minimize the effects of reduced agricultural and ecosystem water demands (potentially by limiting MID's cut back to growers and Merced National Wildlife Refuge (NWR) or by extending water supply during multiple dry years). Any reduction of impacts to growers and ecosystem needs would minimize associated economic impacts for agriculture and the community as a whole.

The project would also increase local water supply reliability by diversifying the water source to the Highlands area such that the groundwater levels could recover in the Merced Subbasin. Because all potable supply in the Merced Region is solely provided by groundwater, increasing groundwater levels would increase water supply reliability in the Region and the delivery of safe drinking water. Thus, this project would meet the following project types specified in Section C of the PSP: 1) Provide immediate regional drought preparedness; 2) Increase local water supply reliability and the delivery of safe drinking water; and 3) Reduce water quality conflicts or ecosystem conflicts created by the drought. Because the project would reduce overall pumping, this project would result in a net reduction in energy consumption and greenhouse gas emissions.

Expedited funding is needed as a result of the dire situation caused by the current drought and the anticipated worsening situation if the drought were to extend into 2015. These effects are identified in Attachment 2. MID also does not currently have funding to move forward with this project, because budget has been spent on immediate drought-related relief, including lowering/deepening wells and implementing mandatory conservation / rationing, which impacts revenues. With this project, MID is in a unique position to help not only its customers but the Merced Subbasin as a whole by increasing groundwater levels, which would reduce secondary impacts including water quality effects, loss of groundwater wells, subsidence, reduction in agricultural production, and other related economic impacts.

Cressey Recharge Basin Enlargement Project

Brief Description: This project will expand an existing recharge basin to provide immediate drought relief by increasing supplies in the Merced Subbasin.

Expanded Description: The Cressy Recharge Basin Enlargement Project, sponsored by MID, is the second phase of an ongoing recharge project. The project would enlarge the existing Cressey recharge basin, located at the southwest corner of Mercedes Avenue and Jones Road north of the town of Winton, from 8 acres to 13 acres. The existing recharge basin began operations in 2011[1] and is capable of recharging 2.74 acre feet per acre per day (AF/AC/day)[2]. Similar to the existing project, the expanded basin would be supplied by water from Lake McClure flood releases, precipitation from the watershed, and planned releases when water is available. Water would be delivered through the Cressey Lateral during the irrigation season, which typically occurs from March through October period, but varies depending on hydrologic year type.

The expanded project would help alleviate the drought impacts identified in Attachment 2. Specifically, the project would have the immediate benefit of increasing the quantity and quality of available groundwater. Because recharge activities would elevate groundwater levels within the entire Merced Subbasin, the project would address the risk of not meeting existing drinking and agricultural water demands once the basin has been expanded, both in the immediate and long term. Flood releases that otherwise would have ultimately been conveyed out of the Merced Region via the Merced River would instead be stored in the basin for later use, particularly during years of drought when insufficient supply is available. Recharge activities would contribute to the recovery of groundwater levels, which would address the over draft condition of the entire basin. With increasing water levels in the basin, existing and potential impacts such as drinking water MCL violations, the loss of groundwater wells, and potential for regional subsidence would be substantially reduced. Water recharged by this project and stored in the groundwater basin could be extracted under future dry conditions to minimize the impacts of reduced agricultural and ecosystem water demands (potentially by limiting MID's cutbacks to growers and Merced NWR or by extending the supply during multiple dry years). Any reduction of impacts to growers and ecosystem needs would minimize associated economic impacts for agriculture and the community as a whole. Thus, this project would not only provide immediate regional drought preparedness, but also reduce water quality or ecosystem conflicts created by the drought.

In addition, the project would enhance local water supply reliability by increasing groundwater levels and reducing over draft in the Merced Subbasin. Because all potable supply in the Merced Region is solely provided by groundwater, increasing groundwater levels would increase water supply reliability in the Merced Region and the delivery of safe drinking water.

Expedited funding is needed to address the dire situation caused by the current drought and the additional impacts expected if the drought were to extend into 2015. These effects are identified in Attachment 2. MID also does not currently have funding to move forward with this project, because budget has been spent on other immediate drought relief programs, including rehabilitating / deepening wells and implementing mandatory conservation / rationing, which impacts revenues. This project provides a unique opportunity to not only help MID meet its customers' demands, but to benefit the Merced Subbasin as a whole by increasing groundwater levels. This would in turn reduce secondary impacts including water quality effects, loss of groundwater wells, reduction in agricultural production, and other related economic impacts.

[1] MID. 2014. Groundwater Recharge. Accessed on July 2, 2014. Available at: http://www.mercedid.com/index.cfm/water/groundwater/
[2] This infiltration rate is based on monitoring data at the basin. See **Appendix 3-14**.

Water Meter Conservation Project

Brief Description: This project would install water meters for existing customers in Le Grand, to reduce water consumption and enable water usage to be monitored.

Expanded Description: The project would install 525 new water meters (500 connections to homes and 25 connections to businesses, schools, and the County park) and transmitter equipment in the LGCSD service area. Each meter would be housed in a box under the curb outside each site to allow for real-time water usage readings. The project is an emergency drought-preparedness project which would result in immediate demand reductions, This would alleviate the dire drought impacts identified in Attachment 2 for this DAC, particularly due to the precipitous drop (50 feet) in groundwater levels that has resulted in the need for LGCSD to redrill all of its municipal wells. The project would allow each customer to self-monitor water usage and modify usage to respond to the drought. It would also allow LGCSD to monitor water consumption by individual customers and proactively address over-consumption. The project would address both immediate and long-term drought preparedness by contributing to sustainable water supplies and supply reliability during water shortages by promoting water conservation, achieving water use reductions, and enabling proactive groundwater management. The project would also reduce net energy consumption, as long-term reduction in water consumption by customers and rising groundwater levels would decrease energy requirements for pumping. With reduced energy consumption, greenhouse gas emissions would also be reduced. Groundwater is disinfected using chlorination at the wellhead; a reduction in water usage would translate to a reduced requirement for water treatment chemicals. Arsenic and 123-TCP occur locally in Le Grand, in both the shallow and deep aquifers. Increases in groundwater levels would improve water quality in the short- and long-term.

The project would also increase local water supply reliability by conserving water. The water meters act as a management tool for tracking the consumption of water within the LGCSD service area. Currently, LGCSD has no way of monitoring individual customers. The installation of the meters would serve as an enforcement tool that would allow LGCSD to address over-consumption during critical periods.

Expedited funding is needed because LGCSD has no alternative source of potable supply and must implement this project to conserve water for the community on an emergency basis. Because of the precipitous drop in groundwater elevations (about 50 feet within a three month timespan), LGCSD has had to deepen its production wells to ensure drinking water supply is available to this DAC. There is no other alternative water supply source in this community, which is entirely reliant on groundwater. The situation is so dire that the Le Grand public schools did not have sufficient water pressure to flush toilets in May, causing an immediate public health and safety concern. Stage 3 water conservation measures have already been imposed, and it is anticipated that conservation levels will increase to Stage 4 by the end of the year. As such, this community will likely be unable to meet its drinking water demand and ensure Human Right to Water by late summer 2014. The funds that were originally set aside for this project have been redirected to other drought-related relieve actions such as deepening existing municipal wells, preventing LGCSD from proceeding with this project, even though final design was completed in 2011 and the project is shovel-ready.

Regional Map and Project Map

Regional Map

Figure 3-1 shows the regional map of the area, including the Merced IRWM Region boundary, and locations of the Highlands Groundwater Conservation Project, the Cressey Recharge Basin Project, and the Water Meter Conservation Project.

Project Maps

Figures 3-2 through **3-4** show the project maps for each of the three projects. Included in the maps are the projects' geographical locations, the surrounding work boundaries, facilities of the projects, water resources that will be affected, DACs within the project service areas, and proposed locations where claimed benefits would be monitored. For the Highlands Groundwater Conservation Project (**Figure 3-2**), the proposed locations where benefits would be

monitored include the seven existing groundwater wells located within the boundary of the Highlands area. For the Cressey Recharge Basin Enlargement Project (**Figure 3-3**), the proposed locations where benefits would be monitored include the four monitoring stations that were originally installed as part of the pilot project. The SCADA system would be upgraded to allow MID to track percolation/groundwater recharge rates in real time. It should be noted that **Figure 3-4** does not show the 525 water meters that are proposed for the project because the scale of the figure does not accommodate identification of the individual water meters. The proposed locations where claimed benefits would be monitored include the District office where household water usage information would be transmitted and analyzed, as well as at existing groundwater wells where levels are checked regularly.

Project Physical Benefits

Highlands Groundwater Conservation Project

The physical benefits of this project are shown in **Table 3-2**. The conjunctive use project would allow for in-lieu recharge of the groundwater basin through the provision of surface water supply to MID customers. Reduced groundwater pumping would result in an increase in groundwater elevations over the long term, and a reduction in net electricity consumption and greenhouse gas emissions. The increase in groundwater levels would also improve water quality and reduce subsidence potential. These benefits are gained from project construction and operation, including upgrades/modifications to the existing pump station and installation of about 10,500 feet of new and/or replacement pipelines.

Figure 3-1: Regional Map

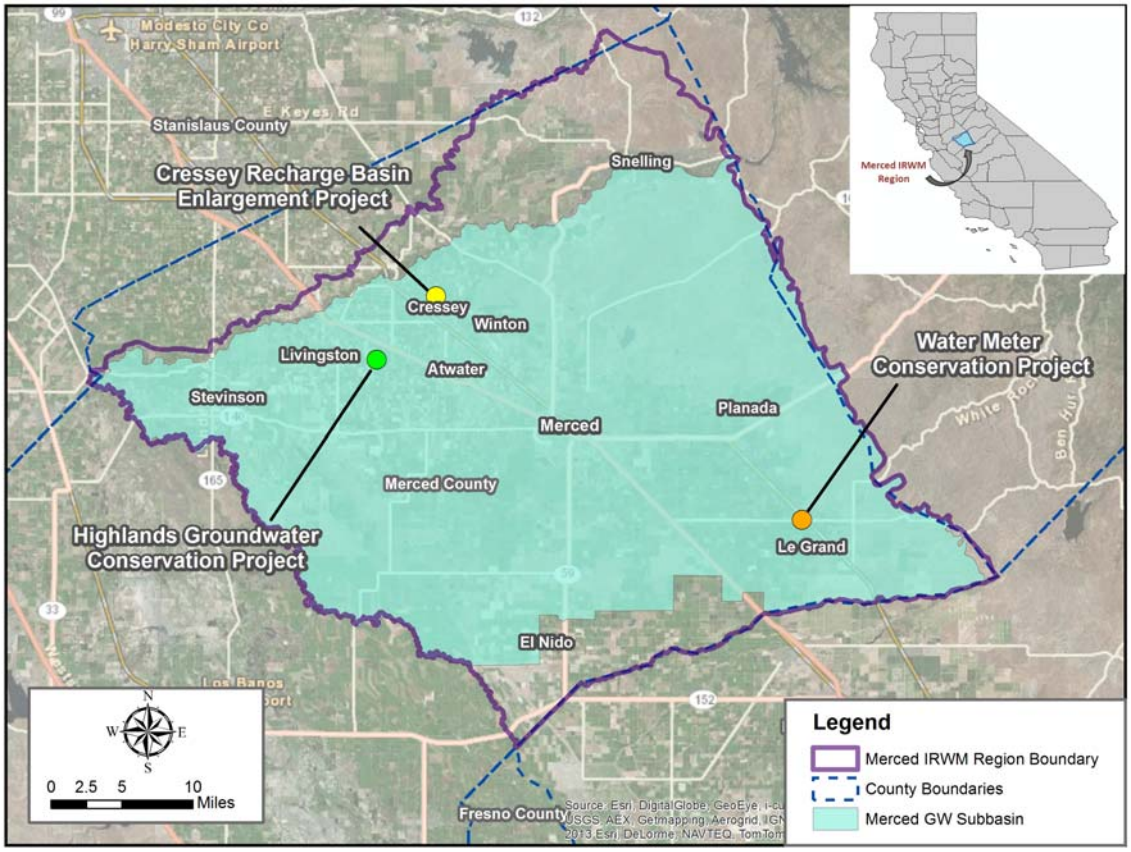


Figure 3-2: Highlands Groundwater Conservation Project

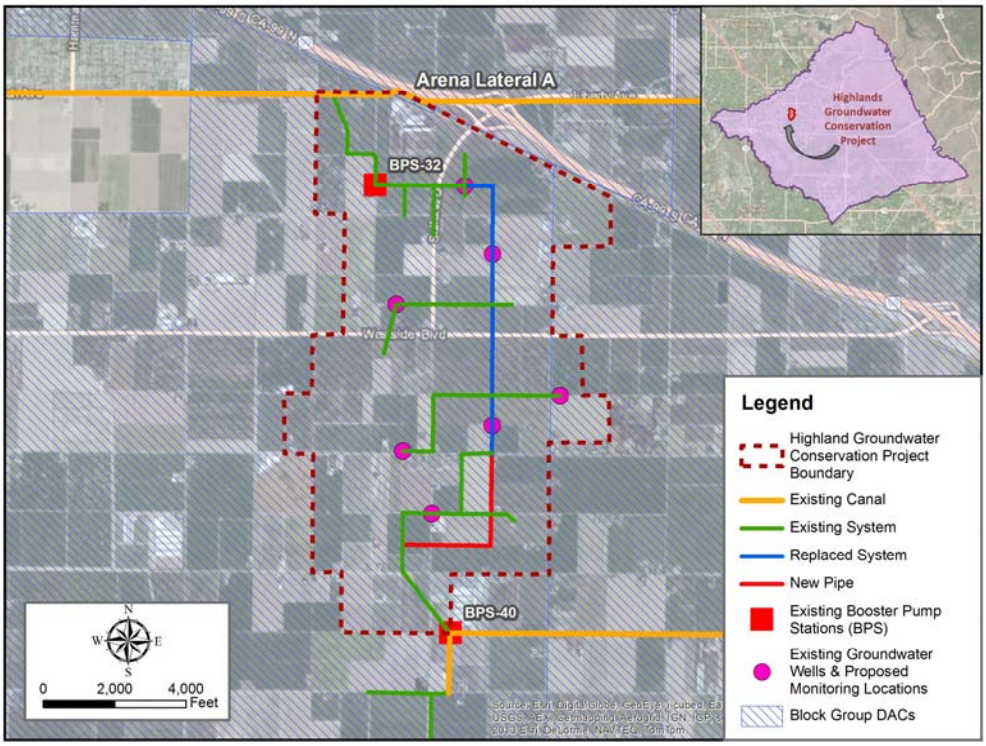


Figure 3-3: Cressey Recharge Basin Enlargement Project

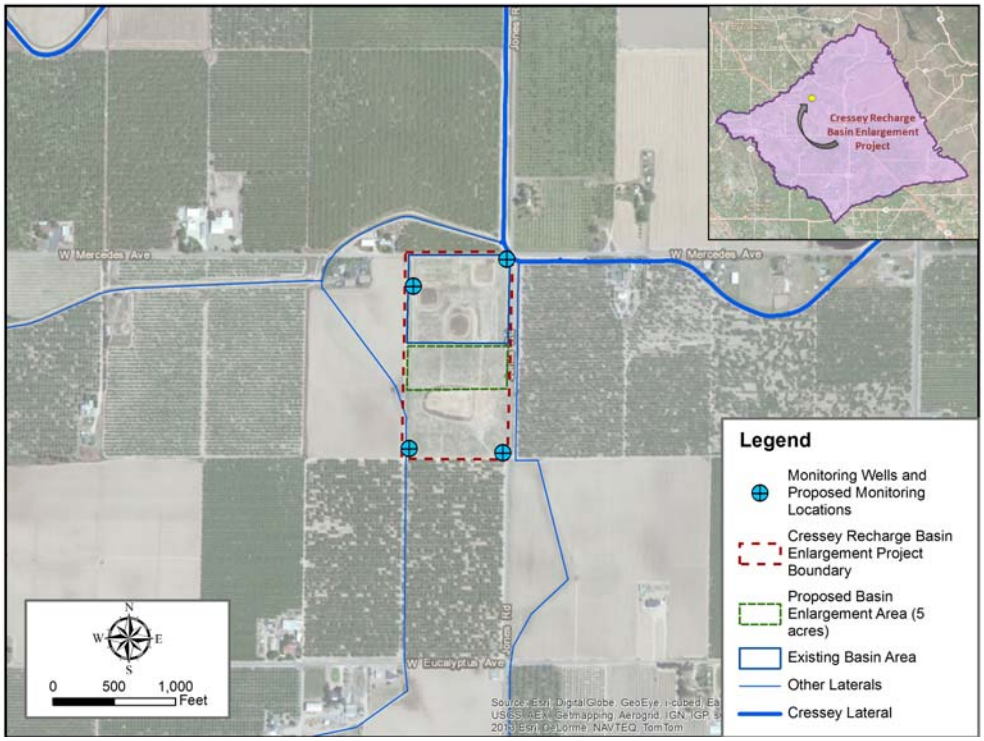
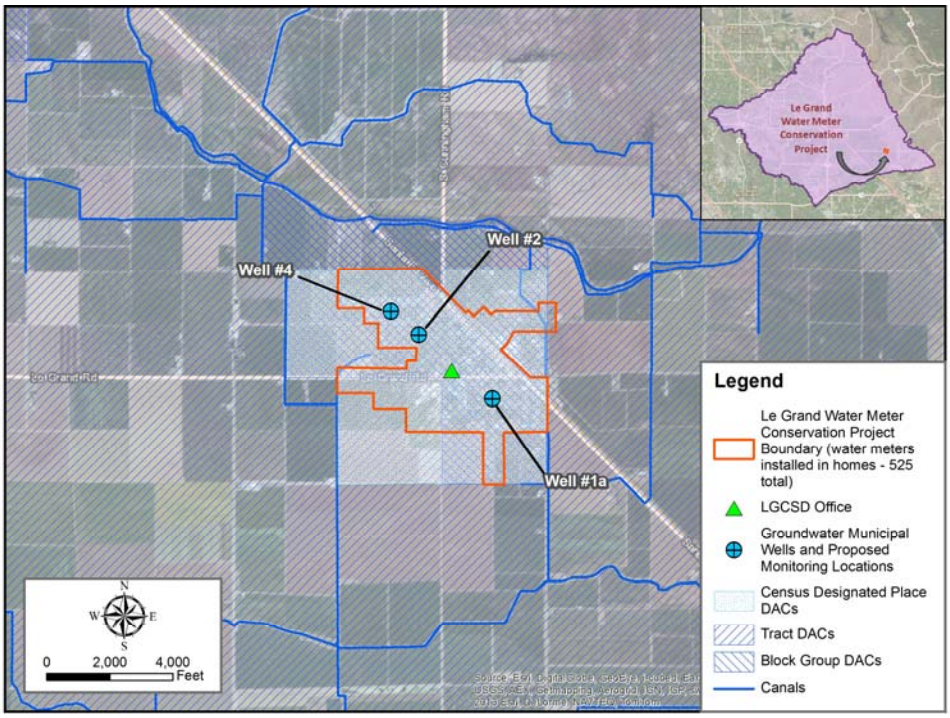


Figure 3-4: Water Meter Conservation Project



Benefits of the project are summarized in **Table 3-2**, and annual projected physical benefits are shown in **Tables 3-3** through **3-5**.

Table 3-2: Physical Benefits Summary
Highlands Groundwater Conservation Project

Physical Benefit	Type of Benefit	Quantification of Benefits
Conserved long-term water supply and associated reduction in groundwater basin over draft	Primary	Up to 2,216 AFY
Reduce Net Consumption of Electricity	Primary	Up to 9,751 kWh/yr
Reduce Net Production of Greenhouse Gases	Secondary	Up to 3 MT CO_2/yr
Improve Water Quality	Secondary	Not quantified
Reduction in Subsidence Potential	Secondary	Not quantified

Table 3-3 shows the water supply benefits for this project. Claimed water supply benefits are different depending on the hydrologic year type. Benefits are anticipated to be slightly reduced in critically dry years, when surface water supplies are reduced and only 75 percent of demands could be met with surface water alone. In all other year types, surface water would be sufficient to meet 100 percent of existing demands and groundwater pumping would be completely avoided. Projected hydrologic conditions for the next 31 years were based on a review of the DWR's San Joaquin River index for the past 31 years. The following table summarizes the projected benefit of the proposed project, assuming critical dry years occur at the same frequency in the next 31 years as they did in the past 31 years. Justification and explanation of the claimed benefits are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-3: Highlands Groundwater Conservation Project
Conserved Water Supply and Reduction in Groundwater Basin Over Draft

Table 5 – Annual Project Physical Benefits Project Name: *Highlands Groundwater Conservation Project* Type of Benefit Claimed: *Conserved Water Supply and Reduction in Groundwater Basin Over Draft* Units of Benefit Claimed: *Acre-feet per year (AFY)* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2016	0	1,108	1,108
2017-2019	0	2,216	2,216
2020-2025	0	1,662	1,662
2026	0	2,216	2,216
2027	0	1,662	1,662
2028-2039	0	2,216	2,216
2040-2041	0	1,662	1,662
2042-2044	0	2,216	2,216

Table 3-4 shows the benefits associated with reduction of energy consumption for this project. Similar to the water savings, claimed energy benefits differ based on hydrologic year type. Groundwater pumping would be completely offset in all but critical dry years. During critically dry years, groundwater pumping would be reduced by 75 percent compared to current conditions; as such, it was assumed that energy savings in critically dry years is equal to 75 percent of the energy usage. The projected occurrence of critically dry years was based on the San Joaquin River index for the past 31 years. Energy usage and savings were estimated based on energy usage data for the groundwater wells and booster pump station in the Highlands area from Pacific Gas and Electricity (PG&E). The justifications and explanations for the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-4: Highlands Groundwater Conservation Project
Net Reduction in Energy Consumption

Table 5 – Annual Project Physical Benefits Project Name: *Highlands Groundwater Conservation Project* Type of Benefit Claimed: *Net Reduction in Energy Consumption* Units of Benefit Claimed: *kilowatt hour/yr (KWh/yr)* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2016	0	4,875	4,875
2017-2019	0	9,751	9,751
2020-2025	0	7,313	7,313

Table 5 – Annual Project Physical Benefits Project Name: *Highlands Groundwater Conservation Project* Type of Benefit Claimed: *Net Reduction in Energy Consumption* Units of Benefit Claimed: *kilowatt hour/yr (KWh/yr)* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2026	0	9,751	9,751
2027	0	7,313	7,313
2028-2039	0	9,751	9,751
2040-2041	0	7,313	7,313
2042-2044	0	9,751	9,751

Table 3-5 shows the benefits associated with reduction in greenhouse gas emissions produced for this project. Similar to the water and energy savings, claimed energy benefits differ depending on the type of hydrologic year, Greenhouse gas reduction was calculated using the energy consumption provided in **Table 3-4** above. The justification and explanation of the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-5: Highlands Groundwater Conservation Project
Net Reduction in Greenhouse Gas Production

Table 5 – Annual Project Physical Benefits Project Name: *Highlands Groundwater Conservation Project* Type of Benefit Claimed: *Net Reduction in Greenhouse Gas Production* Units of Benefit Claimed: *Mega-ton of CO_2 per year (MT CO2e/yr)* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2016	0	1.5	1.5
2017-2019	0	3	3
2020-2025	0	2.5	2.5
2026	0	3	3
2027	0	2.5	2.5
2028-2039	0	3	3
2040-2041	0	2.5	2.5
2042-2044	0	3	3

Cressey Recharge Basin Enlargement Project

The physical benefits of this project are shown in **Table 3-6**. The Cressey Recharge Basin Enlargement Project would increase recharge to the Merced Subbasin, increasing groundwater quantity and quality. This would result in both immediate and long-term water supply savings and an associated reduction in groundwater basin over draft, improved water quality / reduced MCL violations, and reductions in subsidence potential. Project physical benefits are shown in **Tables 3-7**. Justification and explanation of claimed benefits claimed are presented in the section Technical Analysis of Physical Benefits Claimed below.

Table 3-6: Physical Benefits Summary
MID Cressey Recharge Basin Enlargement Project

Physical Benefit	Type of Benefit	Quantification of Benefits
Conserved long-term water supply and associated reduction in groundwater basin over draft	Primary	Up to 3,094 AFY
Improved Water Quality	Secondary	Not quantified
Reduction in Subsidence Potential	Secondary	Not quantified

Table 3-7 shows the water supply benefits for this project. Benefits vary by hydrologic year type; year types were determined using the DWR San Joaquin River index for the past 31 years. Justification and explanation of claimed benefits are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-7: Cressey Recharge Basin Enlargement Project
Conserved Water Supply and Reduction in Groundwater Basin Over Draft

Table 5 – Annual Project Physical Benefits

Project Name: Cressey Recharge Basin Enlargement Project

Type of Benefit Claimed: Conserved Water Supply and Reduction in Groundwater Basin Over draft

Units of Benefit Claimed: AFY

Additional Information About this Benefit:

(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2016	0	1,547	1,547
2017-2019	0	3,094	3,094
2020-2025	0	0	0
2026	0	3,094	3,094
2027	0	0	0
2028-2039	0	3,094	3,094
2040-2041	0	0	0
2042-2044	0	3,094	3,094

Water Meter Conservation Project

The physical benefits of this project are a result of a single, measureable, benefit – water conserved due to meter installation and the associated reduction in groundwater basin over draft. Benefits are summarized in **Table 3-8**, and annual project physical benefits are shown in **Table 3-9** through **Table 3-12**. The justifications for the benefits claimed are presented in the section Technical Analysis of Physical Benefits Claimed below.

Table 3-8: Physical Benefits Summary
Water Meter Conservation Project

Physical Benefit	Type of Benefit	Quantification of Benefits
Conserved long-term water supply and associated reduction in groundwater basin over draft	Primary	119 AFY
Reduced Net Electricity Consumption	Secondary	65,052 kW/hr/yr
Reduced Net Greenhouse Gas Production	Secondary	22 MT CO_2/yr
Reduced Net Chemical Usage	Secondary	720 gallons/yr
Improved Water Quality	Secondary	Not quantified

Table 3-9 shows the benefits associated with reduction in water demands / consumption resulting from project implementation. Demand reductions are estimated based on reductions achieved by similar projects in this region. Justification and explanation of the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-9: Water Meter Conservation Project
Conserved Water Supply and Reduction in Groundwater Basin Over Draft

Table 5 – Annual Project Physical Benefits Project Name: Water Meter Conservation Project Type of Benefit Claimed: Conserved Water Savings Units of Benefit Claimed: AFY Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015-2039	0	95	95

Table 3-10 shows the projected reduction in energy consumption resulting from project implementation. Energy usage was provided by LGCSD. Justification and explanation of the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-10: Water Meter Conservation Project
Reduce Net Consumption of Electricity

Table 5 – Annual Project Physical Benefits Project Name: *Water Meter Conservation Project* Type of Benefit Claimed: *Net Reduction in Energy Consumption* Units of Benefit Claimed: *KWh/yr* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015-2039	0	65,052	65,052

Table 3-11 shows the projected reduction in greenhouse gas emissions resulting from project implementation. Greenhouse gas reduction was calculated using the energy consumption provided in **Table 3-10** above. Justification and explanation of the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-11: Water Meter Conservation Project
Reduce Net Production of Greenhouse Gas Emissions

Table 5 – Annual Project Physical Benefits Project Name: *Water Meter Conservation Project* Type of Benefit Claimed: *Net Reduction in Greenhouse Gas Production* Unit of Benefit Claimed: *MT CO2e/yr* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project
2015-2039	0	22	22

Table 3-12 shows the projected reduction in water treatment chemicals resulting from project implementation. Projected savings in chemical use were provided by LGCSD. Justification and explanation of the benefits claimed are presented in the Technical Analysis of Physical Benefits Claimed section below.

Table 3-12: Water Meter Conservation Project
Reduce Net Use of Chemicals

Table 5 – Annual Project Physical Benefits			
Project Name: *LCGSD Water Meter Conservation Project* Type of Benefit Claimed: *Net Reduction in Chlorine Use* Units of Benefit Claimed: *gallons chlorine per year* Additional Information About this Benefit:			
(a)	(b)	(c)	(d)
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015-2039	0	720	720

Technical Analysis of Physical Benefits Claimed

Highlands Groundwater Conservation Project

Summary of Benefits

The projected project benefits include:

- **Water Supply (primary benefit):** The project is estimated to conserve 2,216 AFY of groundwater during most years, when surface water would completely offset groundwater pumping, and 1,662 AFY during critically dry years when some groundwater pumping would be needed to supplement surface water supplies.
- **Energy and greenhouse gas emissions (primary benefit)**: The project would provide surface water to an area that has primarily relied on groundwater. Existing wells would be idled in most years and operating at an assumed 25 percent capacity during critically dry years. Thus, the reduction in pumping would result in net reductions in energy consumption and greenhouse gas emissions production of 9,751 kWh/yr and 3 MT CO2e/yr, respectively, during all hydrologic years but critically dry years. During critically dry years, the net reduction energy consumption and greenhouse gas production would be 7,313 kWh/yr and 2.5 MT CO2e/yr, respectively.
- **Improved Water Quality (secondary benefit, unquantified)**: Improved water quality is a secondary benefit that would result from increasing groundwater levels. Although unquantified, water quality is expected to improve substantially with respect to TDS and nitrate concentrations, as there are two areas immediately north and northeast of the Highlands with elevated concentrations of these constituents. Increases in groundwater levels would reverse exceedances of the MCL for nitrate and avoid damage to crops from high TDS levels.
- **Reduction in subsidence potential (secondary benefit, unquantified)**: Reduced subsidence potential is a secondary benefit that would result from increased groundwater levels. This is an unquantified benefit because the exact reduction in subsidence cannot be determined. However, it is expected that increases in groundwater levels could reduce subsidence by up to 0.2 feet/yr based on the losses that have occurred in the recent past.

Technical Basis of the Project

The following list provides the technical basis for the project. The methods used to determine the claimed benefits are further discussed in a separate subsection.

- MID conducted conceptual design for the proposed Project to determine facility sizing. The calculations to support the project are included in **Appendix 3-1** (As described on page 1 of **Appendix 3-1**, the project was designed for a flow rate of 18 cubic feet per second [cfs]. The spreadsheet on page 3 of this appendix provides facility sizing information from the conceptual design).
- The water supply benefits claimed for the project were calculated based on acreage of land anticipated to be converted from groundwater to surface water supply (**Appendix 3-2**), cropscape information (i.e., type of crops), evapotranspiration data for specific crops, and irrigation efficiency for the Highlands area presented in **Appendix 3-3** (page 1 [lower tables] show the calculations for the consumptive use and total water supply applied in AFY, based on the evapotranspiration data for individual crops by month presented on page 2 and the irrigation efficiency data for the various crops on page 3). The benefits in critically dry years also required the historical, average water allocations (curtailments), provided in **Appendix 2-2**.
- The energy benefits claimed for the project were calculated based on PG&E electricity usage information for the wells and booster pump station in the Highlands area, included in **Appendix 3-4**. Annual energy consumption by existing groundwater users (i.e., use of groundwater wells) is presented on page 13 of this appendix. Annual energy usage by surface water users (i.e., use of booster pump station) is presented on page 2 of this appendix. Raw data for the calculating the energy consumption are included on pages 7 - 12 (booster pump station) and pages 42 - 73 (groundwater wells). The reduction in energy consumption is summarized on page 1 of the appendix.
- Greenhouse gas benefits claimed for the project were calculated based on energy consumption information included in **Appendix 3-4** (see page 1).
- Water quality benefits were based on data included in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, presented in **Appendix 3-5** (maps of the groundwater elevation on page 28, generalized groundwater flow directions on page 29, TDS concentrations on page 34, and nitrate concentrations on page 36).
- Subsidence avoidance benefits were based on data included in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, presented in **Appendix 3-5** (maps of subsidence on pages 31 and 32)
- Ecosystem benefits are based on the license with Federal Power Commission (revised February 1, 1964) (pages 1 – 29 of **Appendix 3-6**), the United States of America Federal Energy Regulatory Commission Notice of Authorization for Continued Project Operation (March 5, 2014) (pages 30 – 32 of **Appendix 3-6**), and the 2013 USFWS letter identifying the preliminary schedule for the delivery of water in 2013 to Merced NWR (page 33 of **Appendix 3-6**).
- Groundwater production wells that were rendered inoperable are based on the list of wells that have been lost in the 2014 irrigation season as shown in **Appendix 3-7**.
- Groundwater level information for MID and El Nido is presented in **Appendix 3-8**. Page 1 of this appendix shows the MID well groundwater depth from 2009-2013 including the groundwater depth within the Highlands area ("7 well avg" as shown on the chart). Pages 2 – 5 of the appendix shows a summary of the groundwater levels at each wells for the same period. The raw data for the wells are presented on pages 6 – 11. The groundwater level depth for El Nido is presented on pages 12 – 14.

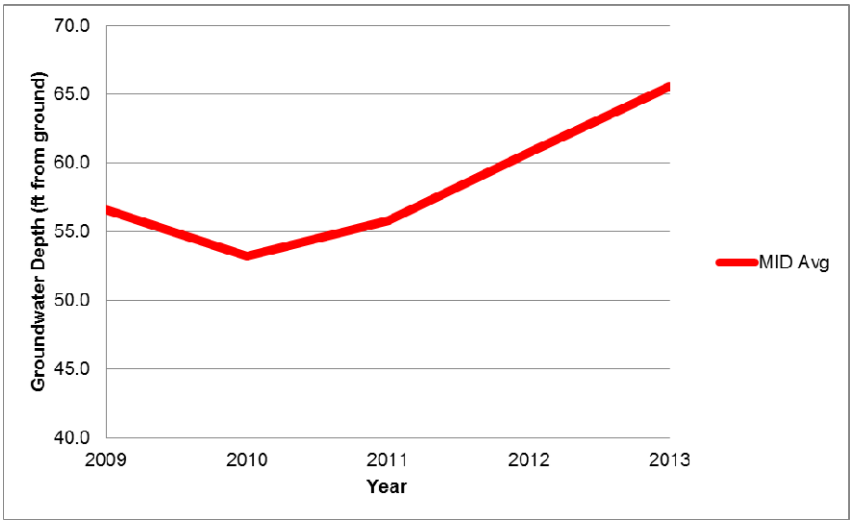
Background for Benefits Claimed

Precipitation is an important source of groundwater recharge in the Merced Subbasin. The Merced Subbasin has been in a state of mild groundwater level decline with a cumulative decrease in storage of approximately 720,000 AF from 1980 to 2007[3]. Lack of rain in recent years has caused a reduction in basin recharge. In addition, increased pumping activities needed to sustain agricultural crops during this drought have resulted in a significant decline in

[3] AMEC Geomatrix, Inc. 2008. Merced Groundwater Basin Groundwater Management Plan Update. Merced County. July 29. [pages 20 and 22)

groundwater levels. Between 2010 and 2013, the average groundwater level in the MID service area declined more than 10 feet (see **Figure 3-5**).

Figure 3-5: Average MID Groundwater Depth from 2009-2013



During the 2014 irrigation season, up to 27 of MID's production wells became inoperable as a result of the substantial drop in groundwater levels. These wells, shown in **Figure 3-6**, are identified in **Appendix 3-7**. The red dots in **Figure 3-6** denote groundwater wells that will require rehabilitation (existing pumps will have to be lowered within the existing well casing) and the purple dots denote groundwater wells where deepening (via redrilling) will be required. Within the Highlands area, two wells have been rendered inoperable because of this drought. Although the exact numbers are not known, many private wells have also been rendered inoperable because of the drought, resulting in the need for either rehabilitation or deepening. The loss of irrigation wells directly affects agricultural production, which has exacerbated the current difficulties faced by many residents and farmers in the Highlands area (a DAC) and overall within the Merced Subbasin. The loss of private domestic wells also affects directly access to safe drinking water supplies in the area.

Declining water levels affect groundwater quality. The Highlands area is located south of Highway 99, close to the community of Arena between the cities of Livingston and Atwater. As indicated in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, there is an area of depressed groundwater elevations (60-foot contour) to the north and northeast of the Highlands area (see page 28 of **Appendix 3-5**). This is in close proximity and down gradient of two areas of high TDS (with levels exceeding the 500 mg/L MCL) (see **Figure 3-7** and page 34 of **Appendix 3-5**) and high nitrate concentrations (ranging from 25 to 45 mg/L, compared to the 45 mg/L MCL) (see **Figure 3-8** and page 36 of **Appendix 3-5**). Water quality is expected to continue to deteriorate as groundwater declines without the project, thus affecting drinking water and irrigation supplies. If drinking water quality is further impacted, DACs in and around the Highlands area would face significant public health and safety issues, as there is no other alternative drinking water supply to meet basic human needs in this area.

Figure 3-6: MID Production Wells that Have become Inoperable in 2014

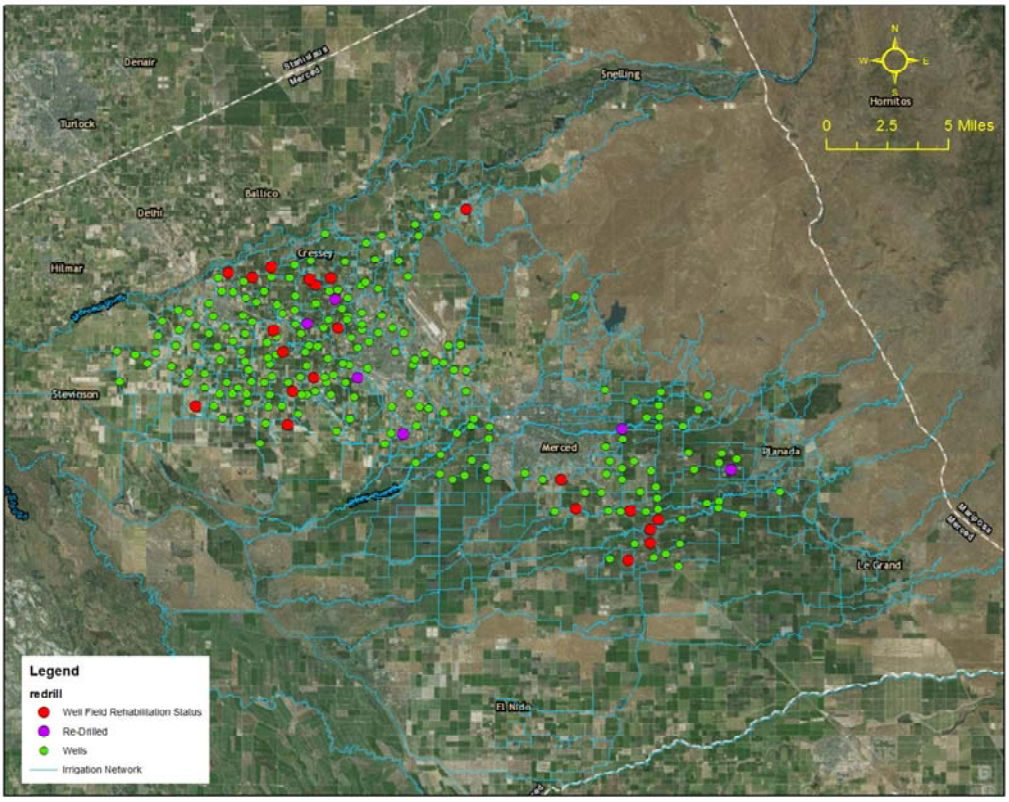


Figure 3-7: TDS Concentrations in the Merced IRWM Region

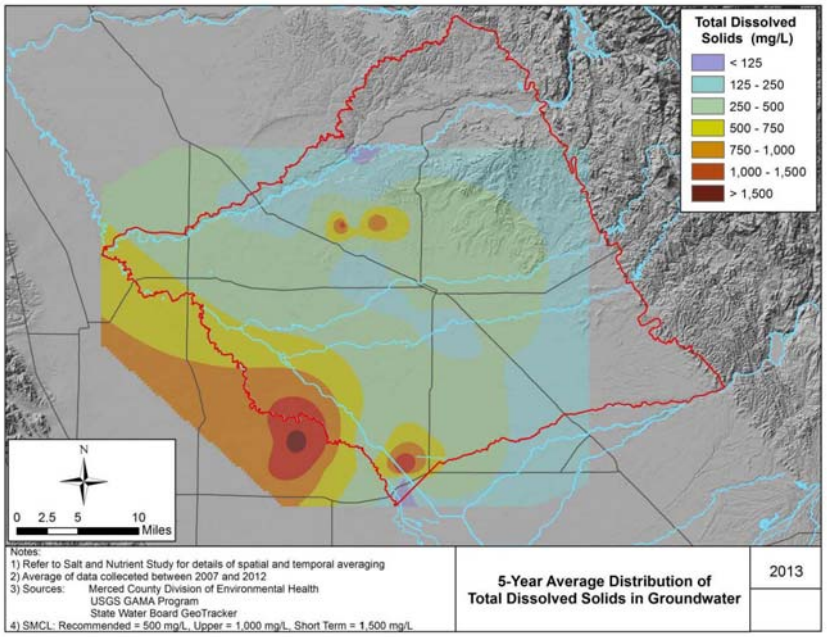
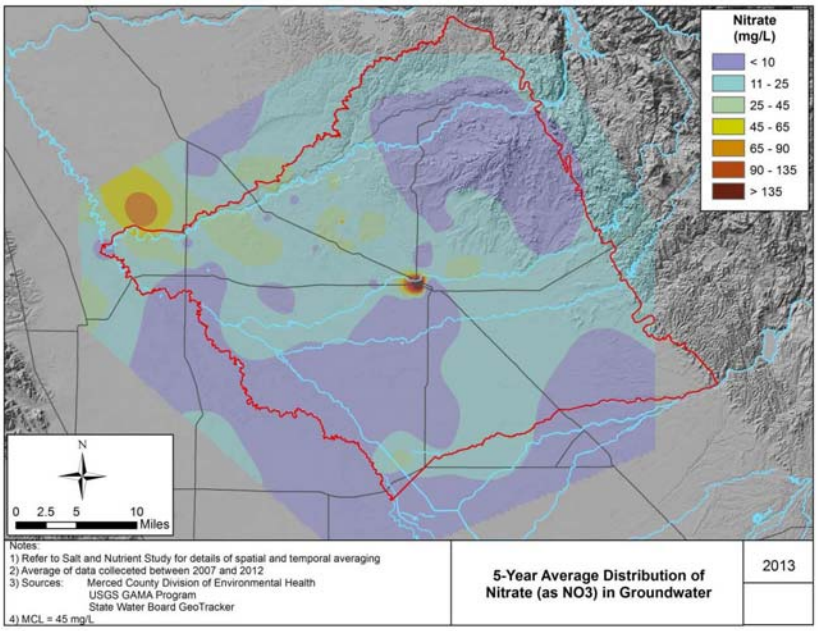


Figure 3-8: Nitrate Concentrations in the Merced IRWM Region

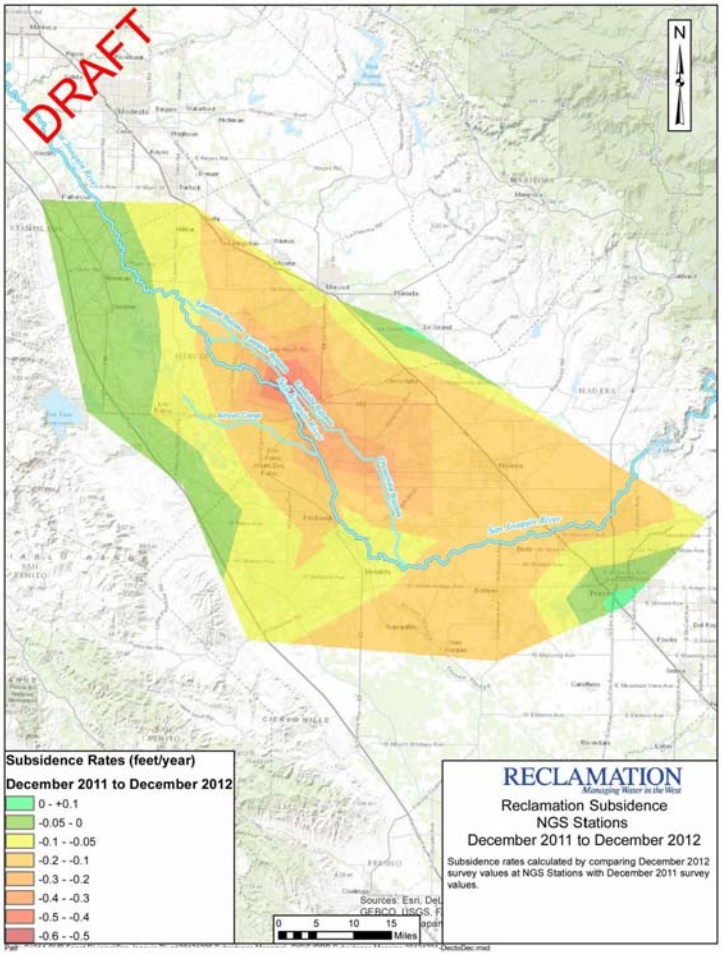


The Highlands area is located within an area defined by USBR as having subsided at a rate of -0.1 to -0.2 feet/yr between December 2011 and December 2012 (see **Figure 3-9** and **Appendix 3-5**, page 31).

Without-Project Conditions

Without the proposed project, the groundwater basin will continue to be over drafted. During drought conditions, the decline would increase significantly and the region's supply of both surface water and groundwater would continue to be diminished as additional stress on the Merced Subbasin is incurred from increased groundwater pumping activity in the Merced Subbasin. Additional groundwater wells (both public and private) would be expected to be rendered inoperable as the drought worsens, requiring rehabilitation or deepening, which in turn results in further reduction in water production in this critical crisis.

Figure 3-9: Land Subsidence in the San Joaquin River Area, December 2011-December 2012



Source: (US Bureau of Reclamation, 2012)

Water quality impacts, which result from declining water levels, would be expected to worsen. In particular, TDS and nitrate levels could continue to increase in the vicinity of the Highlands area, potentially exceeding 500 mg/L for TDS and 45 mg/L for nitrate (above the MCLs). As the entire region relies solely on groundwater for its potable supply, the loss of this critical resource would have devastating effects. These effects could be just as dire for the agricultural economy if water quality of the groundwater were to worsen such that damages to agricultural crops were incurred due to increased salinity of the source water. The impact to the agricultural economy would be further magnified when considering the combined effect of MID water supply curtailments and dwindling surface and groundwater supplies.

Ecosystem water would also be reduced substantially. Although MID is required to provide up to 15,000 AFY of ecosystem water to Merced National Wildlife Refuge (NWR) per Article 45 of its license with the Federal Power Commission (revised February 1, 1964) (see page 26 of **Appendix 3-6**) and the United States of America Federal Energy Regulatory Commission (FERC) Notice of Authorization for Continued Project Operation (March 5, 2014) (pages 30 to 31 of **Appendix 3-6**), during droughts such requirements may not be met. Each year, USFWS submits a letter outlining the preliminary schedule for delivery of water prior to the irrigation season, and the MID Board of Directors determines the duration of the irrigation season. Typically, the irrigation season extends from March through October. However, for 2014, the season will be cut short by two months. Because the USFWS requested schedule for delivery of water differs each year, it is difficult to accurately predict the precise distribution of water deliveries by month. In 2013, for example, the allocations varied from 1,200 to 2,700 AF, with 1,200 AF in March

and 2,700 AF in October (see page 33 of **Appendix 3-6**). If the same schedule was provided in 2014, then the reductions in ecosystem water would be 3,900 AF for the year, a substantial decrease that could translate to reduced habitat for plants and wildlife. This could result in a reduction in numbers of plants and wildlife, which could cause indirect effects to the recreation and tourism industry (e.g., for birdwatching and hunting). Without the project and the additional supply stored in the groundwater basin over the long term, the NWR could face more severe cutbacks in the future.

Without the project, subsidence would be expected to worsen in the future, particularly due to the increased groundwater extraction and resulting dewatering of sensitive clay units. Thus, uniform and differential subsidence could occur. The latter type of subsidence could damage infrastructure.

Finally, without the proposed project, the risk of not meeting drinking water and agricultural supplies would continue with declining groundwater levels and groundwater quality could be compromised.

Methods used to Estimate Physical Benefits

Water Supply Benefits. Water supply benefits were calculated based on property information for the Highlands Area (see **Appendix 3-2** which shows the acreage of land that is currently using groundwater). The Highlands area consists of approximately 1,132 acres of agricultural land, of which approximately 463 acres are currently using surface water and limited well water, 67 acres are reliant on well water from MID wells, 583 acres are reliant on well water from private wells, and 67 acres are reliant on both MID well water and surface water, for a total of 717 acres of land that are currently supported by groundwater. Agricultural crops in this area use approximately 3.09 AF/AC on average (see page 1 of **Appendix 3-3**), based on a land use analysis that evaluated the type of crops in the Highlands area[4], the evapotranspiration (ET) rates[5] (see page 2 of **Appendix 3-3**) and irrigation efficiencies (IE)[6] (see page 3 of **Appendix 3-3**) associated with these crops. Consumptive use was calculated using crop type and ET, and the total water supply also considered the IE and total acreage. 2013 land use data was used to reflect changed land uses in the recent past from field crops to nut orchards. The ET and IE factors are based generally on the types of crops and thus are not associated with any particular year. Based on this information, calculated crop demand for 717 acres of land would be converted from groundwater to surface water use and a water demand of 3.09 AF/AC per year, or approximately 2,216 AFY of groundwater, would be conserved in the basin for future use.

Because of the conjunctive nature of this project, groundwater may be used during some years. To be conservative, the last 31 years of record from DWR's Chronological Reconstructed San Joaquin Valley Water Year Hydrologic Classification Index were reviewed to define the type of water years anticipated to occur over the life of the project (31 years)[7]. Critical dry years occurred in 10 of the last 31 years of record based on DWR data, as shown on **Figure 3-10** below. Construction of the project is anticipated to be complete in the spring of 2016. It is assumed that only half of the benefits (to be conservative) would be incurred on the first year because construction would not be completed until April 2016 (see Attachment 6 for the project schedule). Thereafter, during all years but critically dry hydrologic years, it is assumed that 100 percent of the benefit would accrue. During critically dry years, only 75 percent of the benefits would be realized, as it is assumed that surface water deliveries would be reduced by 25 percent and the remainder would be made up through groundwater pumping. This percentage was calculated based on historical water curtailment records (see **Appendix 2-2**). Water allocations were set in 1977, 1988-1992, 2008,

[4] USDA National Agricultural Statistics Service Cropland Data Layer. 2014. Published crop-specific data layer [Online]. Accessed May 22,2014 at http://nassgeodata.gmu.edu/CropScape/

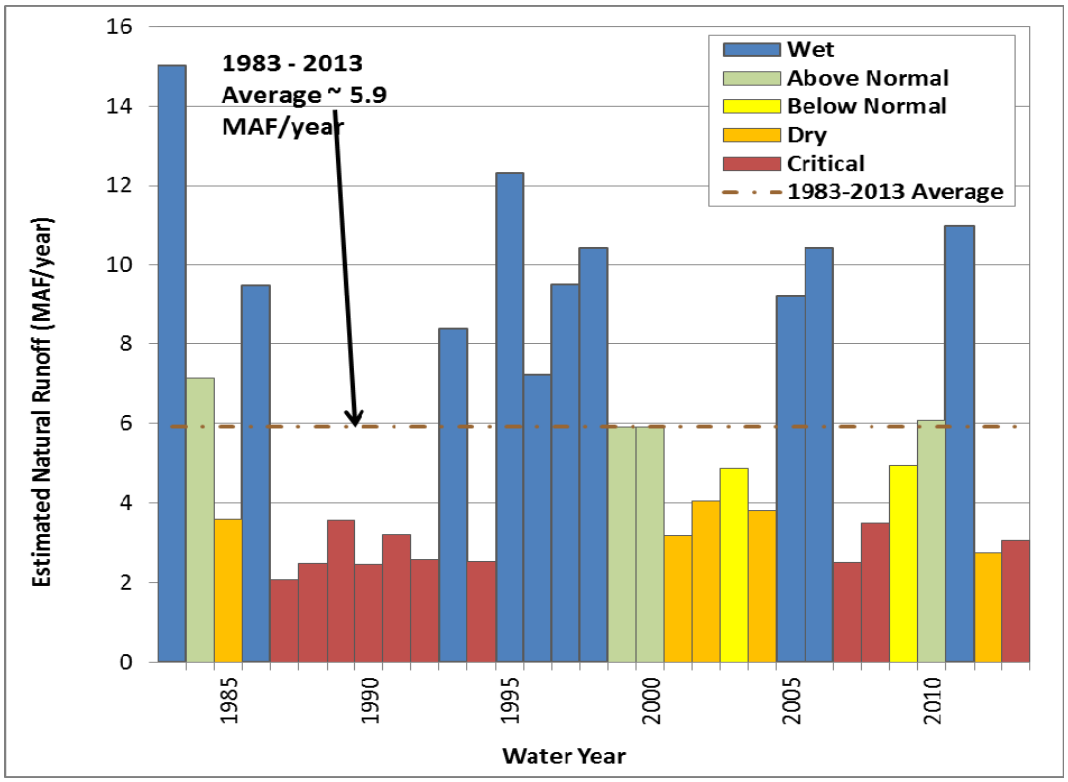
[5] Irrigation Training and Research Center (ITRC). California Evapotranspiration Data for Irrigation District Water Balances. Accessed online on July 3, 2014 at http://itrc.org/etdata/waterbal.htm

[6] Minimum soil moisture requirement and crop irrigation efficiency values were based on values used in the CVGSM model, which in turn were derived from the DWR Consumptive Use Model (James M. Montgomery Consulting Engineers. 1990A. Documentation and User's Manual for Integrated Groundwater and Surface Water Model. Sacramento, CA: James M. Montgomery Consulting Engineers, Inc.)

[7] Department of Water Resources (DWR). 2013. DWR California Data Exchange Center. Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices. December 19. Accessed on July 2, 2014. Available at: http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

and 2012-2014. The average allocation for these years was 2.25 AFY/AC, which is equivalent to about 75 percent of the typical crop usage of 3.0 AFY/AC. Thus, it was assumed that during critically dry years, the water supply benefits associated with conserved water is 75 percent of 2,216 AFY or 1,662 AFY.

Figure 3-10: DWR San Joaquin Valley Water Year Hydrologic Classification Index



Energy Benefits. The net reduction in electricity was based on PG&E power consumption data obtained for the seven wells and booster pump station No. 32 within the Highlands area. Based on PG&E data, the average annual energy usage of seven wells was 78,143kWh between 2011 and 2013 (see page 13 of **Appendix 3-4**). The average annual energy usage of the booster pump station No. 23 was 44,173 kWh between 2008 and 2013 (see page 6 of **Appendix 3-4**). The unit energy use was then calculated to determine the energy usage per acre foot of water. As described under Water Supply Benefits above, 463 of the existing 1132 acres of land are currently using surface water (see p. 2 of **Appendix 3-4**). Using 3.09 AFY/AC as the demand for agricultural corps in the area (see page 1 of Appendix 3-3), the total production of surface water associated with the 463 AC of land is 1,431 AFY; the unit energy use would then be 44,173 kWh divided by 1,431 AFY, or 31 kWh/AFY. The total land area currently supported by groundwater is 717 AC. Multiplying by 3.09 AF/AC, the total groundwater production would be 2,216 AFY. The unit energy use for groundwater pumping is then 78,143 kWH divided by 2,216 AFY, or 35 kWh/AFY (see page 1 of **Appendix 3-4**).

To determine the energy savings from conversion of groundwater to surface water, the difference between pumping of the booster pump station and groundwater wells is calculated assuming 2,216 AFY (717 AC times 3.09 AFY/AC) of water production as this is the acreage that would be converted from groundwater to surface water in most water year types. As shown on page 1 of **Appendix 3-4**, the energy consumption of the booster pump station would be 68,392 kWh/yr (2,216 AFY times 31 kWh/AFY). . The groundwater wells would consume 78,143 kWh/yr to produce the same amount of water. Thus, the difference of the two pumping is 9,751 kWh/yr, or the energy savings associated the reduced consumption of energy. During critically-dry years, it is assumed that 25 percent of the water supply would come from groundwater wells. Thus, the savings would reduce to 7,313 kWh/yr.

Greenhouse Gas Benefits. The net reduction in greenhouse gas production was calculated based on the energy consumption data. The GHG emission factor associated with power production is derived from the California Energy Commission (CEC) and EPA's eGRID data. Per the CEC's Energy Almanac[8], , California produces 70 percent of its energy and imports 10 percent from the Pacific Northwest, and 20 percent from the Pacific Southwest. USEPA eGRID data provides information about the GHGs associated with each of the energy supplies (calculated as carbon dioxide equivalent units or CO2e) as 613.28 pounds of CO2e per MWH (lbs/MWh), 846.97 lbs/MWh, and 1,182 lbs/MWh, respectively[9]. Averaging each of these CO2e emissions factors shows that California energy supplies have a combined CO2e emissions factor of 750.57 lbs/MWh, or 0.34 metric tons (MT) of CO2e per MWh. Based on projected energy savings, the avoided greenhouse gas emissions benefit would be 3 MT CO2e/yr during critically dry years and 2.5 MT CO2e /yr during all other years.

Water Quality Benefits Because groundwater flows generally in the west and southwesterly direction in this area (see page 29 of **Appendix 3-5**), it is expected that increases in groundwater levels resulting from in-lieu recharge would generate substantial water quality benefits in the Highlands area. Elevated concentrations of TDS and nitrate would decrease overtime, reducing the potential for damage associated with irrigation of crops with elevated TDS and nitrate in excess of the MCLs.

Subsidence Benefits. The Highlands area is located within an area defined by USBR as having subsided at a rate of -0.1 to -0.2 ft/yr between December 2011 and December 2012 (see **Figure 3-9** above). Managing water levels reduces future subsidence, particularly with regard to dewatering of sensitive clay units. This project would therefore prevent impacts to infrastructure due to difference subsidence, though this benefit cannot be quantified.

New facilities, Policies, and Actions Required to Obtain Physical Benefits

The following new facilities are necessary to obtain physical benefits:

- Upgrade of Booster Pump Station No. 32 with a larger pump and variable frequency drive;
- Modification of Booster Pump Station 40 by removing the pump and installation of a spill structure;
- Upgrade of 6,500 feet of existing pipelines from 12- to 16-inches to 27-inch in diameter;
- Installation of 4,000 feet of new 27-inch in diameter pipelines;
- Installation of outlet structures; and
- Installation of pressure boxes.

No policies are required to obtain the physical benefits.

The actions necessary to obtain the physical benefits above are completion of design, environmental compliance, and construction of the project. MID will complete the environmental documentation and design for proposed facilities described above.

Potential Adverse Physical Effects of the Project

Proposed facilities would be constructed within existing disturbed areas (e.g., pump stations) or within road rights-of-ways, except for an approximately 600-foot segment where a new pipeline would cross an existing orchard. Implementation of the project would have primarily temporary, construction-related impacts as well as long-term impacts to agricultural uses associated with the removal of a small amount of farmland from production for placement and operation of the pipeline. MID will comply with CEQA and prepare an environmental document (anticipated to be an Initial Study / Mitigated Negative Declaration) to analyze the project and to reduce any potential impacts through appropriate mitigation measures. Thus, it is not anticipated that potential adverse physical effects would occur.

[8] CEC. 2013. California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours). Accessed 24 June 2014. Available: http://energyalmanac.ca.gov/electricity/electricity_generation.html
[9] U.S. Environmental Protection Agency (USEPA). 2014. eGRID 9th edition Version 1.0 Year 2010 Summary Tables. February. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/

Cressey Recharge Basin Enlargement Project

Summary of Benefits

The projected project benefits include:

- **Water Supply (primary benefit):** The project is estimated to conserve 3,094 AFY through the life of the project during all but critically dry years through artificial recharge. In critically dry years, this benefit is assumed to be 0 AFY.
- **Improved Water Quality (secondary benefit, unquantified)**: Improved water quality is a secondary benefit that would result from increasing groundwater levels. Although unquantified, water quality is expected to improve substantially with respect to TDS and nitrate concentrations, as the project is located upgradient of areas with elevated concentrations of these constituents. Increases in groundwater levels could correct exceedances of the nitrate MCL and avoid damage to crops from high TDS levels.
- **Reduction in subsidence potential (secondary benefit, unquantified)**: The reduction in subsidence potential is a secondary benefit that results from increasing groundwater levels. This is an unquantified benefit because the exact reduction in subsidence cannot be determined. However, it is expected that increases in groundwater levels could reduce subsidence by up to 0.2 feet/yr based on the losses that have occurred in the recent past.

Technical Basis of the Project

The following information provides the technical basis for the project:

- DWR prepared a Technical Memorandum on the Cressey Recharge Basin Assessment Project in August 2002. This document is the work plan for the pilot recharge project. Page 1 of **Appendix 3-9** shows that the original pilot project sites were determined by MAGPI members and DWR. Page 2 of this appendix specifies that following completion of a hydrogeological evaluation of the site, MAGPI members and DWR developed a work plan that identifies the physical, legal, institutional, engineering, and data collection and analysis considerations that may be required for the successful implementation of a pilot recharge project. This work plan provides the justification for the Enlargement Project because it establishes the location of the potential recharge basin and shows that physical, legal, institutional, and engineering considerations were already considered as part of the pilot project.
- DWR prepared the hydrogeological investigation of the Cressey site in 2002 (see **Appendix 3-10**). As indicated above, the results of this investigation allowed MAGPI and DWR to proceed with the pilot project. As discussed on pages 2 and 3 of this appendix, five exploratory drill holes were initially drilled to a maximum depth of 150 feet below ground surface (bgs) and three drill holes were converted into monitoring wells. Due to the lithologic variability encountered during drilling, three additional drill holes were drilled and one additional monitoring well was installed. Page 10 of this appendix shows the locations of the exploratory drill holes and the monitoring wells. Pages 5 through 8 of this appendix provide the findings, conclusions, and recommendations of the study. The geologic logs are provided on pages 17 through 58 of this appendix. Because the hydrogeologic investigation has been completed, these results will apply to the enlargement project and a separate hydrogeologic investigation will not be required. This investigation provides the basis for the feasibility of the enlarged basin location.
- MID prepared the Improvement Plans for Cressey Groundwater Recharge Basin in January 2011. Because the proposed site would be an expansion of the original recharge basin, it is expected that the design of the enlargement project would be similar to that of the original recharge basin. The same characteristics (i.e., height of berms, material used, etc.) would be expected for the enlarged basin. This document is included as **Appendix 3-11**.

- MID evaluated the original 8-acre recharge basin within the 18-acre site in the initial study / mitigated negative declaration (IS/MND) conducted in March 31, 2010 (see **Appendix 3-12**). This document, which evaluated construction of the original basin and the use of the remaining site for stockpiling, concluded that no significant environmental impacts would occur because revisions in the project were made to avoid impacts (see pages 15 and 16 of this appendix). Similar conclusions in a newly prepared environmental document are anticipated because site conditions are unlikely to have change substantially and MID would avoid adverse impacts to the environment through appropriate mitigation measures. This document provides documentation the viability of the site in terms of environmental factors and that physical adverse effects are not anticipated.
- MID's description of the proposed basin enlargement is provided in **Appendix 3-13**.
- The water supply benefits claimed for the project were calculated based on proposed acreage (5 acres), the infiltration rate calculated based on monitoring at the existing Cressey Recharge Basin (2.74 AF/AC/day) (see **Appendix 3-14**), and the average length of the irrigation season derived from historic record (1993 to 2012) **(**see **Appendix 3-15)**. The calculations of the water supply benefits are also included in **Appendix 3-15**.
- The benefits to water quality are based on information included in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, presented in **Appendix 3-5** (maps of the groundwater elevation on page 28, generalized groundwater flow directions on page 29, TDS on page 34, nitrate on page 36, and arsenic on page 37).
- The avoidance of subsidence effects is based on information included in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, presented in **Appendix 3-5** (maps of subsidence on pages 31 and 32 of this appendix)
- Ecosystem demands are based on the license with Federal Power Commission (revised February 1, 1964) (pages 1 – 29 of **Appendix 3-6**), the United States of America FERC Notice of Authorization for Continued Project Operation (March 5, 2014) (pages 30 – 32 of the same appendix), and the 2013 USFWS letter identifying the preliminary schedule for the delivery of water in 2013 to Merced NWR (page 33 of **Appendix 3-6**). The groundwater production wells that were rendered inoperable are based on the list of wells that have been lost in the 2014 irrigation season as shown in **Appendix 3-7**.
- Groundwater level information for MID and El Nido is presented in **Appendix 3-8**. Page 1 of this appendix shows the MID well groundwater depth from 2009-2013. Pages 2 – 5 of the appendix shows a summary of the groundwater levels at each wells for the same period. The raw data for the wells are presented on pages 6 – 11. The groundwater level depth for El Nido is presented on pages 12 – 14.

Background for Benefits Claimed

Precipitation is an important source of groundwater recharge in the Merced Subbasin. The Merced Subbasin has been in a state of mild groundwater level decline with a cumulative decrease in storage of approximately 720,000 AF from 1980 to 2007[10]. The lack of rain in recent years has resulted in reduced recharge to the basin. In addition, increased pumping activities necessary to sustain agricultural crops during this drought have resulted in further declining groundwater levels. Between 2010 and 2013, the average groundwater level in the MID service area declined more than 10 feet (see **Figure 3-5** above).

During the 2014 irrigation season, up to 27 of MID's production wells became inoperable as a result of the substantial drop in groundwater levels. These wells, shown in **Figure 3-6** above, are identified in **Appendix 3-7**. The red dots in **Figure 3-6** denote groundwater wells that will require rehabilitation (existing pumps will have to be lowered within the existing well casing) and the purple dots denote groundwater wells where deepening (via redrilling) will be required. Although the exact numbers are not known, many private wells have also been rendered

[10] AMEC Geomatrix, Inc. 2008. Merced Groundwater Basin Groundwater Management Plan Update. Merced County. July 29. [pages 20 and 22)

inoperable because of the drought, resulting in the need for either rehabilitation or deepening. The loss of wells also directly affects agricultural production.

Without the project, water quality impacts, which are linked to declining water levels, would be expected to worsen. The Cressey Recharge Basin is located upgradient of two areas of elevated concentrations of TDS and nitrate, where TDS concentrations exceed 750 mg/L and nitrate concentrations exceed 45 mg/L for nitrate (both of which are above the respective MCLs) (see **Figure 3-7** and **3-8** above). In general, water quality of the Merced Subbasin would deteriorate with declining groundwater levels. As the entire region relies solely on groundwater for its potable water supply, the loss of this critical resource would have a devastating effect on public health and safety. The agricultural economy would also be impacted if water quality of the groundwater were to worsen such that agricultural crops were damaged by increased salinity of the source water. The impacts to the agricultural economy would be further magnified when combined with MID water supply curtailments. Water quality would continue to deteriorate, affecting drinking water and irrigation supplies.

The project area is also located upgradient of an area defined by USBR as having subsided at a rate of -0.1 to -0.2 feet/yr of between December 2011 and December 2012 (see **Figure 3-9** above). Subsidence can worsen in the basin with decreasing groundwater levels.

Without-Project Conditions

Without the proposed project, the groundwater basin will continue to be over drafted. During drought conditions, the decline would increase significantly and the region's supply of both surface water and groundwater would continue to be diminished as groundwater pumping increases to meet potable and agricultural demands. Additional groundwater wells (both public and private) would be expected to be rendered inoperable as the drought worsens, requiring rehabilitation or deepening.

Water quality impacts, which are also linked to declining water levels, would be expected to become more severe. In particular, TDS and nitrate levels could continue to increase in and down gradient of the Cressey Recharge Basin area, potentially exceeding the TDS and nitrate MCLs of 500 mg/L and 45 mg/L, respectively. As the entire region relies solely on groundwater for its potable supply, the loss of this critical resource would have devastating effects on public health and safety. These effects could be just as dire for the agricultural economy if groundwater salinity were to increase to the point where agricultural crops were damaged. The impacts to the agricultural economy would be further magnified when combined with MID water supply curtailments.

Ecosystem water would also be reduced substantially. Although MID is required to provide up to 15,000 AFY of ecosystem water to Merced NWR per Article 45 of its license with the Federal Power Commission (revised February 1, 1964) (see page 26 of **Appendix 3-6**) and the United States of America FERC Notice of Authorization for Continued Project Operation (March 5, 2014) (pages 30 to 31 of **Appendix 3-6**), during droughts such requirements may not be met. Each year, USFWS submits a letter outlining the preliminary schedule for delivery of water prior to the irrigation season, and MID determines the duration of the irrigation season. Typically, the irrigation season extends from March through October. However, for 2014, the season will be cut short by two months. Because the USFWS requested schedule for delivery of water differs each year, it is difficult to accurately predict the precise distribution of water deliveries by month. In 2013, for example, the allocations varied from 1,200 to 2,700 AF, with 1,200 AF in March and 2,700 AF in October (see page 33 of **Appendix 3-6**). If the same schedule was provided in 2014, then the reductions in ecosystem water would be 3,900 AF for the year, a substantial decrease that could translate to reduced habitat for plants and wildlife. This could in turn result in a reduction in the number of plants and wildlife and could subsequently cause indirect effects to the recreation and tourism industry (e.g., for birdwatching and hunting). Without the project and the additional supply stored in the groundwater basin over the long term, the NWR could face more severe cutbacks in the future.

Without the project, subsidence would be expected to worsen in the future, particularly due to the increase groundwater extraction and resulting dewatering of sensitive clay units. This could cause uniform and differential subsidence and potentially damage infrastructure.

Without the proposed project, drinking water and agricultural demands may not be met and groundwater quality could be compromised. The Human Right to Water would not be achieved given such a scenario. Ecosystem supplies would also suffer, as there would be cutbacks to the water sent to the Merced NWR.

Methods used to Estimate Physical Benefits

Water Supply Benefits. The calculation of the water supply benefit is based on several factors:

- The expected percolation rate of 2.74 AF/AC/day is derived from observed percolation rates for the existing recharge basin (see **Appendix 3-14**). Specifically, the percolation rate for each day from July 21, 2011 through October 20, 2011 was calculated, and then averaged to determine the infiltration rate for the existing 8 acre basin (21.92 AF/day). The per acre value was then calculated (21.92 AF/day divided by 8 AC = 2.74 AF/AC/day). It should be noted that during the July 2011 through October 2011 period, there were periods of 0 inflow;
- The expansion area is 5 acres as proposed;
- The duration of recharge on any given year was based on the last 20 years (1993 to 2012) of irrigation season data (**Appendix 3-15**); .
- Total water savings for non-critical dry years were calculated based on the percolation rate (2.74 AF/AC/day) times the expanded basin area (5 AC) times the average number of days in the irrigation season for each year from 1993 through 2013. An average was then taken for that same period to derive the claimed water benefits for non-critically dry years (see **Appendix 3-15**). The water supply benefit was calculated to be 3,094 AFY. For critically dry years, it was assumed that the claimed benefits would be 0 because there would not be any available for artificial recharge. To determine the critically dry years, the last 30 years of record from DWR's Chronological Reconstructed San Joaquin Valley Water Year Hydrologic Classification Index was used to define the type of water year that are anticipated to occur over the life of the project (31 years). Critically dry years occurred in 10 of the last 31 years of record based on DWR data, as shown on **Figure 3-10** above. Construction of the project is anticipated to be complete in the spring of 2016. It is assumed that only half of the benefits (to be conservative) would be incurred in the first year because construction would not be completed until February 2016 (see Attachment 6 for the project schedule). Thereafter, during all years but critically dry hydrologic years, it is assumed that 100 percent of the benefit would accrue. During critically dry years, 0 percent of the benefits would be claimed

Water Quality Benefit. Although an unquantified benefit, artificial recharge would increase groundwater levels such that water quality in this area would be improved. TDS levels in the vicinity range from 500 mg/L to approximately 1,500 mg/L, in excess of the MCL, and nitrate concentrations range from 25 mg/L to 45 mg/L, near the MCL. With increased groundwater levels, elevated concentrations of TDS and nitrates are expected to decrease overtime, reducing MCL exceedances and the potential for crop damage due to elevated TDS. While this is an unquantified benefit, the improvement in water quality would be substantial.

Subsidence Benefit: The project area is located just north of an area defined by USBR as having subsided at a rate of -0.1 to -0.2 feet/yr of between December 2011 and December 2012 (see **Figure 3-9** above). Increasing recharge artificially in this area would allow for better management of water levels that could reduce future subsidence related to dewatering of sensitive clay units. Thus, this project would reduce subsidence, though this benefit cannot be quantified.

New facilities, Policies, and Actions Required to Obtain Physical Benefits

The following new facilities are necessary to obtain physical benefits:

- Enlarged basin (five acre expansion)
- Upgrade of the SCADA system to allow MID to track percolation/groundwater recharge rates in real time

No policies are required to obtain the physical benefits.

In order to achieve the benefits summarized above, the final design, environmental compliance, and construction of the project must be completed. MID will complete the environmental documentation and design for proposed facilities described above.

Potential Adverse Physical Effects of the Project

An IS/ND was prepared for the original Cressey Basin Project, which evaluated impacts over the entire 18-acre area for a 10+acre basin with the remaining area used for stockpiling (see **Appendix 3-12**). Expansion of the recharge basin within the existing 18-acre footprint is not expected to result in any adverse physical effects as all work would be confined within areas that are currently disturbed. MID will comply with CEQA and prepare an environmental document (anticipated to be an IS/MND) to analyze the project and to reduce any potential impacts through appropriate mitigation measures. Thus, potential adverse physical effects are not anticipated.

Water Meter Conservation Project

Summary of Benefits

The projected project benefits include:

- **Water Supply (primary benefit):** The project is estimated to conserve 119 AFY over the life of the project, based on an estimated 25 percent reduction in water consumption in Le Grand. These savings would result from a change in customer behavior due to water metering, which will enable usage to be monitored by customers and LGCSD.
- **Reduction in energy and greenhouse gas emissions (secondary benefit)**: The project would reduce energy consumption and greenhouse gas emissions commensurate with the water usage savings (25 percent). The anticipated reductions in energy usage and greenhouse gas emissions are 65,052 kWh/yr, and 22 MT CO2e/yr, respectively.
- **Reduction in Chemical Use (secondary benefit)**: A reduction in overall water usage will the reduce need for water treatment chemicals. It is anticipated that chlorine use would be reduced by 720 gallons/yr, in proportion to the reduction in water consumption.
- **Improved Water Quality (secondary benefit, unquantified)**: Improved water quality is a secondary benefit that would result from the reduction in water consumption and subsequent increase in groundwater elevations. Although unquantified, water quality is expected to improve substantially with respect to arsenic and 123-TCP concentrations, as Elevated levels of arsenic and 123-TCP have been detected in both the shallow and deep aquifers in Le Grand. Increases in groundwater levels could prevent exceedances of the arsenic MCL and contamination of the potable water supply.

Technical Basis of the Project

The following information provides the technical basis for the project:

- LGCSD completed final design for the project. The final design drawings are included in **Appendix 3-16**.
- Groundwater level changes in Le Grand are included in **Appendix 3-17**.
- The benefit to water quality as it relates to arsenic is based on information included in the *Merced IRWM Plan Groundwater Recharge Feasibility Study*, presented in **Appendix 3-5** (a map of arsenic concentrations is on page 37 of this appendix).
- The benefit to water quality as it relates to 123-TCP is based on information included in the *Merced Integrated Regional Water Management Plan Salt and Nutrient Study*, presented in **Appendix 3-18** (p. 4 of this appendix).

- The water supply benefits claimed are based on the existing groundwater pumping data, reduced by 25 percent to account for conservation associated with water meter operations. The existing pumping data is presented in **Appendix 3-19**. The 25 percent estimate was developed by the LGCSD Engineer, based on experience installing water meters throughout communities in eastern Merced County. In general, water meter installation in this area has resulted in a reduction in water use by between 25 and 30 percent.
- The energy benefits claimed for the project were calculated based on energy usage information for the wells, included in **Appendix 3-20.** A summary of the energy consumption between July 2013 and June 2014 is shown on page 1 of **Appendix 3-20**, followed by the raw data presented in the PG&E bills.
- The greenhouse gas benefits claimed for the project were calculated based on the energy consumption information included in **Appendix 3-20**.
- The reduction in chemical usage is based on the usage of chlorine in 2013, presented in **Appendix 3-21**.

Background for Benefits Claimed

Precipitation is an important source of groundwater recharge in the Merced Subbasin. The Merced Subbasin has been in a state of mild groundwater level decline with a cumulative decrease in storage of approximately 720,000 AF between 1980 and 2007[11]. Lack of rain in recent years has reduced recharge in the Merced Subbasin. This has caused water levels to decline precipitously – observed groundwater elevations in the LGCSD service area dropped by about 50 feet between March and June of 2014 (see **Appendix 3-17**). As a result, the LGCSD has to deepen all three of its production wells to continue to provide drinking water supply to this DAC. As there is no other available potable water supply, this community is entirely reliant on groundwater. Stage 3[12] water conservation measures have already been imposed, and it is expected that conservation levels will increase to Stage 4 by the end of the year. This community is not expected to be able to meet its drinking water demands by September 30 of this year. The money that was originally set aside for this project has been used to deepen the wells; as such, LGCSD would be unable to proceed with this project without grant funding.

Arsenic has been detected in Le Grand, both in the shallow and deep aquifers. As shown in **Figure 3-11** (see also **Appendix 3-5**, page 37), Le Grand is located in an area where arsenic levels range from 2.5 to 10 µg/L and adjacent to an area with concentrations ranging from 10 µg/L to 20 µg/L. The current California MCL for arsenic is 10 µg/L. Given the precipitous drop in groundwater levels that have already occurred in Le Grand (of approximately 50 feet between March and June 2014 as described above), it is expected that arsenic levels will continue to increase as the groundwater elevations decrease, impacting the sole drinking water supply for this DAC. 123-TCP is also a problem in the shallow and deep aquifers, as shown in **Figure 3-12** below. Concentrations of 123-TCP range from 0.005 to 1 µg/L (see page 4 of **Appendix 3-18**).[13]. The notification level for 123-TCP is 0.005 µg/L[14].

Without-Project Conditions

Without the proposed project, excess groundwater pumping will continue to cause a decline in groundwater elevations at unprecedented rates. This will, in turn, cause water quality to deteriorate further, and supplies will further violate the California MCLs and notification levels for arsenic and 123-TCP, respectively, making it unsafe for human consumption. Because groundwater is the sole source of drinking water for this community, it would leave the area – a designated DAC – with no source of drinking water.

[11] AMEC Geomatrix, Inc. 2008. Merced Groundwater Basin Groundwater Management Plan Update. Merced County. July 29. [pages 20 and 22)

[12] Stage 3 conservation consists of limiting the days and hours that residents can water. In addition, all vehicle washing would be done on a lawn, using buckets for washing and rinsing.

[13] AMEC, Inc Geomatrix in Association with RMC Water and Environment. 2013. Merced Integrated Regional Water Management Plan Salt and Nutrient Study. August.

[14] AMEC, Inc Geomatrix in Association with RMC Water and Environment. 2013. Merced Integrated Regional Water Management Plan Salt and Nutrient Study. August.

Figure 3-11: Arsenic Concentrations in the Merced IRWM Region

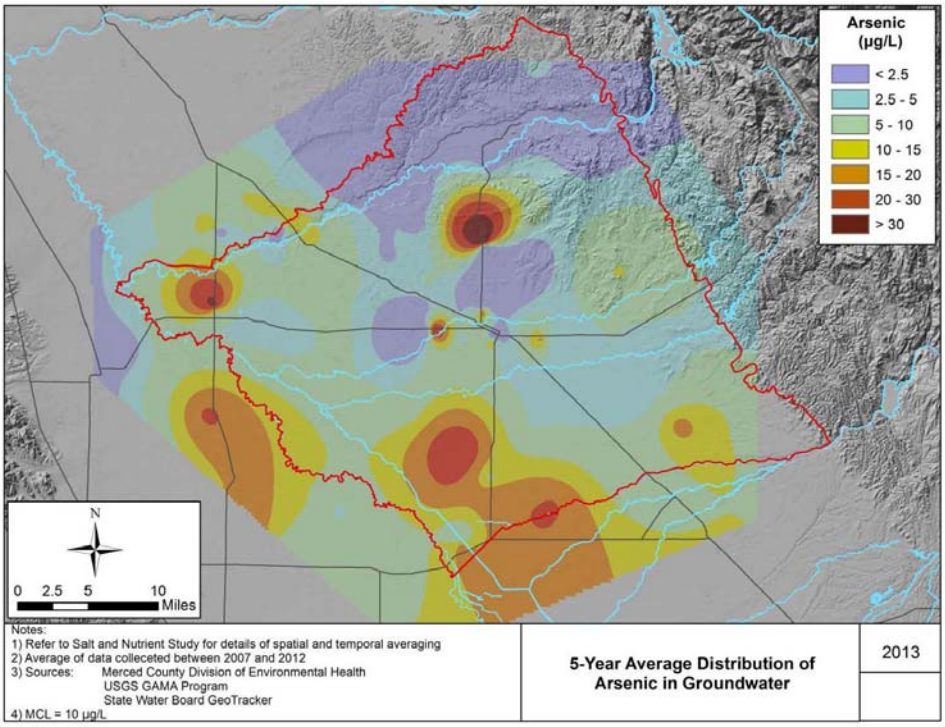
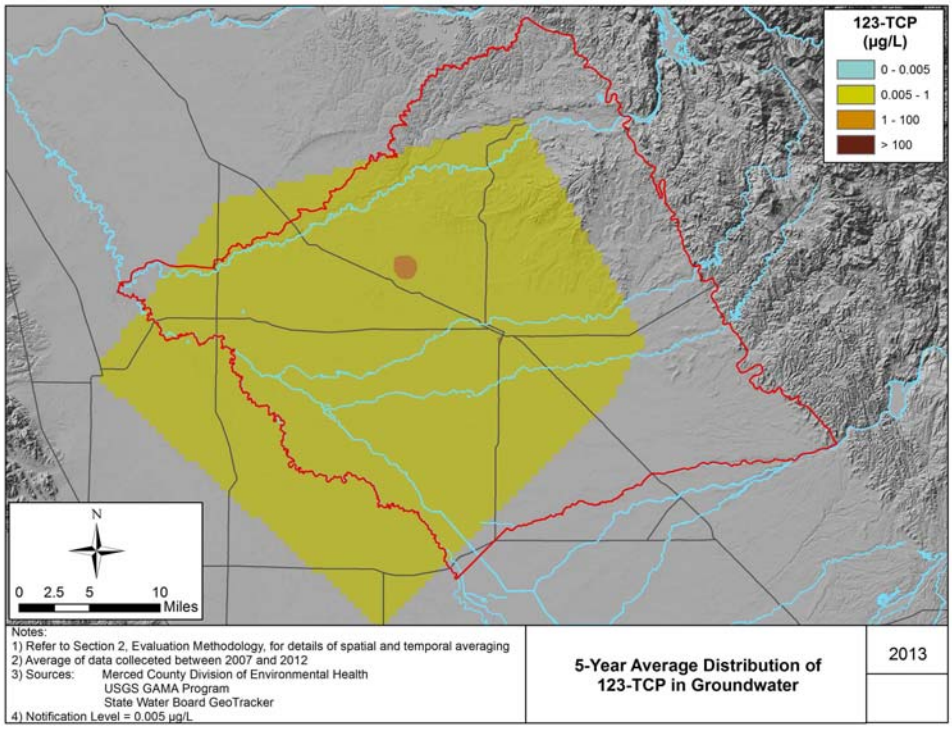


Figure 3-12: 123-TCP Concentrations in the Merced IRWM Region



As described in Attachment 2, the only industry in Le Grand is the Live Oak Farms, a tomato and pepper packing company, which employs the majority of Le Grand's residents. Closing of Live Oak Farms due to lack of water would have devastating financial consequences for the community, as the community is a DAC. Public health and safety is also a concern for Le Grand. The public schools, which are the third largest users of water in the community, did not have sufficient pressure to flush toilets in May. The schools are currently not in session, but are expected to be back in session in early August. As only one well is in operation at this time, there is concern that there would not be sufficient water to meet public health and safety needs. **Appendix 2-3** describes issues currently faced by LGCSD. The situation in Le Grand is so dire that LGCSD had sought assistance from the California Department of Public Health (CDPH).LGCSD secured grant funding through the CDPH Public Water System Drought Emergency Response Program to implement a two-phase emergency drought response program that included interim water hauling to the community, rehabilitation of three of the community's impacted wells (see **Appendix 2-1**, page 19). LGCSD is already unable to meet existing demands. If the drought were to continue into 2015, water supplies would continue to be insufficient to meet existing demands despite continuing conservation measures.

Methods used to Estimate Physical Benefits

Water Supply Benefits: Estimated water supply benefits are based on the expected water demand reduction – 25 percent – resulting from operation of the water meters (see **Appendix 3-19**). The total water pumpage from June 2013 through May 2014 was 154 million gallons (475 AF). With a 25 percent reduction, the total savings would be about 119 AF per year. The benefit is expected to remain the same throughout the life of the project.

Energy Benefits: The net reduction in electricity was based on PG&E power consumption data obtained for the three wells from July 2013 to June 2014. The benefits were calculated assuming a 25 percent reduction in pumping. The total annual electrical usage required to operate the three wells was 260,210 kWh. Assuming a 25 percent reduction in energy consumption, the savings would be 65,052 kWh/yr. The claimed energy savings are assumed to be conservative because the energy usage during this period was lower than previous years because some groundwater wells were offline for repairs and because additional energy would be required for pumping as groundwater elevations drop (see **Appendix 3-20**). A summary of the energy consumption during the July 2013 to June 2014 period is shown on page 1 of **Appendix 3-20**, followed by the raw data presented in the PG&E bills. The benefit is expected to remain the same throughout the life of the project.

Greenhouse Gas Benefits: The net reduction in greenhouse gas production was calculated based on the projected energy savings described above. The GHG emission factor associated with power production is derived from the California Energy Commission (CEC) and EPA's eGRID data. Per the CEC's Energy Almanac[15], California produces 70 percent of its energy and imports 10 percent from the Pacific Northwest, and 20 percent from the Pacific Southwest. USEPA eGRID data provides information about the GHGs associated with each of the energy supplies (calculated as carbon dioxide equivalent units or CO2e) as 613.28 pounds of CO2e per MWH (lbs/MWh), 846.97 lbs/MWh, and 1,182 lbs/MWh, respectively[16]. Averaging each of these CO2e emissions factors shows that California energy supplies have a combined CO2e emissions factor of 750.57 lbs/MWh, or 0.34 metric tons (MT) of CO2e per MWh. By reducing groundwater pumping by 25 percent, the project would reduce energy usage by 25 percent, or 65,052 kWh/yr. Using the statewide emissions factor of 0.34 MT CO2e / MWh, this equates to a reduction in GHG emissions of 22 MT/yr (65,052 kWh/yr times x 0.001 MWh/kwh x 0.34 MT CO2e/MWh =22.11 MT CO2e/year). The benefit is expected to remain the same throughout the life of the project.

Chemical Use Benefits: The net reduction in chemical usage was calculated using the amount of chlorine usage in 2013 at the three wells and the anticipated water demand reduction (25 percent). The total chlorine usage in 2013 was 2,880 gallons. Assuming 25 percent reduction in chlorine usage in proportion to the water savings, the reduction in chlorine usage would be 720 gallons per year. (see **Appendix 3-21**).

[15] CEC. 2013. California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours). Accessed 24 June 2014. Available: http://energyalmanac.ca.gov/electricity/electricity_generation.html
[16] U.S. Environmental Protection Agency (USEPA). 2014. eGRID 9th edition Version 1.0 Year 2010 Summary Tables. February. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/

Water Quality Benefits: Elevated levels of arsenic and 123-TCP have been detected in both the shallow and deep aquifers in Le Grand. Although this is an unquantified benefit, groundwater quality is expected to improve as groundwater levels increase commensurate with the decrease in water consumption. Improvement in water quality would reduce the potential for exceedances of drinking water standards.

New facilities, Policies, and Actions Required to Obtain Physical Benefits

In order to achieve these physical benefits, 525 water meters would need to be installed throughout the District, located beneath the curb in front of each site

No policies are required to obtain the physical benefits. All policies are already in place, including meter rates.

Construction and operation of the project is required to obtain physical benefits. Final design of the project is complete. LGCSD expects to prepare a CEQA Notice of Exemption in July 2014. Because of the nature of the project, it is expected that the project would qualify for exemption under the Class I Categorical Exemption, According to the 2014 CEQA Guidelines, a Class 1 categorical exemption consists of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency. Installation of meters would be considered a minor alteration of existing facilities that involve negligible expansion of use.

Potential Adverse Physical Effects of the Project

The water meters would be located under the curb outside of each site. Installation and operation of the facilities are not expected to result in any adverse physical impacts to the environment. LGCSD expects to file a CEQA categorical exemption for the project as described above.

Cost Effectiveness Analysis

Tables 3-13 through **3-15** provide a cost effective analysis for the three projects, in accordance with Table 6 of the PSP.

Table 3-13: *Highlands Groundwater Conservation Project*

Table 6 – Cost Effective Analysis Project Name: Highlands Groundwater Conservation Project	
Question 1: Types of benefits provided as shown in Table 5.	The types of benefits achieved by this project include immediate and long-term conserved water supplies and an associated reduction in groundwater basin over draft, reduction in net consumption of electricity and net production of greenhouse gases, water quality improvements, and reductions in subsidence potential.
Question 2: Have alternative method been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	Another project was considered to recharge the groundwater basin, but not specifically for the Highlands area, and not specifically to achieve the same types and amounts of physical benefits. The Cressey Recharge Basin Enlargement Project, also included in this application, would provide long-term water supply benefits to the groundwater basin, water quality improvements, and reductions in subsidence; however, that project is an artificial recharge project and not an in-lieu recharge project. Thus, the Cressey Recharge Basin Enlargement Project would not achieve any reduction in net consumption of electricity and greenhouse gases. More importantly, the Cressey Recharge Basin Enlargement Project would not address the District's long-term goal of delivering surface water to the Highlands area. Thus, there are no alternatives that would achieve the same objectives as the Highlands Groundwater Conservation Project.
Question 3: If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	As shown in Attachment 5, the Highlands Groundwater Conservation Project is more expensive than the Cressey Recharge Basin Enlargement Project. The Highlands Groundwater Conservation Project is the preferred alternative because it addresses a critical need in an area where no alternatives are available. There are no other alternatives that would achieve the objective of providing surface water to the Highlands area or the claimed benefits associated with the reduction in electricity and greenhouse gas emissions.

Table 3-14: *Cressey Recharge Basin Enlargement Project*

Table 6 – Cost Effective Analysis Project Name: Cressey Recharge Basin Enlargement Project	
Result of Physical Benefit	Quantification of Benefits
Question 1: Types of benefits provided as shown in Table 5.	The types of benefits achieved by this project include immediate and long-term conservation of water supply and associated reduction in groundwater basin over draft, water quality improvements, and a reduction in subsidence potential.
Question 2: Have alternative method been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	The Highlands Groundwater Conservation Project, included in this application, would achieve similar types and degree of physical benefits. The Highlands Groundwater Conservation Project would also provide long-term water supply benefits to the groundwater basin, through in-lieu rather than direct recharge. A groundwater recharge feasibility was completed for the Merced Region in August 2013,[17]which identified opportunity areas for artificial recharge in the basin but did not evaluate site-specific locations. The study acknowledged that "development of recharge facilities will require additional site-specific investigations and/or pilot projects". Because such site-specific investigations (geotechnical borings and pilot studies) have already been completed at the site as part of the pilot project and the original Cressey Recharge Basin, and because the existing recharge basin is already operating successfully at this location, it would be more cost-effective to expand this site then to develop a new recharge basin at an alternate location. Thus, no other alternatives to this project were considered.
Question 3: If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	The Cressey Recharge Basin Enlargement Project is the least cost alternative compared to the Highlands Groundwater Conservation Project. As described above under the response to Question 2, the Cressey Recharge Basin Enlargement Project is an artificial recharge project that would expand upon an existing, successful recharge operation.

[17] RMC. 2013. Merced Integrated Regional Water Management Plan. Groundwater Recharge Feasibility Study. August.

Table 3-15: *Water Meter Conservation Project*

Table 6 – Cost Effective Analysis Project Name: Water Meter Conservation Project	
Result of Physical Benefit	Quantification of Benefits
Question 1: Types of benefits provided as shown in Table 5.	The types of benefits achieved by this project include immediate and long-term reduction in water demands; conservation of water supply; reductions in electricity consumption, greenhouse gas production, and water treatment chemical usage; and improvement in groundwater water quality.
Question 2: Have alternative method been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	No other alternative methods were considered, because no other alternatives are available that could achieve the same type and amounts of physical benefits as the proposed project. Given the small size of the community, the most effective form of water conservation is demand reduction using water meters. Water meters would yield the greatest savings compared to other demand reduction measures (e.g., appliance rebates, conversion of lawns to native plants, etc.), and thus are the preferred option for LGCSD. In addition, water meters are the only mechanism for LGCSD to monitor and manage water use at the individual customer scale and impose penalties in the event that households exceed their allocated amounts during mandatory rationing.
Question 3: If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	As no other alternatives were considered, this question is not applicable.

Merced Integrated Regional Water Management Drought Grant Proposal

Appendices 3-1 to 3-9

App. #	Document Title	File Name
App. 3-1	Highlands Groundwater Conservation Project - Conceptual Design	Att3_DG_ProJust_2of4
App. 3-2	Highlands Groundwater Conservation Project - Property Information and Acreage of Land on Surface and Groundwater Supply	
App. 3-3	Highlands Groundwater Conservation Project – Water Supply Benefits Analysis	
App. 3-4	Highlands Groundwater Conservation Project – Energy and GHG Emissions Benefits	
App. 3-5	Merced IRWM Plan Ground Recharge Feasibility Study	
App. 3-6	Terms and Conditions of License for Unconstructed Major Project Affecting Lands of the United States	
	United States of America Federal Energy Regulatory Commission Notice of Authorization for Continued Project Operation (pages	
	US Fish and Wildlife Letter Requesting During Drought That Ecosystem Demand Requirements May Not Be Met	
App. 3-7	MID Production Wells Rendered Inoperable During the 2014 Irrigation Season Due To The Drought	
App. 3-8	MID and El Nido Groundwater Level Data	
App. 3-9	Technical Memorandum On Pilot Project Work Plan For Cressey Recharge Basin Assessment Project	
App. 3-10	Hydrogeological Investigation of the Cressey Pilot Project Site	Att3_DG_ProJust_3of4
App. 3-11	Improvement Plans for MID Cressey Groundwater Recharge Basin	
App. 3-12	MID Cressey Recharge Basin Initial Study/Proposed Negative Declaration	
App. 3-13	Description of Cressey Recharge Basin Enlargement Project	
App. 3-14	Cressey Existing Basin Infiltration Rate	
App. 3-15	Cressey Length of Irrigation Season Based on Historical Record	

App. #	Document Title	File Name
App. 3-16	Le Grand CSD Final Design Drawings	Att3_DG_ProJust_4of4
App. 3-17	Groundwater Level Changes in Le Grand	
App. 3-18	Merced IRWM Salt and Nutrient Study (excerpt)	
App. 3-19	LGCSD Water Meter Conservation Project Water Supply Benefits	
App. 3-20	LGCSD Water Meter Conservation Project Energy Usage from 2013-2014 and Reduction in Energy Usage Benefits	
App. 3-21	LGCSD Water Meter Conservation Project Chemical Usage in 2013 and Reduction in Chemical Usage Benefits	

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-1

Highlands Groundwater Conservation Project – Conceptual Design

Merced Irrigation District
Highlands Groundwater Conservation Project
Conceptual Design

Background:

The project constitutes the largest contiguous highland area in the District. Certain areas were designated highlands from the inception of the District, since they cannot receive gravity flows from the surface water distribution system. MID installed 7 groundwater wells to serve the impacted parcels. In 1998 and 2009 MID installed Boosters 32 and 40 respectively at the northerly and southerly termini of the distribution system. Currently, the majority of parcels in this area cannot receive surface water, or can only do so with the aid of said booster pumps.

Project Need:

Due to groundwater extraction practices in eastern Merced County, mainly outside the District and though the expansion of urban footprint, static groundwater levels have dropped in elevation. The excessive pumping in some areas caused intrusion of saline water from an existing salt sink around Stevinson. In addition, pressurized low volume irrigation methods using groundwater proved stressful to farmers growing almond crops.

This project would serve to greatly reduce the draw on groundwater which would eventually require the deepening and replacement of groundwater wells in the area and surrounding properties. MID surface water is characterized by low mineral and content and being pH balanced which makes useful to all crops, allows flexibility in fertigation, and provides leaching to existing salt profiles at the root zone of trees, especially almonds.

The project would add to the MID in-lieu recharge program and will combat saline water intrusion. Also, this in-lieu recharge water would allow groundwater to be preserved for potable uses.

Project Description/Design:

Design and construct the infrastructure for a system to deliver water to parcels within a designated area. This system will boost surface water from the nearby MID Arena A Lateral so that it will have the required head to be delivered to growers.

The project was designed for a flow rate of 18 cubic feet per second (cfs). Typically MID designs our projects to handle a flow of approximately 1 cfs per hundred acres, and there are approximately 1,100 acres in the District. While this calculates out to 11 cfs, we increased the design capacity to 18 cfs to accommodate future expansion of the project should the need arise. The attached spreadsheet provides the initial conceptual design sizes for the project. As noted from the spreadsheet, a 21" diameter pipe would suffice for the requirements. However a 27" diameter size was chosen as this would allow for a higher flow rate should the need arise. In addition, 27" diameter pipe is the maximum size in which PVC remains the most economical choice as opposed to Reinforced Concrete Pipe (RCP).

The booster pump will need to handle a flow rate of 18 cfs with a corresponding head of 61 feet of head. The existing pump can pump 6.4 cfs at 10.5 feet of head. The system will be designed to provide the

water at standard pressure. It will be the responsibility of the individual constituents to boost the pressure of the water to their desired pressures.

There are 4 road crossings that will be required as part of the project. The existing irrigation deliveries will be utilized where possible, and the new pipeline will tie in to said deliveries. The existing wells will be tied back into the pipe network. While the purpose of the project is to reduce groundwater pumping, the wells will be tied back in to allow their use during emergencies.

Key Elements:

• Upgrade existing and/or obtain new booster pumps for Booster Station #32 in order to provide enough flow and head for the system.
• Install roughly 10,500 ft of main line for the system with required deliveries and the potential of 15,400 ft of replacement well lines in the future(on an as needed basis)
• Modify/Remove Booster #40 to accommodate a spill and work in conjunction with the new system

System

Design Flow = 18 CFS

Pipes								
Number	Length	Diameter (in)	Material	c	Q (CFS)	Q (GPM)	H_f (headloss/100')	H_f (headloss/ segment)
P1	1328	21	PVC	130	16.0	7180.8	0.65	8.69
P2	1349	21	PVC	130	15.1	6776.9	0.59	7.93
P3	2632	21	PVC	130	12.5	5610.0	0.41	10.91
P4	1876	21	PVC	130	8.0	3590.4	0.18	3.40
P5	3277	21	PVC	130	4.5	2019.6	0.06	2.05
P6	1992	21	PVC	130	2.9	1301.5	0.03	0.55

Nodes					HGL					
Number	Node EL (ft)	Length Along Pipeline	Demand (Flow)	Actual Flow (Active Nodes)	Length	Head	Elevation of EG (ft)	ΔH	Head Req.	Head Reqs. Satisfied
N1	140	0	2.0	2.0	0	192.0	131.0	61.0	0.00	YES
N2	125.1	1328	0.9	0.9	1328	183.31	129.8	53.5	5.56	YES
N3	135.0	2677	2.6	2.6	2677	175.37	139.7	35.7	4.44	YES
N4	133.3	5309	4.5	4.5	5309	164.46	138.0	26.5	10.45	YES
N5	128.5	7185	3.5	3.5	7185	161.06	133.3	27.8	27.20	YES
N6	123.3	10462	1.6	1.6	10462	159.01	128.0	31.0	-0.39	YES
N7	123.0	12454	2.9	2.9	12454	158.46	127.7	30.8	0.73	YES

Pump Required		
Head	Q(CFS)	Q(GPM)
61.0	18.00	8078.4

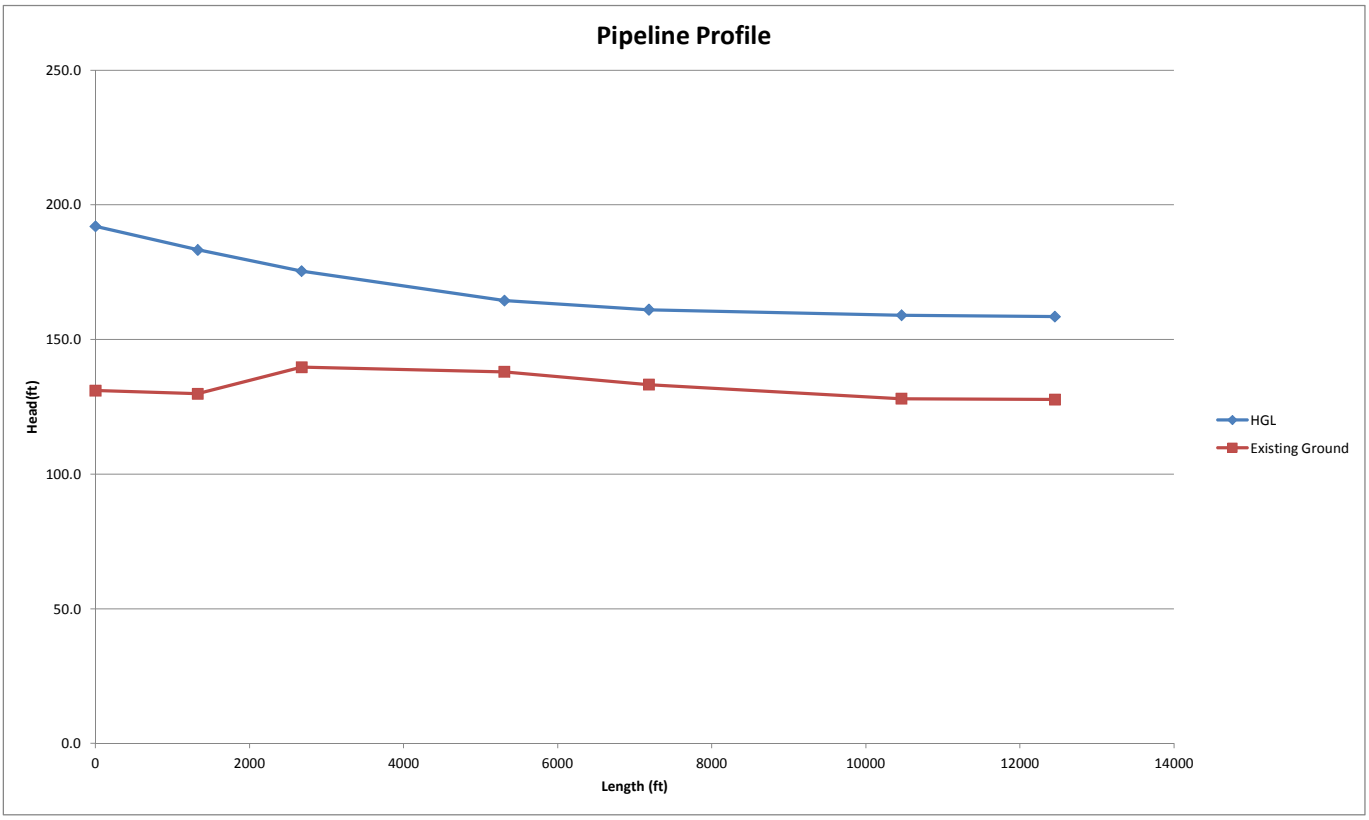
Hazen-Williams

$f = 0.2083(100/c)^{1.852}*(Q^{1.852})/(d_h^{4.8655})$

Assume c = 130 for pvc pipe

Pipes												
Number	Length	Diameter (in)	Material	c	Q (CFS)	Q (GPM)	H_f (headloss/100')	H_f (headloss/ segment)	EL @ Node	EL @ end of Pipe	Cover + Pipe Dia. + 1'	Total Head Req.
P2.1	900	18	PVC	130	0.90	403.9	0.01	0.06	129.8	129.8	5.5	5.56
P3.1	527	12	PVC	130	0.64	287.2	0.03	0.14	139.7	139	5.0	4.44
P4.1	3199	14	PVC	130	3.25	1458.6	0.25	7.87	138	130	5.2	5.03
P4.2	381	16	PVC	130	1.25	561.0	0.02	0.08	138	138	5.3	5.42
P5.1	3247	14	PVC	130	1.56	700.1	0.06	2.05	134.7	146.3	5.2	18.82
P5.2	1517	16	PVC	130	1.94	870.7	0.05	0.75	134.7	137	5.3	8.38
P6.1	3985	16	PVC	130	1.00	448.8	0.01	0.58	134	127.7	5.3	-0.39
P7.1	2317	16	PVC	130	0.50	224.4	0.00	0.09	127.7	123	5.3	0.73

	Acres	Demand (CFS)	CFS/100 Acres
	128	2.0	1.59
	58	0.9	
	165	2.6	
	280	4.5	
	220	3.5	
	100	1.6	
	179	2.9	
Total	1130	18	


Pipeline Profile
250.0
200.0
150.0
100.0
50.0
0.0
Head(ft)
0
2000
4000
6000
8000
10000
12000
14000
Length (ft)
HGL
Existing Ground

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-2

Highlands Groundwater Conservation Project – Property Information and Acreage of Land of Surface and Groundwater Supply

Highlands Groundwater Conservation Project

Acreage of Land on Surface and Groundwater Supply

Totals

Land	1132	acres
Surface Water Unboosted	89	acres
Well/Booster	67	acres
Booster	307	acres
Private Well	583	acres
MID well	67	acres
Owners	33	
Total Lands on Surface Supply	**396**	**acres**
total Lands on Well Supply	**717**	**acres**

Approximate Demand

Potential Acres in NEW System (after pump)	1025	acres
Capacity Required (1CFS/100 acres)	10	CFS
Design (18 CFS)	1.80	CFS/100 acres

Top 5 Land Owners

Last Name	Acres
SAHOTA	127
DHESI	108
ABRAHAM	104
MIRES	70
SILVEIRA	68

Property Information Table

PARCEL_NO	OWNER	ACRES	Water Source
143-190-005	ABRAHAM	19.3	Surface Water Unboosted
143-190-006	ABRAHAM	17.9	Surface Water Unboosted
143-220-010	ABRAHAM	9.7	Private Well
143-220-008	ABRAHAM	8.7	Private Well
056-040-020	ABRAHAM	19.1	Private Well
056-040-021	ABRAHAM	39.4	Private Well
143-220-003	ALVERNAZ	37.7	Private Well
056-040-025	BRENT	19.0	Private Well
143-220-011	CONNOLLY	9.7	Booster
143-200-010	CORBIN	17.2	Booster
056-040-005	DHESI	39.0	MID Well
056-040-005	DHESI	59.1	Surface Water Unboosted
056-040-072	DHESI	10.0	MID Well
143-220-024	DYCK	19.7	Booster
143-220-001	DYCK	9.4	Booster
056-040-037	ENOS	19.5	Private Well
056-040-038	ENOS	19.5	Private Well
056-040-067	FERNANDEZ	8.7	Private Well
056-040-022	FERREIRA	38.7	Private Well
143-220-023	FUENTES	9.5	Private Well
056-040-094	GARCIA	8.7	Private Well
056-040-013	GARCIA	19.7	Private Well
056-040-014	GARCIA	19.7	Private Well
143-220-005	GUZMAN	9.0	Booster
056-060-086	HALL	19.6	Booster
143-190-010	HAWKINS	17.8	Booster
056-050-029	JOHAL	29.1	MID Well
056-040-084	KOEHN	36.5	Private Well
143-220-002	KOEHN	9.7	Booster
056-040-015	LACERDA	19.1	Private Well
056-040-086	LAWRENCE	18.8	Private Well
143-220-017	MIRES	40.5	Private Well
056-040-023	MIRES	29.0	Private Well
143-200-009	MITCHELL	29.5	Booster
056-040-071	MOREN	19.2	Booster
056-040-063	MORGAN	8.8	Private Well
056-040-026	NICHOLS	19.0	Private Well
143-220-007	NOLASCO	9.9	Booster
056-060-085	PALOMINO	19.0	Booster
056-060-010	PINHEIRO	19.6	Booster
143-190-007	SAHOTA	51.7	Surface Water Unboosted
143-210-076	SAHOTA	6.0	Well/Booster
143-210-077	SAHOTA	5.8	Well/Booster
143-210-052	SAHOTA	9.2	Well/Booster
143-210-051	SAHOTA	10.0	Well/Booster
143-210-075	SAHOTA	7.2	Well/Booster
143-210-056	SAHOTA	9.7	Well/Booster
143-210-055	SAHOTA	9.7	Well/Booster
143-210-054	SAHOTA	9.4	Well/Booster
143-210-074	SAHOTA	8.6	Booster
056-040-024	SILVEIRA	9.5	Private Well
056-040-036	SILVEIRA	19.0	Private Well
056-040-095	SILVEIRA	19.4	Private Well
056-040-078	SILVEIRA	19.6	Private Well
143-200-008	UNRUH	29.2	Booster
143-190-008	WALSH	17.7	Private Well
056-040-006	WEIMER	19.1	Private Well
143-190-011	WEIMER	19.8	Private Well
143-220-015	WOMACK	18.8	Private Well

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-3

Highlands Groundwater Conservation Project – Water Supply Benefits Analysis

Highlands Groundwater Conservation Project - Water Supply Benefits analysis
Calculation of Total Water Applied (AFY)

Total Converted Area **717 acres** (Highlands Area)
Typical Precipitation **8.4 in/year**

		Pixel Count						
Cropscape Land Use Class	**ET**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Almonds	39.97	533	485	470	1682	1982	1978	2336
Sweet Potatoes	37.25	4	111	17	343	145	376	286
Cotton	34.35	26	10	19	24	33	0	233
Fallow/Idle Cropland		57	6	13	27	542	19	217
Winter Wheat	20.43	8	32	113	554	1	159	154
Grass/Pasture	49.69	73	196	75	96	149	168	57
Alfalfa	49.2	105	47	112	733	147	164	40
Walnuts	47.19	32	1	0	9	64	0	35
Dbl Crop Oats/Corn	29.8	5	51	0	2	181	369	21
Grapes	29.43	20	8	30	33	36	58	16
Oats	20.43	102	21	33	38	73	125	1

		Percent of Total Area						
Cropscape Land Use Class	**ET**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Almonds		55%	50%	53%	48%	59%	58%	69%
Sweet Potatoes		0%	11%	2%	10%	4%	11%	8%
Cotton		3%	1%	2%	1%	1%	0%	7%
Fallow/Idle Cropland		6%	1%	1%	1%	16%	1%	6%
Winter Wheat		1%	3%	13%	16%	0%	5%	5%
Grass/Pasture		8%	20%	9%	3%	4%	5%	2%
Alfalfa		11%	5%	13%	21%	4%	5%	1%
Walnuts		3%	0%	0%	0%	2%	0%	1%
Dbl Crop Oats/Corn		1%	5%	0%	0%	5%	11%	1%
Grapes		2%	1%	3%	1%	1%	2%	0%
Oats		11%	2%	4%	1%	2%	4%	0%

		Consumptive Use (AFY)						
Cropscape Land Use Class	**ET**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Almonds	39.97	1,042	945	1,005	896	1,115	1,092	1,298
Sweet Potatoes	37.25	7	198	33	167	75	190	145
Cotton	34.35	42	16	33	11	15	0	106
Fallow/Idle Cropland								
Winter Wheat	20.43	6	24	92	112	0	33	33
Grass/Pasture	49.69	187	500	210	67	110	121	41
Alfalfa	49.2	265	118	310	505	107	117	29
Walnuts	47.19	77	2	0	6	44	0	24
Dbl Crop Oats/Corn	29.8	7	67	0	1	69	138	8
Grapes	29.43	26	10	43	12	13	21	6
Oats	20.43	76	16	27	8	16	26	0
TOTAL (AFY)		1,734	1,896	1,753	1,784	1,564	1,740	1,690
TOTAL (AFY/AC)		2.42	2.64	2.44	2.49	2.18	2.43	2.36

		Total Water Applied (AFY)						
Cropscape Land Use Class	**IE**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Almonds	0.78	1,336	1,212	1,289	1,149	1,430	1,400	1,664
Sweet Potatoes	0.72	10	275	46	232	104	264	202
Cotton	0.69	61	23	48	15	22	0	154
Fallow/Idle Cropland								
Winter Wheat	0.72	8	33	128	156	0	46	45
Grass/Pasture	0.70	267	714	300	96	157	173	59
Alfalfa	0.72	368	164	430	701	148	163	40
Walnuts	0.78	99	3	0	8	57	0	31
Dbl Crop Oats/Corn	0.72	9	94	0	1	96	192	11
Grapes	0.76	34	14	56	15	18	28	8
Oats	0.72	106	22	37	11	22	37	0
TOTAL (AFY)		2,297	2,552	2,334	2,383	2,053	2,303	2,213
TOTAL (AFY/AC)		3.20	3.56	3.26	3.32	2.86	3.21	3.09

Highlands Groundwater Conservation Project - Water Supply Benefits analysis
Evapotranspiration Data

ETc Table for Irrigation District Water Balances
Zone 15 Monthly Evapotranspiration
Sprinkler Irrigation Typical Year
IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo
Table includes adjustments for bare spots and reduced vigor

	January inches	February inches	March inches	April inches	May inches	June inches	July inches	August inches	September inches	October inches	November inches	December inches	Annual inches
Precipitation	3.46	0.39	0.07	0.59	0.01	0.33	0.01	0	0.02	0.33	1.91	1.28	8.4
Grass Reference ETo	0.95	2.3	4.38	6.3	8.18	8.18	8.35	7.33	5.72	4.04	1.58	1.09	58.41
Apple, Pear, Cherry, Plum and Prune	0.96	0.87	0.79	3.53	6.68	7.27	7.08	5.98	4.78	2.17	0.76	1.01	41.88
Apples, Plums, Cherries etc w/covercrop	0.96	2.37	3.52	4.96	8.08	8.78	8.63	7.61	5.46	3.66	1.28	1.1	56.42
Peach, Nectarine and Apricots	0.96	0.87	0.6	2.66	6.31	7.22	7.2	6.14	4.42	2.67	0.75	1.01	40.82
Immature Peaches, Nectarines, etc	0.98	0.87	0.35	1.62	4.23	5.03	5.07	4.21	3.06	1.85	0.76	1.03	29.06
Almonds	0.96	1.06	1.2	4.06	6.24	6.44	6.73	5.52	4.1	1.89	0.76	1.01	39.97
Almonds w/covercrop	0.94	2.16	2.38	5.4	7.58	7.51	7.28	6.41	4.67	2.67	1.11	1.07	49.16
Immature Almonds	0.98	0.99	0.76	3.55	5.43	5.74	5.64	4.92	3.48	1.77	0.76	1.03	35.05
Walnuts	0.96	0.88	0.91	2.74	7.12	8.54	8.66	7.46	5.33	2.58	1	1.01	47.19
Pistachio	0.96	0.87	0.11	1.55	2.5	6.28	8.2	7.18	5.24	2.88	0.8	1.01	37.59
Pistachio w/ covercrop	0.97	2.14	2.4	4.59	5.61	8	8.86	7.82	6.01	3.77	1.29	1.12	52.57
Immature Pistachio	0.98	0.87	0.11	1.06	1.43	4.33	5.94	5.32	3.81	1.89	0.91	1.03	27.68
Misc. Deciduous	0.96	0.87	0.78	3.09	6.66	6.92	6.69	6.07	4.49	2.32	0.75	1.01	40.63
Grain and Grain Hay	1.03	2.23	4.42	6.44	3.69	0.37	0.01	0	0.01	0.31	0.82	1.1	20.43
Cotton	1.02	0.85	0.11	1.27	1.7	4.95	8.19	7.44	5.35	1.64	0.79	1.05	34.35
Safflower and Sunflower	1.02	1.09	1.63	5.73	8.81	7.54	1.13	0	0.01	0.31	0.79	1.05	29.12
Corn and Grain Sorghum	1.02	0.85	1.1	1.52	2.69	6.98	8.09	5.02	0.36	0.31	0.79	1.05	29.8
Misc. field crops	1.02	0.85	1.1	1.53	2.65	7.24	7.55	2.59	0.01	0.31	0.79	1.05	26.7
Alfalfa Hay and Clover	1.02	2.25	3.98	5.7	6.95	7.23	6.93	6.05	4.72	1.93	1.29	1.17	49.2
Pasture and Misc. Grasses	1.02	1.35	2.05	5	7.49	7.66	7.68	6.75	5.2	3.25	1.19	1.05	49.69
Small Vegetables	1.03	1.44	3.86	10.37	2.38	0.36	0.01	1.02	1.51	2.49	1.68	1.16	27.31
Tomatoes and Peppers	1.02	0.85	0.8	1.49	4.21	8.1	6.63	0.46	0.01	0.31	0.79	1.05	25.73
Potatoes, Sugar beets, Turnip etc..	1.02	1.16	2.3	6.27	8.48	8.55	7.21	0.08	0.01	0.31	0.79	1.05	37.25
Melons, Squash, and Cucumbers	1.02	0.85	0.11	0.57	0.56	2.17	5.2	5.68	1.66	0.31	0.79	1.05	19.97
Onions and Garlic	1.03	2.04	3.57	5.37	4.92	0.76	0.01	0	0.01	0.31	1.42	1.1	20.54
Strawberries	1.02	0.85	1.1	1.53	2.65	7.24	7.55	2.59	0.01	0.31	0.79	1.05	26.7
Flowers, Nursery and Christmas Tree	0.96	0.87	0.78	3.09	6.66	6.92	6.69	6.07	4.49	2.32	0.75	1.01	40.63
Citrus (no ground cover)	0.97	2.23	3.26	4.66	5.81	6.19	5.89	5.15	4	3.18	1.39	1.13	43.86
Immature Citrus	0.98	1.52	1.49	3.39	3.59	4.25	3.85	3.36	2.69	2.32	1.06	1.11	29.62
Misc Subtropical	0.96	0.87	0.78	3.09	6.66	6.92	6.69	6.07	4.49	2.32	0.75	1.01	40.63
Grape Vines with 80% canopy	0.98	0.87	0.48	1.79	4.16	5.98	5.85	4.66	2.38	0.5	0.76	1.03	29.43
Grape Vines with cover crop (80% canopy)	0.98	1.92	2.43	3.39	5.82	6.8	6.69	5.04	3.8	2.15	1.08	1.12	41.21
Immature Grapes Vines with 50% canopy	0.99	0.86	0.35	1.32	3.21	4.56	4.61	3.49	2.06	0.31	0.77	1.03	23.58

Monthly Irrigation Efficiency Data by Crop

	Baseline IE Values													
Month	PA	AL	SB	FI	RI	TR	TO	TH	TM	OR	GR	VI	CO	SO
10	0.70	0.72	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.76	0.00	0.81
11	0.70	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.70	0.72	0.73	0.72	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.69	0.81
4	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.00	0.81
5	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.00	0.81
6	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.69	0.81
7	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.69	0.81
8	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.69	0.81
9	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.00	0.78	0.00	0.76	0.00	0.81
	0.70	0.72	0.73	0.72	0.57	0.74	0.72	0.72	0.72	0.78	0.00	0.76	0.69	0.81

*	Crop No.	Name
*	---	---
*	1	PA = Pasture
*	2	AL = Alfalfa
*	3	SB = Sugar Beets
*	4	FI = Field Crops
*	5	RI = Rice
*	6	TR = Truck Crops
*	7	TO = Tomato
*	8	TH = Tomato (Hand)
*	9	TM = Tomato (Machine)
*	10	OR = Orchard
*	11	GR = Grains
*	12	VI = Vineyards
*	13	CO = Cotton
*	14	SO = Citrus and Olives

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-4

Highlands Groundwater Conservation Project – Energy and GHG Emissions Benefits

Highlands Groundwater Conservation Project
Summary Energy and Greenhouse Gas Emissions Benefits

Page 1

100% Surface water	Units	Surface Water	Well Water	**Saving**
Existing Production	AFY	1,431	2,216	-
Energy Intensity	kWh/year	44,173	78,143	
Unit Energy Use	kWh/AFY	31	35.27	
Future Production	AFY	2,216	2,216	
Total Energy saving	kWh/year	68,392.07	78,143	**9,751**
Unit GHG saving	MT/MWh	0.34	0.34	-
Total GHG saving	MT/year	23	26.60	**3**

Surface Water Percentage	**75%**					
75% Surface water	Units	Surface Water	Well Water	Total Blend	Original Well Water	**Saving**
Future Production	AFY	1,662	554	2,216	2,216	-
Unit Energy Use	kWh/AFY	30.87	35.27	-	-	-
Total Energy saving	kWh/year	51,294.05	19,535.75	70,830	78,143	**7,313**
Unit GHG saving	MT/MWh	0.34	0.34			-
Total GHG saving	MT/year	17.46	6.65	24	27	**2.5**

GHG saving calc back up

Share	Region	EGRID subregion r	CO2e Emission Factor	
70%	California	WECC California	613.28	lbs/MWh
10%	Pacific Northwest	WECC Northwest	846.97	lbs/MWh
20%	Pacific Southwest	WECC Southwest	1182.89	lbs/MWh
			750.57	lbs/MWh
			0.34	MT/MWh

The percentage share/import (7:1:2 split) is obtained from California Energy Commission.http://energyalmanac.ca.gov/electricity/electricity_generation.html.
CO2e emission factor from eGrid 2010 subregion summary

Summary of Energy Usage for Surface Water Customers

Page 2

Totals		
Land	1132	acres
Surface Water Unboosted	89	acres
Well/Booster	67	acres
Booster	307	acres
Private Well	583	acres
MID well	67	acres
Owners	33	

Total Surface Water usage acreage

463 acres

Unit area water demand

3.09 AFY/acre

Total Surface Water demand

1431 AFY

Average Annual Power Consumption at Booster 32

44173 kWh/year

Unit Energy Intensity

31 kWh/AF

Surface Water Booster Pump Station Power Usage (2003-2014)

Pages 3 to 6

ExtraColumn	Booster 032

Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Month	Sum of Year	Total kWh Sum of esales
1/23/2003	0	0	0	1	2003	0
2/24/2003	0	0	0	2	2003	0
3/26/2003	0	74	1276	3	2003	1350
4/24/2003	0	363	2621	4	2003	2984
5/26/2003	195	147	3890	5	2003	4232
6/24/2003	0	0	0	6	2003	0
7/24/2003	1115	0	9745	7	2003	10860
8/25/2003	521	0	5606	8	2003	6127
9/23/2003	426	0	3348	9	2003	3774
10/22/2003	0	0	0	10	2003	0
11/21/2003	556	0	3934	11	2003	4490
12/23/2003	0	0	0	12	2003	0
1/22/2004	0	1	2	1	2004	3
2/24/2004	0	0	5	2	2004	5
3/24/2004	0	0	4	3	2004	4
4/21/2004	0	1065	3003	4	2004	4068
5/21/2004	0	0	0	5	2004	0
6/23/2004	1393	0	11177	6	2004	12570
7/23/2004	1055	0	6193	7	2004	7248
8/23/2004	0	0	0	8	2004	0
9/22/2004	0	0	0	9	2004	0
10/20/2004	1890	0	10756	10	2004	12646
11/19/2004	2	2	1	11	2004	5
12/21/2004	0	3	1	12	2004	4
1/21/2005	0	0	3	1	2005	3
2/22/2005	0	1	3	2	2005	4
3/23/2005	0	1	0	3	2005	1
4/21/2005	0	955	1856	4	2005	2811
5/23/2005	701	635	4741	5	2005	6077
6/22/2005	1365	0	5958	6	2005	7323
7/22/2005	1305	0	6536	7	2005	7841
8/22/2005	1039	0	6590	8	2005	7629
9/22/2005	429	0	3580	9	2005	4009
10/21/2005	338	0	1851	10	2005	2189
11/23/2005	374	2	2108	11	2005	2484
12/20/2005	0	2	1	12	2005	3
1/20/2006	0	1	1	1	2006	2
2/22/2006	0	1	4	2	2006	5

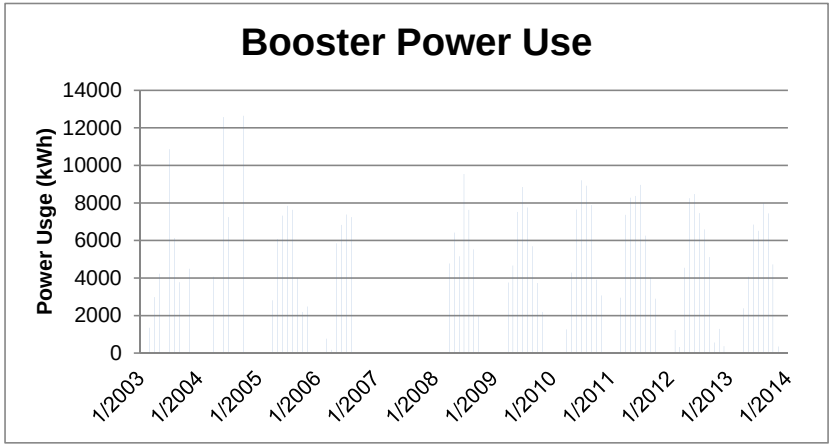
Year	Power Use (kWh)
1/2003	0
2/2003	0
3/2003	1350
4/2003	2984
5/2003	4232
6/2003	0
7/2003	10860
8/2003	6127
9/2003	3774
10/2003	0
11/2003	4490
12/2003	0
1/2004	3
2/2004	5
3/2004	4
4/2004	4068
5/2004	0
6/2004	12570
7/2004	7248
8/2004	0
9/2004	0
10/2004	12646
11/2004	5
12/2004	4
1/2005	3
2/2005	4
3/2005	1
4/2005	2811
5/2005	6077
6/2005	7323
7/2005	7841
8/2005	7629
9/2005	4009
10/2005	2189
11/2005	2484
12/2005	3
1/2006	2
2/2006	5

3/22/2006	0	30	735	3	2006	765	3/2006	765
4/24/2006	0	139	32	4	2006	171	4/2006	171
5/23/2006	817	316	4713	5	2006	5846	5/2006	5846
6/22/2006	1187	0	5646	6	2006	6833	6/2006	6833
7/25/2006	1179	0	6208	7	2006	7387	7/2006	7387
8/22/2006	1044	0	6205	8	2006	7249	8/2006	7249
1/17/2008	0	0	0	1	2008	0	1/2008	0
2/19/2008	0	0	0	2	2008	0	2/2008	0
3/18/2008	0	0	0	3	2008	0	3/2008	0
4/17/2008	0	1969	2810	4	2008	4779	4/2008	4779
5/19/2008	515	798	5106	5	2008	6419	5/2008	6419
6/13/2008	928	0	4234	6	2008	5162	6/2008	5162
6/16/2008	0	0	0	6	2008	0	6/2008	0
7/18/2008	1603	0	7938	7	2008	9541	7/2008	9541
8/18/2008	1272	0	6360	8	2008	7632	8/2008	7632
9/16/2008	865	0	4663	9	2008	5528	9/2008	5528
10/17/2008	277	0	1690	10	2008	1967	10/2008	1967
11/14/2008	0	0	2	11	2008	2	11/2008	2
12/16/2008	0	0	0	12	2008	0	12/2008	0
1/16/2009	0	0	0	1	2009	0	1/2009	0
2/18/2009	0	0	0	2	2009	0	2/2009	0
3/19/2009	0	0	0	3	2009	0	3/2009	0
4/20/2009	0	1175	2590	4	2009	3765	4/2009	3765
5/19/2009	373	482	3808	5	2009	4663	5/2009	4663
6/18/2009	1297	0	6226	6	2009	7523	6/2009	7523
7/20/2009	1504	0	7347	7	2009	8851	7/2009	8851
8/18/2009	1336	0	6426	8	2009	7762	8/2009	7762
9/17/2009	795	0	4898	9	2009	5693	9/2009	5693
10/16/2009	509	0	3225	10	2009	3734	10/2009	3734
11/16/2009	260	0	1935	11	2009	2195	11/2009	2195
12/17/2009	0	0	0	12	2009	0	12/2009	0
1/19/2010	0	0	0	1	2010	0	1/2010	0
2/18/2010	0	0	0	2	2010	0	2/2010	0
3/22/2010	0	0	0	3	2010	0	3/2010	0
4/20/2010	0	276	988	4	2010	1264	4/2010	1264
5/19/2010	720	0	3570	5	2010	4290	5/2010	4290
6/18/2010	1287	0	6357	6	2010	7644	6/2010	7644
7/19/2010	1512	0	7697	7	2010	9209	7/2010	9209
8/19/2010	1662	0	7256	8	2010	8918	8/2010	8918
9/20/2010	1339	0	6547	9	2010	7886	9/2010	7886
10/19/2010	684	0	3232	10	2010	3916	10/2010	3916
11/18/2010	432	171	2470	11	2010	3073	11/2010	3073
1/20/2011	0	0	0	1	2011	0	12/2010	0

2/17/2011	0	0	0	2	2011	0	1/2011	0
3/19/2011	0	0	1	3	2011	1	2/2011	1
4/20/2011	0	930	2020	4	2011	2950	3/2011	2950
5/18/2011	848	1042	5473	5	2011	7363	4/2011	7363
6/20/2011	1409	0	6867	6	2011	8276	5/2011	8276
7/20/2011	1550	0	6822	7	2011	8372	6/2011	8372
8/20/2011	1653	0	7304	8	2011	8957	7/2011	8957
9/16/2011	1147	0	5113	9	2011	6260	8/2011	6260
10/17/2011	649	0	3369	10	2011	4018	9/2011	4018
11/16/2011	444	0	2455	11	2011	2899	10/2011	2899
12/16/2011	0	0	2	12	2011	2	11/2011	2
1/18/2012	0	0	0	1	2012	0	12/2011	0
2/17/2012	0	3	1	2	2012	4	1/2012	4
3/19/2012	0	387	845	3	2012	1232	2/2012	1232
4/16/2012	0	1	321	4	2012	322	3/2012	322
5/17/2012	608	139	3794	5	2012	4541	4/2012	4541
6/18/2012	1364	0	6890	6	2012	8254	5/2012	8254
7/19/2012	1489	0	6983	7	2012	8472	6/2012	8472
8/17/2012	1327	0	6136	8	2012	7463	7/2012	7463
9/18/2012	1166	0	5424	9	2012	6590	8/2012	6590
10/17/2012	834	0	4280	10	2012	5114	9/2012	5114
10/23/2012	2	0	559	10	2012	561	10/2012	561
10/29/2012	200.157	0	1090.783	10	2012	1291	11/2012	1291
11/29/2012	67.786	0	298.569	11	2012	366	12/2012	366
1/1/2013	0	0	0	1	2013	0	1/2013	0
1/30/2013	0	0	0	1	2013	0	2/2013	0
3/3/2013	0	0	0	3	2013	0	3/2013	0
4/1/2013	0	797.341	1588.983	4	2013	2386	4/2013	2386
5/1/2013	55.791	1314.38	2700.172	5	2013	4070	5/2013	4070
6/2/2013	1003.017	0	5841.86	6	2013	6845	6/2013	6845
7/1/2013	1110.418	0	5400.854	7	2013	6511	7/2013	6511
7/31/2013	1391.967	0	6590.243	7	2013	7982	8/2013	7982
8/29/2013	1323.521	0	6117.322	8	2013	7441	9/2013	7441
9/30/2013	783.614	0	3937.592	9	2013	4721	10/2013	4721
12/1/2013	62.544	0	292.362	12	2013	355	11/2013	355
12/30/2013	0	0	0	12	2013	0	12/2013	0
1/30/2014	0	0.146	0	1	2014	0	1/2014	0
Grand Total	**56589.815**	**13222.867**	**334225.74**	**738**	**236972**	**404037**		

Average Annual Usage (kWh) **2006 and 2010 data are not used since not whole year**

2003-2005	**36,915**	**kWh**
2008-2013	**44,173**	**kWh**



Surface Water Booster Pump Station Power Usage (2003-2014) - RAW DATA

Page 7 to 12

sa id	acct id	meternum	service address	svc descriptor	current	ExtraColumn	num days	e or g	rate	onpk kwh	ptpk kwh	offpk kwh	esales
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/23/2003	Booster 032	31	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/24/2003	Booster 032	32	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/26/2003	Booster 032	30	E	AG4D	0	74	1276	1350
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/24/2003	Booster 032	29	E	AG4D	0	363	2621	2984
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/26/2003	Booster 032	32	E	AG4D	195	147	3890	4232
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/24/2003	Booster 032	29	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/24/2003	Booster 032	30	E	AG4D	1115	0	9745	10860
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/25/2003	Booster 032	32	E	AG4D	521	0	5606	6127
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/23/2003	Booster 032	29	E	AG4D	426	0	3348	3774
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/22/2003	Booster 032	29	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/21/2003	Booster 032	30	E	AG4D	556	0	3934	4490
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/23/2003	Booster 032	32	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/22/2004	Booster 032	30	E	AG4D	0	1	2	3
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/24/2004	Booster 032	33	E	AG4D	0	0	5	5
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/24/2004	Booster 032	29	E	AG4D	0	0	4	4
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/21/2004	Booster 032	28	E	AG4D	0	1065	3003	4068
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/21/2004	Booster 032	30	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/23/2004	Booster 032	33	E	AG4D	1393	0	11177	12570
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/23/2004	Booster 032	30	E	AG4D	1055	0	6193	7248
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/23/2004	Booster 032	31	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/22/2004	Booster 032	30	E	AG4D	0	0	0	0
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/20/2004	Booster 032	28	E	AG4D	1890	0	10756	12646
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/19/2004	Booster 032	30	E	AG4D	2	2	1	5
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/21/2004	Booster 032	32	E	AG4D	0	3	1	4
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/21/2005	Booster 032	31	E	AG4D	0	0	3	3
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/22/2005	Booster 032	32	E	AG4D	0	1	3	4
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/23/2005	Booster 032	29	E	AG4D	0	1	0	1
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/21/2005	Booster 032	29	E	AG4D	0	955	1856	2811
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/23/2005	Booster 032	32	E	AG4D	701	635	4741	6077
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/22/2005	Booster 032	30	E	AG4D	1365	0	5958	7323
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/22/2005	Booster 032	30	E	AG4D	1305	0	6536	7841
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/22/2005	Booster 032	31	E	AG4D	1039	0	6590	7629
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/22/2005	Booster 032	31	E	AG4D	429	0	3580	4009
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/21/2005	Booster 032	29	E	AG4D	338	0	1851	2189
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/23/2005	Booster 032	33	E	AG4D	374	2	2108	2484
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/20/2005	Booster 032	27	E	AG4D	0	2	1	3
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/20/2006	Booster 032	31	E	AG4D	0	1	1	2
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/22/2006	Booster 032	33	E	AG4D	0	1	4	5
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/22/2006	Booster 032	28	E	AG4D	0	30	735	765
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/24/2006	Booster 032	33	E	AG4D	0	139	32	171
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/23/2006	Booster 032	29	E	AG4D	817	316	4713	5846
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/22/2006	Booster 032	30	E	AG4D	1187	0	5646	6833
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/25/2006	Booster 032	33	E	AG4D	1179	0	6208	7387
7345508725	7345508181	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/22/2006	Booster 032	28	E	AG4D	1044	0	6205	7249
7345508725	4675912044	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/17/2008	Booster 032	29	E	AG4D	0	0	0	0
7345508725	4675912044	36269R	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/19/2008	Booster 032	33	E	AG4D	0	0	0	0

7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/18/2008	Booster 032	28	E	AG4D	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/17/2008	Booster 032	30	E	AG4D	0	1969	2810	4779
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/19/2008	Booster 032	32	E	AG4D	515	798	5106	6419
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/13/2008	Booster 032	25	E	AG4D	928	0	4234	5162
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/16/2008	Booster 032	3	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/18/2008	Booster 032	32	E	AG5E	1603	0	7938	9541
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/18/2008	Booster 032	31	E	AG5E	1272	0	6360	7632
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/16/2008	Booster 032	29	E	AG5E	865	0	4663	5528
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/17/2008	Booster 032	31	E	AG5E	277	0	1690	1967
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/14/2008	Booster 032	28	E	AG5E	0	0	2	2
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/16/2008	Booster 032	32	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/16/2009	Booster 032	31	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/18/2009	Booster 032	33	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/19/2009	Booster 032	29	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/20/2009	Booster 032	32	E	AG5E	0	1175	2590	3765
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/19/2009	Booster 032	29	E	AG5E	373	482	3808	4663
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/18/2009	Booster 032	30	E	AG5E	1297	0	6226	7523
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/20/2009	Booster 032	32	E	AG5E	1504	0	7347	8851
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/18/2009	Booster 032	29	E	AG5E	1336	0	6426	7762
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/17/2009	Booster 032	30	E	AG5E	795	0	4898	5693
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/16/2009	Booster 032	29	E	AG5E	509	0	3225	3734
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/16/2009	Booster 032	31	E	AG5E	260	0	1935	2195
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/17/2009	Booster 032	31	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/19/2010	Booster 032	33	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/18/2010	Booster 032	30	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/22/2010	Booster 032	32	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/20/2010	Booster 032	29	E	AG5E	0	276	988	1264
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/19/2010	Booster 032	29	E	AG5E	720	0	3570	4290
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/18/2010	Booster 032	30	E	AG5E	1287	0	6357	7644
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/19/2010	Booster 032	31	E	AG5E	1512	0	7697	9209
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/19/2010	Booster 032	31	E	AG5E	1662	0	7256	8918
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/20/2010	Booster 032	32	E	AG5E	1339	0	6547	7886
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/19/2010	Booster 032	29	E	AG5E	684	0	3232	3916
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/18/2010	Booster 032	30	E	AG5E	432	171	2470	3073
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/20/2011	Booster 032	31	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/17/2011	Booster 032	28	E	AG5E	0	0	0	0
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/19/2011	Booster 032	30	E	AG5E	0	0	1	1
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/20/2011	Booster 032	32	E	AG5E	0	930	2020	2950
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/18/2011	Booster 032	28	E	AG5E	848	1042	5473	7363
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/20/2011	Booster 032	33	E	AG5E	1409	0	6867	8276
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/20/2011	Booster 032	30	E	AG5E	1550	0	6822	8372
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/20/2011	Booster 032	31	E	AG5E	1653	0	7304	8957
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/16/2011	Booster 032	27	E	AG5E	1147	0	5113	6260
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/17/2011	Booster 032	31	E	AG5E	649	0	3369	4018
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/16/2011	Booster 032	30	E	AG5E	444	0	2455	2899
7345508725	4675912044	36269R		SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/16/2011	Booster 032	30	E	AG5E	0	0	2	2
7345508725	4675912044		1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/18/2012	Booster 032	33	E	AG5E	0	0	0	0
7345508725	4675912044		1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	2/17/2012	Booster 032	30	E	AG5E	0	3	1	4
7345508725	4675912044		1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/19/2012	Booster 032	31	E	AG5E	0	387	845	1232
7345508725	4675912044		1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/16/2012	Booster 032	28	E	AG5E	0	1	321	322

7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/17/2012	Booster 032	31	E	AG5E	608	139	3794	4541
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/18/2012	Booster 032	32	E	AG5E	1364	0	6890	8254
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/19/2012	Booster 032	31	E	AG5E	1489	0	6983	8472
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/17/2012	Booster 032	29	E	AG5E	1327	0	6136	7463
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/18/2012	Booster 032	32	E	AG5E	1166	0	5424	6590
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/17/2012	Booster 032	29	E	AG5E	834	0	4280	5114
7345508725	4675912044	1009835882	SE SW 07 07 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/23/2012	Booster 032	6	E	AG5E	2	0	559	561
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	10/29/2012	Booster 032	6	E	HAG5B	200.157	0	1090.783	1291
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	11/29/2012	Booster 032	31	E	HAG5B	67.786	0	298.569	366
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/1/2013	Booster 032	33	E	HAG5B	0	0	0	0
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/30/2013	Booster 032	29	E	HAG5B	0	0	0	0
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	3/3/2013	Booster 032	32	E	HAG5B	0	0	0	0
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	4/1/2013	Booster 032	29	E	HAG5B	0	797.341	1588.983	2386
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	5/1/2013	Booster 032	30	E	HAG5B	55.791	1314.38	2700.172	4070
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	6/2/2013	Booster 032	32	E	HAG5B	1003.017	0	5841.86	6845
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/1/2013	Booster 032	29	E	HAG5B	1110.418	0	5400.854	6511
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	7/31/2013	Booster 032	30	E	HAG5B	1391.967	0	6590.243	7982
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	8/29/2013	Booster 032	29	E	HAG5B	1323.521	0	6117.322	7441
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	9/30/2013	Booster 032	32	E	HAG5B	783.614	0	3937.592	4721
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/1/2013	Booster 032	33	E	HAG5B	62.544	0	292.362	355
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	12/30/2013	Booster 032	29	E	HAG5B	0	0	0	0
4675912242	4675912044	1009835882	SE SW 7 7 12, ATWATER, CA 95301	BOOSTER PUMP #32	1/30/2014	Booster 032	31	E	HAG5B	0	0.146	0	0

erevenue	cr demand	bl demand	onpk kw	ptpk kw	offpk kw	grevenue	thru put	taxes	sa_status_flg	bus_activity_desc	per_id	service_prem_id	end_dt	Month	Year
47.26	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		1	2003
47.72	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		2	2003
179.17	0	15	0	0	0			0.27	20	BOOSTER PUMP #32	3522769182	4408133529		3	2003
341.84	0	15	0	0	0			0.59	20	BOOSTER PUMP #32	3522769182	4408133529		4	2003
542.91	0	15	0	0	0			0.85	20	BOOSTER PUMP #32	3522769182	4408133529		5	2003
49.34	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		6	2003
1487.16	0	15	0	0	0			2.17	20	BOOSTER PUMP #32	3522769182	4408133529		7	2003
833.66	0	15	0	0	0			1.23	20	BOOSTER PUMP #32	3522769182	4408133529		8	2003
558.83	0	15	0	0	0			0.75	20	BOOSTER PUMP #32	3522769182	4408133529		9	2003
49.34	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		10	2003
643.18	0	15	0	0	0			0.9	20	BOOSTER PUMP #32	3522769182	4408133529		11	2003
47.72	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		12	2003
47.1	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		1	2004
48.66	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		2	2004
46.65	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		3	2004
359.99	0	15	0	0	0			1.22	20	BOOSTER PUMP #32	3522769182	4408133529		4	2004
48.9	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		5	2004
1440.28	0	15	0	0	0			3.77	20	BOOSTER PUMP #32	3522769182	4408133529		6	2004
912.63	0	15	0	0	0			2.17	20	BOOSTER PUMP #32	3522769182	4408133529		7	2004
49.51	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		8	2004
49.05	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		9	2004
1570.77	0	15	0	0	0			3.79	20	BOOSTER PUMP #32	3522769182	4408133529		10	2004
48.18	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		11	2004
47.46	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		12	2004
49.02	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		1	2005
50.59	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		2	2005
48.98	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		3	2005
277.32	0	15	0	0	0			0.62	20	BOOSTER PUMP #32	3522769182	4408133529		4	2005
739.36	0	15	0	0	0			1.33	20	BOOSTER PUMP #32	3522769182	4408133529		5	2005
994.24	0	15	0	0	0			1.61	20	BOOSTER PUMP #32	3522769182	4408133529		6	2005
1012.18	0	15	0	0	0			1.73	20	BOOSTER PUMP #32	3522769182	4408133529		7	2005
930.83	0	15	0	0	0			1.68	20	BOOSTER PUMP #32	3522769182	4408133529		8	2005
485.96	0	15	0	0	0			0.88	20	BOOSTER PUMP #32	3522769182	4408133529		9	2005
314.55	0	15	0	0	0			0.48	20	BOOSTER PUMP #32	3522769182	4408133529		10	2005
336.05	0	15	0	0	0			0.54	20	BOOSTER PUMP #32	3522769182	4408133529		11	2005
48.21	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		12	2005
51.91	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		1	2006
54.12	0	15	0	0	0			0	20	BOOSTER PUMP #32	3522769182	4408133529		2	2006
110.36	0	15	0	0	0			0.17	20	BOOSTER PUMP #32	3522769182	4408133529		3	2006
71.22	0	15	0	0	0			0.04	20	BOOSTER PUMP #32	3522769182	4408133529		4	2006
787.72	0	15	0	0	0			1.28	20	BOOSTER PUMP #32	3522769182	4408133529		5	2006
985.36	0	15	0	0	0			1.5	20	BOOSTER PUMP #32	3522769182	4408133529		6	2006
1032.59	0	15	0	0	0			1.63	20	BOOSTER PUMP #32	3522769182	4408133529		7	2006
980.42	0	15	0	0	0			1.59	20	BOOSTER PUMP #32	3522769182	4408133529		8	2006
37.75	0	15	0	0	0			0						1	2008
26.33	0	15	0	0	0			0						2	2008

23.73	0	15	0	0	0	0				3	2008
565.35	0	15	0	0	0	1.05				4	2008
870.99	0	15	0	0	0	1.41				5	2008
812.63	0	15	0	0	0	1.14				6	2008
3.08	0	0	0	0	0	0				6	2008
1012.84	13	13	13	0	13	2.1				7	2008
856.97	13	13	13	0	13	1.68				8	2008
680.47	13	13	13	0	13	1.22				9	2008
407.9	13	13	13	0	13	0.44				10	2008
28.83	0	13	0	0	0	0				11	2008
32.8	0	0	0	0	0	0				12	2008
31.77	0	0	0	0	0	0				1	2009
33.83	0	0	0	0	0	0				2	2009
29.73	0	0	0	0	0	0				3	2009
332.08	13	13	0	13	13	0.83				4	2009
555.88	13	13	13	13	13	1.02				5	2009
911.71	13	13	13	0	13	1.66				6	2009
1024.6	13	13	13	0	13	1.95				7	2009
930.82	13	13	13	0	13	1.71				8	2009
735.51	13	13	13	0	13	1.25				9	2009
573.87	13	13	13	0	13	0.82				10	2009
322.86	13	13	13	0	13	0.48				11	2009
31.77	0	13	0	0	0	0				12	2009
33.83	0	13	0	0	0	0				1	2010
30.75	0	13	0	0	0	0				2	2010
32.8	0	13	0	0	0	0				3	2010
171.13	13	13	0	13	13	0.28				4	2010
571.57	12	13	12	12	12	0.94				5	2010
958.94	14	14	13	0	14	1.68				6	2010
1070.3	13	14	13	0	13	2.02				7	2010
1065.36	13	14	13	0	13	1.96				8	2010
961.03	13	14	13	0	13	1.73				9	2010
594.63	12	14	12	0	12	0.86				10	2010
408.22	12	14	12	12	12	0.67				11	2010
31.77	0	13	0	0	0	0	20	3522769182	4408133529	1	2011
28.7	0	13	0	0	0	0	20	3522769182	4408133529	2	2011
30.81	0	13	0	0	0	0	20	3522769182	4408133529	3	2011
299.14	12	12	0	12	12	0.86	20	3522769182	4408133529	4	2011
805.44	12	14	12	12	12	2.14	20	3522769182	4408133529	5	2011
982.23	12	13	12	0	12	2.4	20	3522769182	4408133529	6	2011
999.16	12	13	12	0	12	2.43	20	3522769182	4408133529	7	2011
1052.46	12	13	12	0	12	2.6	20	3522769182	4408133529	8	2011
804.47	12	12	12	0	12	1.82	20	3522769182	4408133529	9	2011
598.7	12	12	12	0	12	1.17	20	3522769182	4408133529	10	2011
383.2	12	12	12	0	12	0.84	20	3522769182	4408133529	11	2011
30.88	0	12	0	0	0	0	20	3522769182	4408133529	12	2011
37.37	0	12	0	0	0	0	40 BOOSTER PUMP #32	3522769182	4408133529	1	2012
36.99	0	12	0	0	0	0	40 BOOSTER PUMP #32	3522769182	4408133529	2	2012
184.11	12	12	0	12	12	0.36	40 BOOSTER PUMP #32	3522769182	4408133529	3	2012
116.23	13	13	0	0	13	0.09	40 BOOSTER PUMP #32	3522769182	4408133529	4	2012

577.08	13	13	12	13	13	1.32	40	BOOSTER PUMP #32	3522769182	4408133529	5	2012
998.08	12	12	12	0	12	2.39	40	BOOSTER PUMP #32	3522769182	4408133529	6	2012
1020.36	12	12	12	0	12	2.46	40	BOOSTER PUMP #32	3522769182	4408133529	7	2012
927.7	12	12	12	0	12	2.16	40	BOOSTER PUMP #32	3522769182	4408133529	8	2012
853.47	12	12	12	0	12	1.91	40	BOOSTER PUMP #32	3522769182	4408133529	9	2012
712.75	12	12	12	0	12	1.48	40	BOOSTER PUMP #32	3522769182	4408133529	10	2012
91.5	12	12	10	0	12	0.16	40	BOOSTER PUMP #32	3522769182	4408133529	10	2012
163.91	12	12	12	0	12	0.37	20	BOOSTER PUMP #32	3522769182	4408133529	10	2012
83.83	12	12	11	0	12	0.11	20	BOOSTER PUMP #32	3522769182	4408133529	11	2012
39.03	0	0	0	0	0	0	20	BOOSTER PUMP #32	3522769182	4408133529	1	2013
34.3	0	0	0	0	0	0	20	BOOSTER PUMP #32	3522769182	4408133529	1	2013
37.85	0	0	0	0	0	0	20	BOOSTER PUMP #32	3522769182	4408133529	3	2013
264.24	12	12	0	12	12	0.69	20	BOOSTER PUMP #32	3522769182	4408133529	4	2013
399.65	12	12	11	12	12	1.18	20	BOOSTER PUMP #32	3522769182	4408133529	5	2013
887.33	12	12	12	0	12	1.99	20	BOOSTER PUMP #32	3522769182	4408133529	6	2013
882.3	13	13	12	0	13	1.89	20	BOOSTER PUMP #32	3522769182	4408133529	7	2013
1010.33	12	12	12	0	12	2.31	20	BOOSTER PUMP #32	3522769182	4408133529	7	2013
953.81	11	11	11	0	11	2.16	20	BOOSTER PUMP #32	3522769182	4408133529	8	2013
695.21	11	11	11	0	11	1.37	20	BOOSTER PUMP #32	3522769182	4408133529	9	2013
84.94	11	11	10	0	11	0.1	20	BOOSTER PUMP #32	3522769182	4408133529	12	2013
34.3	0	0	0	0	0	0	20	BOOSTER PUMP #32	3522769182	4408133529	12	2013
39.21	1	1	0	1	0	0	20	BOOSTER PUMP #32	3522769182	4408133529	1	2014

Summary Energy Usage for Groundwater Well

Page 13

	Total kWh	2003-2005 Average	2011-2013 Average
Row Labels	**Sum of esales**	**Annual Power Use (kWh)**	**Annual Power Use (kWh)**
Well 059 A&B	14,817	1,467	2,523
Well 072	157,595	35,474	3,633
Well 073	98,231	14,525	5,027
Well 078	34,917	7,530	1,223
Well 144	325,154	44,415	22,593
Well 241	251,903	26,421	22,899
Well 242	175,509	18,901	20,245
Grand Total	**1,058,126**	**148,733**	**78,143**

Groundwater Well 059A&B Energy Usage Data

Pages 14 to 17

ExtraColumn	Well 059 A&B

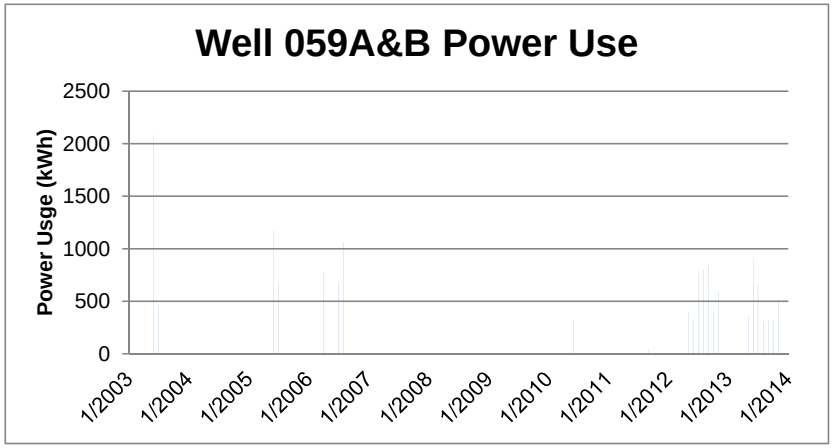
Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Year	Sum of Month	Total kWh Sum of esales	Year	Power Use (kWh)
1/23/2003	0	0	0	2003	1	0	1/2003	0
2/24/2003	0	0	0	2003	2	0	2/2003	0
3/26/2003	0	0	0	2003	3	0	3/2003	0
4/24/2003	0	0	0	2003	4	0	4/2003	0
5/24/2003	0	0	0	2003	5	0	4/2003	0
6/25/2003	0	0	0	2003	6	2080	6/2003	2080
7/24/2003	0	0	0	2003	7	468	7/2003	468
8/23/2003	0	0	0	2003	8	0	8/2003	0
9/23/2003	0	0	0	2003	9	0	9/2003	0
10/22/2003	0	0	0	2003	10	0	10/2003	0
11/20/2003	0	0	0	2003	11	0	11/2003	0
12/22/2003	0	0	0	2003	12	0	12/2003	0
1/22/2004	0	0	0	2004	1	0	1/2004	0
2/23/2004	0	0	0	2004	2	0	2/2004	0
3/25/2004	0	0	0	2004	3	5	3/2004	5
4/23/2004	0	0	0	2004	4	0	4/2004	0
5/21/2004	0	0	0	2004	5	0	4/2004	0
6/24/2004	0	0	0	2004	6	0	6/2004	0
7/23/2004	0	0	0	2004	7	0	7/2004	0
8/24/2004	0	0	0	2004	8	0	8/2004	0
9/22/2004	0	0	0	2004	9	0	9/2004	0
10/21/2004	0	0	0	2004	10	0	10/2004	0
11/20/2004	0	0	0	2004	11	0	11/2004	0
12/22/2004	0	0	0	2004	12	1	12/2004	1
1/22/2005	0	0	0	2005	1	0	1/2005	0
2/22/2005	0	0	0	2005	2	0	2/2005	0
3/23/2005	0	0	0	2005	3	0	3/2005	0
4/23/2005	0	0	0	2005	4	0	4/2005	0
5/23/2005	0	0	0	2005	5	0	4/2005	0
6/23/2005	0	0	0	2005	6	1176	6/2005	1176
7/25/2005	0	0	0	2005	7	672	7/2005	672
8/22/2005	0	0	0	2005	8	0	8/2005	0
9/22/2005	0	0	0	2005	9	0	9/2005	0
10/21/2005	0	0	0	2005	10	0	10/2005	0
11/22/2005	0	0	0	2005	11	0	11/2005	0
12/22/2005	0	0	0	2005	12	0	12/2005	0
1/23/2006	0	0	0	2006	1	0	1/2006	0
2/23/2006	0	0	0	2006	2	0	2/2006	0

3/23/2006	0	0	0	2006	3	0	3/2006	0
4/25/2006	0	0	0	2006	4	0	4/2006	0
5/23/2006	0	0	0	2006	5	779	4/2006	779
6/23/2006	0	0	0	2006	6	0	6/2006	0
7/24/2006	0	0	0	2006	7	680	7/2006	680
8/22/2006	0	0	0	2006	8	1064	8/2006	1064
6/8/2010	27.503	0	296.701	2010	6	324	6/2010	324
7/8/2010	0	0	0	2010	7	0	7/2010	0
8/9/2010	0	0	0	2010	8	0	8/2010	0
10/7/2010	0	0	0	2010	10	0	10/2010	0
11/7/2010	0	0	0	2010	11	0	11/2010	0
12/9/2010	0	0	0	2010	12	0	12/2010	0
2/7/2011	0	0	0	2011	2	0	2/2011	0
3/9/2011	0	0	0	2011	3	0	3/2011	0
4/7/2011	0	0	0	2011	4	0	4/2011	0
5/9/2011	0	0	0	2011	5	0	5/2011	0
6/8/2011	0	0	0	2011	6	0	6/2011	0
7/10/2011	0	0	0	2011	7	0	7/2011	0
8/8/2011	0	0	0	2011	8	0	8/2011	0
9/7/2011	0	0	43.617	2011	9	44	9/2011	44
11/6/2011	0	0	0	2011	11	0	11/2011	0
12/6/2011	0	0	0	2011	12	0	12/2011	0
1/6/2012	0	0	0	2012	1	0	1/2012	0
2/6/2012	0	0.132	0	2012	2	0	2/2012	0
3/7/2012	0	0	0	2012	3	0	3/2012	0
4/5/2012	0	0	0	2012	4	0	4/2012	0
5/7/2012	0	250.288	148.099	2012	5	398	5/2012	398
6/6/2012	79.959	0	248.57	2012	6	329	6/2012	329
7/8/2012	118.961	0	647.79	2012	7	767	7/2012	767
8/6/2012	0	0	797.369	2012	8	797	8/2012	797
9/5/2012	0	0	845.425	2012	9	845	9/2012	845
10/4/2012	0	0	405.977	2012	10	406	10/2012	406
11/4/2012	145.364	0	444.159	2012	11	590	11/2012	590
12/5/2012	0	0	0	2012	12	0	12/2012	0
1/6/2013	0	0	0	2013	1	0	1/2013	0
2/5/2013	0	0	0	2013	2	0	2/2013	0
3/7/2013	0	0	0	2013	3	0	3/2013	0
4/7/2013	0	0	0	2013	4	0	4/2013	0
5/7/2013	0	178.664	185.497	2013	5	364	5/2013	364
6/6/2013	0	0	903.661	2013	6	904	6/2013	904
7/8/2013	0	0	672.671	2013	7	673	7/2013	673
8/6/2013	0	0	312.21	2013	8	312	8/2013	312
9/5/2013	0	0	315.596	2013	9	316	9/2013	316

10/6/2013	0	0	323.761	2013	10	324	10/2013	324
11/4/2013	80.064	0	418.473	2013	11	499	11/2013	499
12/5/2013	0	0	0	2013	12	0	12/2013	0
1/6/2014	0	0	0	2014	1	0	1/2014	0
Grand Total	**451.851**	**429.084**	**7009.576**	**170676**	**548**	**14817**		

Average Annual Usage (kWh) **2006 and 2010 data are not used since not whole year**

2003-2005	**1,467**	**kWh**
2011-2013	**2,523**	**kWh**



Groundwater Well 072 Energy Usage Data

ExtraColumn	Well 072

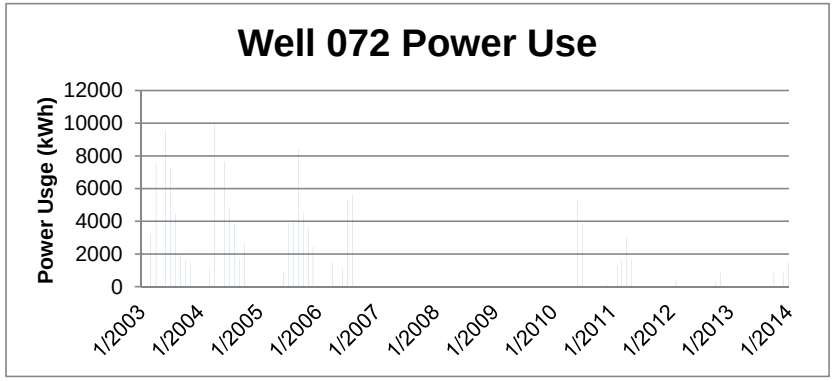
Pages 18 to 21

Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Year	Sum of Montl	Total kWh Sum of esales	Year	Power Use (kWh)
1/23/2003	0	0	0	2003	1	0	1/2003	0
2/24/2003	0	0	0	2003	2	0	2/2003	0
3/26/2003	0	896	2314	2003	3	3210	3/2003	3210
4/24/2003	0	3182	4360	2003	4	7542	4/2003	7542
5/24/2003	19	0	3226	2003	5	3245	4/2003	3245
6/25/2003	1002	0	8579	2003	6	9581	6/2003	9581
7/24/2003	909	0	6392	2003	7	7301	7/2003	7301
8/23/2003	7	0	4449	2003	8	4456	8/2003	4456
9/23/2003	0	0	1908	2003	9	1908	9/2003	1908
10/22/2003	3	0	1643	2003	10	1646	10/2003	1646
11/20/2003	40	0	1403	2003	11	1443	11/2003	1443
12/22/2003	0	0	0	2003	12	0	12/2003	0
1/22/2004	0	0	0	2004	1	0	1/2004	0
2/23/2004	0	0	0	2004	2	0	2/2004	0
3/25/2004	0	1023	117	2004	3	1140	3/2004	1140
4/23/2004	0	3370	3147	2004	4	6517	4/2004	6517
5/21/2004	1883	1391	6716	2004	5	9990	4/2004	9990
6/23/2004	474	0	7188	2004	6	7662	6/2004	7662
7/23/2004	63	0	4799	2004	7	4862	7/2004	4862
8/24/2004	8	0	3856	2004	8	3864	8/2004	3864
9/22/2004	2	0	1683	2004	9	1685	9/2004	1685
10/21/2004	24	0	2636	2004	10	2660	10/2004	2660
11/20/2004	0	0	0	2004	11	0	11/2004	0
12/13/2004	0	0	0	2004	12	0	12/2004	0
12/20/2004	0	0	0	2004	12	0	1/2005	0
1/21/2005	0	0	0	2005	1	0	2/2005	0
2/22/2005	0	0	0	2005	2	0	3/2005	0
3/2/2005	0	0	0	2005	3	0	4/2005	0
3/23/2005	0	0	0	2005	3	0	4/2005	0
4/23/2005	0	0	956	2005	4	956	6/2005	956
5/23/2005	269	0	3631	2005	5	3900	7/2005	3900
6/23/2005	10	0	3876	2005	6	3886	8/2005	3886
7/25/2005	229	0	8171	2005	7	8400	9/2005	8400
8/22/2005	14	0	4492	2005	8	4506	10/2005	4506
9/22/2005	8	0	3603	2005	9	3611	11/2005	3611
10/21/2005	1	0	2449	2005	10	2450	12/2005	2450
11/22/2005	0	0	0	2005	11	0	1/2006	0
12/22/2005	0	0	0	2005	12	0	2/2006	0
1/23/2006	0	0	0	2006	1	0	3/2006	0
2/23/2006	0	299	1054	2006	2	1353	4/2006	1353
3/23/2006	0	339	1217	2006	3	1556	4/2006	1556
4/25/2006	0	827	322	2006	4	1149	6/2006	1149
5/23/2006	758	244	4296	2006	5	5298	7/2006	5298
6/23/2006	559	0	5086	2006	6	5645	8/2006	5645
7/24/2006	6	0	5287	2006	7	5293	6/2010	5293
8/22/2006	7	0	3820	2006	8	3827	7/2010	3827

1/18/2008	0	0	0	2008	1	0	8/2010	0
2/15/2008	0	0	0	2008	2	0	10/2010	0
3/19/2008	0	0	0	2008	3	0	11/2010	0
4/18/2008	0	129	1	2008	4	130	12/2010	130
5/19/2008	445	392	435	2008	5	1272	2/2011	1272
6/18/2008	694	0	891	2008	6	1585	3/2011	1585
7/18/2008	1206	0	1824	2008	7	3030	4/2011	3030
8/18/2008	679	0	991	2008	8	1670	5/2011	1670
9/17/2008	0	0	0	2008	9	0	6/2011	0
10/16/2008	0	0	0	2008	10	0	7/2011	0
11/14/2008	1	0	3	2008	11	4	8/2011	4
12/16/2008	0	0	0	2008	12	0	9/2011	0
1/16/2009	0	0	0	2009	1	0	11/2011	0
2/18/2009	0	0	0	2009	2	0	12/2011	0
3/19/2009	0	0	0	2009	3	0	1/2012	0
4/20/2009	0	419	0	2009	4	419	2/2012	419
8/18/2009	0	0	0	2009	8	0	3/2012	0
9/17/2009	0	0	0	2009	9	0	4/2012	0
10/16/2009	0	0	0	2009	10	0	5/2012	0
11/18/2009	0	0	0	2009	11	0	6/2012	0
12/17/2009	0	0	0	2009	12	0	7/2012	0
1/16/2010	0	0	0	2010	1	0	8/2012	0
2/18/2010	0	0	0	2010	2	0	9/2012	0
3/22/2010	0	65	295	2010	3	360	10/2012	360
4/21/2010	0	1	881	2010	4	882	11/2012	882
5/20/2010	0	0	0	2010	5	0	12/2012	0
7/20/2010	0	0	0	2010	7	0	1/2013	0
8/20/2010	0	0	0	2010	8	0	2/2013	0
1/20/2011	0	0	0	2011	1	0	3/2013	0
2/17/2011	0	0	0	2011	2	0	4/2013	0
3/19/2011	0	0	0	2011	3	0	5/2013	0
4/21/2011	0	0	0	2011	4	0	6/2013	0
5/20/2011	0	0	0	2011	5	0	7/2013	0
7/21/2011	0	0	0	2011	7	0	8/2013	0
8/20/2011	0	0	0	2011	8	0	9/2013	0
11/17/2011	0	284	536	2011	11	820	10/2013	820
12/17/2011	0	0	0	2011	12	0	11/2013	0
1/14/2012	0	277	581	2012	1	858	12/2013	858
2/16/2012	0	229	1340	2012	2	1569	1/2014	1569
3/16/2012	0	511	1150	2012	3	1661		
4/17/2012	0	390	774	2012	4	1164		
5/18/2012	342	410	1863	2012	5	2615		
7/19/2012	0	0	0	2012	7	0		
9/17/2012	0	0	0	2012	9	0		
10/16/2012	0	0	0	2012	10	0		
12/15/2012	0	0	0	2012	12	0		
1/16/2013	0	0	0	2013	1	0		
2/15/2013	0	328	190	2013	2	518		
3/18/2013	0	536	444	2013	3	980		
4/18/2013	0	0	0	2013	4	0		
5/17/2013	0	0	0	2013	5	0		

6/18/2013	0	0	0	2013	6	0
7/18/2013	27	0	593	2013	7	620
8/16/2013	694	0	1558	2013	8	2252
9/17/2013	511	0	1790	2013	9	2301
10/15/2013	52	0	719	2013	10	771
11/14/2013	48	0	1524	2013	11	1572
12/17/2013	0	0	0	2013	12	0
Grand Total	**10994**	**15542**	**131059**	**208811**	**637**	**157595**

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	35,474	kWh	
2011-2013	3,633	kWh	



Groundwater Well 073 Energy Usage Data

Pages 22 to 25

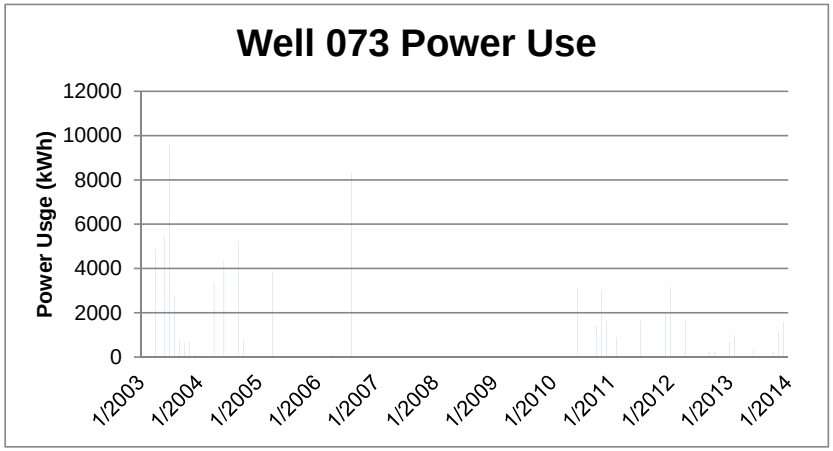
ExtraColumn	Well 073

Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Year	Sum of Month	Total kWh Sum of esales	Year	Power Use (kWh)
1/27/2003	0	0	0	2003	1	0	1/2003	0
2/26/2003	0	0	0	2003	2	0	2/2003	0
3/27/2003	0	0	0	2003	3	0	3/2003	0
4/28/2003	0	0	0	2003	4	0	4/2003	0
5/28/2003	454	0	4455	2003	5	4909	4/2003	4909
6/26/2003	1067	0	4349	2003	6	5416	6/2003	5416
7/28/2003	1574	0	8006	2003	7	9580	7/2003	9580
8/26/2003	0	0	2797	2003	8	2797	8/2003	2797
9/25/2003	0	0	808	2003	9	808	9/2003	808
10/24/2003	0	0	647	2003	10	647	10/2003	647
11/24/2003	0	599	92	2003	11	691	11/2003	691
12/24/2003	0	135	21	2003	12	156	12/2003	156
1/24/2004	0	0	0	2004	1	0	1/2004	0
2/25/2004	0	0	0	2004	2	0	2/2004	0
3/26/2004	0	0	0	2004	3	0	3/2004	0
4/26/2004	0	1835	1516	2004	4	3351	4/2004	3351
5/25/2004	211	0	802	2004	5	1013	4/2004	1013
6/25/2004	1108	0	3244	2004	6	4352	6/2004	4352
7/27/2004	0	0	0	2004	7	0	7/2004	0
8/25/2004	0	0	0	2004	8	0	8/2004	0
9/21/2004	818	0	4412	2004	9	5230	9/2004	5230
10/23/2004	423	0	334	2004	10	757	10/2004	757
11/23/2004	0	0	0	2004	11	0	11/2004	0
12/23/2004	0	0	0	2004	12	0	12/2004	0
1/25/2005	0	0	0	2005	1	0	1/2005	0
2/24/2005	0	0	0	2005	2	0	2/2005	0
3/25/2005	0	0	0	2005	3	0	3/2005	0
4/27/2005	0	609	3259	2005	4	3868	4/2005	3868
5/25/2005	0	0	0	2005	5	0	4/2005	0
6/24/2005	0	0	0	2005	6	0	6/2005	0
7/26/2005	0	0	0	2005	7	0	7/2005	0
8/24/2005	0	0	0	2005	8	0	8/2005	0
9/26/2005	0	0	0	2005	9	0	9/2005	0
10/25/2005	0	0	0	2005	10	0	10/2005	0
11/23/2005	0	0	0	2005	11	0	11/2005	0
12/23/2005	0	0	0	2005	12	0	12/2005	0
12/28/2005	0	0	0	2005	12	0	1/2006	0
1/25/2006	0	0	0	2006	1	0	2/2006	0

2/24/2006	0	0	0	2006	2	0	3/2006	0
3/27/2006	0	72	44	2006	3	116	4/2006	116
4/26/2006	0	0	0	2006	4	0	4/2006	0
5/25/2006	4	0	0	2006	5	4	6/2006	4
6/26/2006	0	0	0	2006	6	0	7/2006	0
7/29/2006	2727	0	5593	2006	7	8320	8/2006	8320
8/27/2006	1452	0	1649	2006	8	3101	6/2010	3101
1/22/2008	0	0	0	2008	1	0	7/2010	0
2/21/2008	0	0	0	2008	2	0	8/2010	0
3/21/2008	0	669	734	2008	3	1403	10/2010	1403
4/22/2008	0	1530	1498	2008	4	3028	11/2010	3028
5/21/2008	0	0	1658	2008	5	1658	12/2010	1658
6/20/2008	206	0	689	2008	6	895	2/2011	895
7/22/2008	0	0	1	2008	7	1	3/2011	1
8/20/2008	0	0	0	2008	8	0	4/2011	0
9/19/2008	0	0	0	2008	9	0	5/2011	0
10/21/2008	0	0	1	2008	10	1	6/2011	1
11/18/2008	295	0	1357	2008	11	1652	7/2011	1652
12/19/2008	0	0	0	2008	12	0	8/2011	0
1/19/2009	0	0	0	2009	1	0	9/2011	0
2/20/2009	0	0	0	2009	2	0	11/2011	0
3/24/2009	0	753	1236	2009	3	1989	12/2011	1989
4/22/2009	0	1729	1453	2009	4	3182	1/2012	3182
5/21/2009	0	0	0	2009	5	0	2/2012	0
6/22/2009	0	0	0	2009	6	0	3/2012	0
7/22/2009	333	0	1338	2009	7	1671	4/2012	1671
9/21/2009	0	0	0	2009	9	0	5/2012	0
10/20/2009	0	0	0	2009	10	0	6/2012	0
11/19/2009	0	0	0	2009	11	0	7/2012	0
1/21/2010	0	0	0	2010	1	0	8/2012	0
3/24/2010	0	0	262	2010	3	262	9/2012	262
4/23/2010	0	232	19	2010	4	251	10/2012	251
7/23/2010	0	0	3	2010	7	3	11/2012	3
8/21/2010	0	0	21	2010	8	21	12/2012	21
9/22/2010	0	0	700	2010	9	700	1/2013	700
10/22/2010	0	0	1016	2010	10	1016	2/2013	1016
11/20/2010	0	0	0	2010	11	0	3/2013	0
1/21/2011	0	0	0	2011	1	0	4/2013	0
2/19/2011	0	0	0	2011	2	0	5/2013	0
3/23/2011	0	0	399	2011	3	399	6/2013	399
4/23/2011	0	58	0	2011	4	58	7/2013	58
5/21/2011	0	0	0	2011	5	0	8/2013	0
6/22/2011	0	0	0	2011	6	0	9/2013	0

7/23/2011	34	0	205	2011	7	239	10/2013	239
8/23/2011	501	0	658	2011	8	1159	11/2013	1159
9/21/2011	441	0	1141	2011	9	1582	12/2013	1582
10/20/2011	0	0	0	2011	10	0	1/2014	0
12/20/2011	0	0	0	2011	12	0		
1/19/2012	0	1493	1972	2012	1	3465		
2/21/2012	0	421	341	2012	2	762		
3/21/2012	0	1870	1956	2012	3	3826		
4/18/2012	0	450	1598	2012	4	2048		
5/21/2012	1088	876	4777	2012	5	6741		
6/19/2012	926	0	1859	2012	6	2785		
7/21/2012	0	0	9	2012	7	9		
8/20/2012	0	0	0	2012	8	0		
10/19/2012	0	0	0	2012	10	0		
11/17/2012	0	1	0	2012	11	1		
12/19/2012	0	0	0	2012	12	0		
1/18/2013	0	0	0	2013	1	0		
2/20/2013	0	0	0	2013	2	0		
3/20/2013	0	896	1331	2013	3	2227		
4/20/2013	0	0	0	2013	4	0		
5/20/2013	0	0	0	2013	5	0		
6/19/2013	0	0	0	2013	6	0		
7/19/2013	0	0	0	2013	7	0		
8/20/2013	0	0	0	2013	8	0		
9/19/2013	0	0	0	2013	9	0		
10/8/2013	0	0	0	2013	10	0		
11/4/2013	0	0	0	2013	11	0		
12/5/2013	0	0	0	2013	12	0		
1/6/2014	0	81.271	0	2014	1	81		
Grand Total	**13662**	**14309.271**	**70260**	**220886**	**686**	**98231**		

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	14,525	kWh	
2011-2013	5,027	kWh	



Groundwater Well 078 Energy Usage Data

ExtraColumn	Well 078

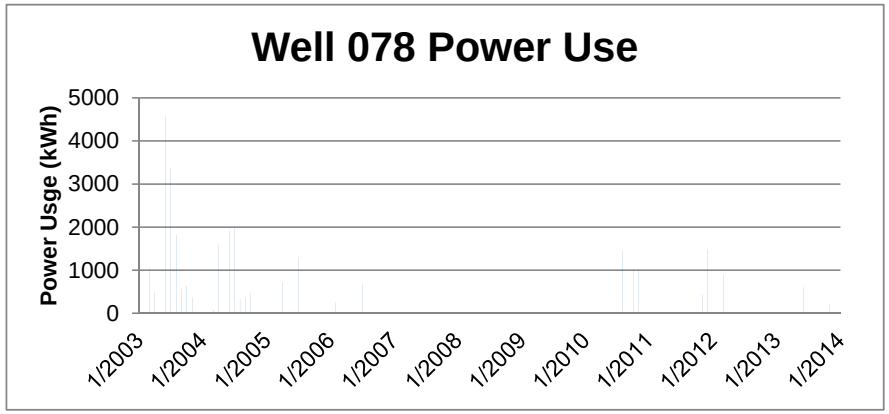
Pages 26 to 29

Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Year	Sum of Montl	Total kWh Sum of esales	Year	Power Use (kWh)
1/27/2003	0	0	0	2003	1	0	1/2003	0
2/26/2003	0	0	0	2003	2	0	2/2003	0
3/27/2003	0	712	351	2003	3	1063	3/2003	1063
4/28/2003	0	132	365	2003	4	497	4/2003	497
5/28/2003	0	0	0	2003	5	0	4/2003	0
6/26/2003	857	0	3723	2003	6	4580	6/2003	4580
7/28/2003	565	0	2799	2003	7	3364	7/2003	3364
8/27/2003	286	0	1528	2003	8	1814	8/2003	1814
9/25/2003	0	0	563	2003	9	563	9/2003	563
10/24/2003	142	0	499	2003	10	641	10/2003	641
11/24/2003	0	0	360	2003	11	360	11/2003	360
12/23/2003	0	0	0	2003	12	0	12/2003	0
1/24/2004	0	0	0	2004	1	0	1/2004	0
2/25/2004	0	0	0	2004	2	0	2/2004	0
3/25/2004	0	75	0	2004	3	75	3/2004	75
4/26/2004	0	843	746	2004	4	1589	4/2004	1589
5/25/2004	141	0	754	2004	5	895	4/2004	895
6/25/2004	765	0	1152	2004	6	1917	6/2004	1917
7/27/2004	413	0	1589	2004	7	2002	7/2004	2002
8/23/2004	0	0	333	2004	8	333	8/2004	333
9/24/2004	0	0	361	2004	9	361	9/2004	361
10/25/2004	267	0	205	2004	10	472	10/2004	472
11/23/2004	0	0	0	2004	11	0	11/2004	0
12/23/2004	0	0	0	2004	12	0	12/2004	0
1/25/2005	0	0	0	2005	1	0	1/2005	0
2/25/2005	0	0	0	2005	2	0	2/2005	0
3/26/2005	0	0	0	2005	3	0	3/2005	0
4/27/2005	0	0	1	2005	4	1	4/2005	1
5/25/2005	389	0	324	2005	5	713	4/2005	713
6/24/2005	47	0	3	2005	6	50	6/2005	50
7/26/2005	131	0	1169	2005	7	1300	7/2005	1300
8/26/2005	0	0	0	2005	8	0	8/2005	0
9/28/2005	0	0	0	2005	9	0	9/2005	0
10/26/2005	0	0	0	2005	10	0	10/2005	0
11/23/2005	0	0	0	2005	11	0	11/2005	0
12/23/2005	0	0	0	2005	12	0	12/2005	0
1/24/2006	0	0	0	2006	1	0	1/2006	0
2/23/2006	0	42	203	2006	2	245	2/2006	245
3/27/2006	0	0	0	2006	3	0	3/2006	0
4/26/2006	0	0	0	2006	4	0	4/2006	0
5/25/2006	0	0	0	2006	5	0	4/2006	0
6/26/2006	0	0	0	2006	6	0	6/2006	0
7/29/2006	220	0	466	2006	7	686	7/2006	686

8/27/2006	0	0	0	2006	8	0	8/2006	0
1/22/2008	0	0	1	2008	1	1	6/2010	1
2/21/2008	0	1	2	2008	2	3	7/2010	3
3/21/2008	0	655	797	2008	3	1452	8/2010	1452
4/22/2008	0	567	469	2008	4	1036	10/2010	1036
5/21/2008	0	0	987	2008	5	987	11/2010	987
6/20/2008	0	0	33	2008	6	33	12/2010	33
7/22/2008	0	0	0	2008	7	0	2/2011	0
8/20/2008	0	0	0	2008	8	0	3/2011	0
9/19/2008	0	0	0	2008	9	0	4/2011	0
10/21/2008	0	0	1	2008	10	1	5/2011	1
11/18/2008	0	0	0	2008	11	0	6/2011	0
12/19/2008	0	1	1	2008	12	2	7/2011	2
1/22/2009	0	1	3	2009	1	4	8/2011	4
2/20/2009	0	1	2	2009	2	3	9/2011	3
3/24/2009	0	202	230	2009	3	432	11/2011	432
4/22/2009	0	548	941	2009	4	1489	12/2011	1489
5/21/2009	0	0	0	2009	5	0	1/2012	0
6/22/2009	0	0	2	2009	6	2	2/2012	2
7/22/2009	121	0	767	2009	7	888	3/2012	888
8/20/2009	0	0	1	2009	8	1	4/2012	1
9/21/2009	0	0	0	2009	9	0	5/2012	0
10/20/2009	0	0	5	2009	10	5	6/2012	5
11/19/2009	0	0	0	2009	11	0	7/2012	0
12/21/2009	0	0	3	2009	12	3	8/2012	3
1/21/2010	0	0	0	2010	1	0	9/2012	0
2/22/2010	0	0	1	2010	2	1	10/2012	1
3/24/2010	0	1	2	2010	3	3	11/2012	3
4/23/2010	0	4	6	2010	4	10	12/2012	10
5/24/2010	1	1	8	2010	5	10	1/2013	10
6/22/2010	0	0	2	2010	6	2	2/2013	2
7/23/2010	1	0	0	2010	7	1	3/2013	1
8/21/2010	0	0	1	2010	8	1	4/2013	1
9/22/2010	0	0	0	2010	9	0	5/2013	0
10/22/2010	1	0	608	2010	10	609	6/2013	609
11/20/2010	0	1	3	2010	11	4	7/2013	4
12/22/2010	0	1	1	2010	12	2	8/2013	2
1/21/2011	0	0	1	2011	1	1	9/2013	1
2/19/2011	0	0	0	2011	2	0	10/2013	0
3/23/2011	0	0	194	2011	3	194	11/2013	194
4/23/2011	0	0	0	2011	4	0	12/2013	0
6/22/2011	1	0	1	2011	6	2	1/2014	2
7/23/2011	122	0	653	2011	7	775		
8/22/2011	0	0	0	2011	8	0		
9/21/2011	105	0	260	2011	9	365		
10/20/2011	0	0	0	2011	10	0		
11/18/2011	2	1	3	2011	11	6		

12/20/2011	0	1	1	2011	12	2
1/19/2012	0	375	231	2012	1	606
2/21/2012	0	0	0	2012	2	0
3/21/2012	0	0	1	2012	3	1
4/18/2012	0	0	0	2012	4	0
5/21/2012	114	280	813	2012	5	1207
6/19/2012	195	0	31	2012	6	226
7/21/2012	123	0	433	2012	7	556
8/20/2012	201	0	234	2012	8	435
9/19/2012	2	0	4	2012	9	6
10/19/2012	2	0	3	2012	10	5
11/17/2012	0	1	1	2012	11	2
12/19/2012	0	0	0	2012	12	0
1/18/2013	0	0	1	2013	1	1
2/20/2013	0	0	0	2013	2	0
3/20/2013	0	0	0	2013	3	0
4/20/2013	0	0	1	2013	4	1
5/20/2013	0	0	1	2013	5	1
6/19/2013	0	0	2	2013	6	2
7/19/2013	1	0	1	2013	7	2
8/20/2013	1	0	6	2013	8	7
9/19/2013	1	0	4	2013	9	5
10/19/2013	0	0	2	2013	10	2
41596	0	0	1	2013	11	1
41627	0	0	0	2013	12	0
Grand Total	**5217**	**4446**	**25254**	**230937**	**733**	**34917**

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	7,530	kWh	
2011-2013	1,223	kWh	



Groundwater Well 144 Energy Usage Data

Pages 30 to 34

ExtraColumn	Well 144

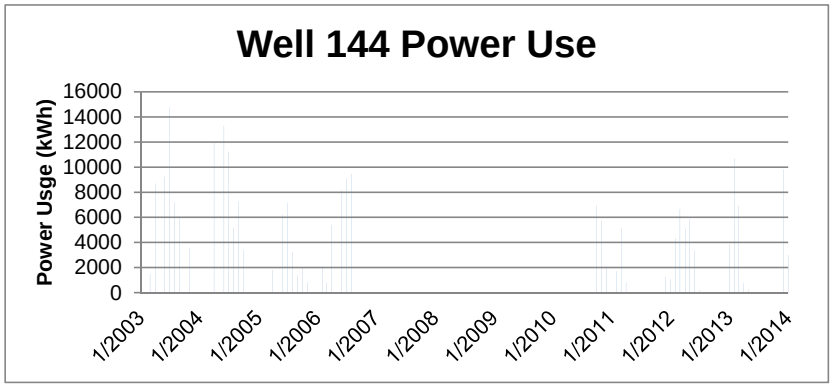
Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Month	Sum of Year	Total kWh Sum of esales
1/23/2003	0	0	0	1	2003	0
2/24/2003	0	0	0	2	2003	0
3/25/2003	0	0	1511	3	2003	1511
4/24/2003	0	0	1402	4	2003	1402
5/23/2003	1680	0	7013	5	2003	8693
6/25/2003	1283	0	7962	6	2003	9245
7/25/2003	2695	0	12047	7	2003	14742
8/25/2003	853	0	6348	8	2003	7201
9/23/2003	904	0	5110	9	2003	6014
10/22/2003	0	0	0	10	2003	0
11/20/2003	586	0	3001	11	2003	3587
12/22/2003	0	0	0	12	2003	0
1/22/2004	0	0	0	1	2004	0
2/23/2004	0	0	0	2	2004	0
3/24/2004	0	0	0	3	2004	0
4/23/2004	0	4456	7487	4	2004	11943
5/21/2004	690	0	4682	5	2004	5372
6/23/2004	1912	0	11370	6	2004	13282
7/26/2004	1697	0	9550	7	2004	11247
8/23/2004	972	0	4194	8	2004	5166
9/23/2004	1255	0	6010	9	2004	7265
10/28/2004	753	0	2648	10	2004	3401
11/20/2004	0	0	0	11	2004	0
12/22/2004	0	0	0	12	2004	0
1/21/2005	0	0	0	1	2005	0
2/22/2005	0	0	0	2	2005	0
3/23/2005	0	0	0	3	2005	0
4/21/2005	0	459	180	4	2005	639
5/23/2005	223	316	1279	5	2005	1818
6/27/2005	1120	0	5073	6	2005	6193
7/22/2005	1555	0	5569	7	2005	7124
8/22/2005	618	0	2624	8	2005	3242
9/23/2005	363	0	998	9	2005	1361
10/21/2005	255	0	1694	10	2005	1949
11/22/2005	204	0	644	11	2005	848
12/21/2005	0	0	0	12	2005	0
1/23/2006	0	0	0	1	2006	0
2/22/2006	0	340	1724	2	2006	2064
3/24/2006	0	19	796	3	2006	815
4/24/2006	0	0	0	4	2006	0
5/23/2006	1037	0	4369	5	2006	5406
6/22/2006	1555	0	6589	6	2006	8144
7/25/2006	1501	0	7603	7	2006	9104
8/22/2006	1715	0	7741	8	2006	9456
1/18/2008	0	0	0	1	2008	0

Year	Power Use (kWh)
1/2003	0
2/2003	0
3/2003	1511
4/2003	1402
4/2003	8693
6/2003	9245
7/2003	14742
8/2003	7201
9/2003	6014
10/2003	0
11/2003	3587
12/2003	0
1/2004	0
2/2004	0
3/2004	0
4/2004	11943
4/2004	5372
6/2004	13282
7/2004	11247
8/2004	5166
9/2004	7265
10/2004	3401
11/2004	0
12/2004	0
1/2005	0
2/2005	0
3/2005	0
4/2005	639
4/2005	1818
6/2005	6193
7/2005	7124
8/2005	3242
9/2005	1361
10/2005	1949
11/2005	848
12/2005	0
1/2006	0
2/2006	2064
3/2006	815
4/2006	0
4/2006	5406
6/2006	8144
7/2006	9104
8/2006	9456
6/2010	0

2/19/2008	0	0	0	2	2008	0	7/2010	0
3/19/2008	0	0	0	3	2008	0	8/2010	0
4/17/2008	0	3202	3734	4	2008	6936	10/2010	6936
5/19/2008	835	299	4595	5	2008	5729	11/2010	5729
6/18/2008	584	0	1489	6	2008	2073	12/2010	2073
7/17/2008	438	0	1260	7	2008	1698	2/2011	1698
8/18/2008	816	0	4304	8	2008	5120	3/2011	5120
9/17/2008	182	0	628	9	2008	810	4/2011	810
10/16/2008	0	0	0	10	2008	0	5/2011	0
11/14/2008	0	0	0	11	2008	0	6/2011	0
12/16/2008	0	0	0	12	2008	0	7/2011	0
1/16/2009	0	0	0	1	2009	0	8/2011	0
2/17/2009	0	0	0	2	2009	0	9/2011	0
3/19/2009	0	0	0	3	2009	0	11/2011	0
4/20/2009	0	846	396	4	2009	1242	12/2011	1242
5/19/2009	41	463	566	5	2009	1070	1/2012	1070
6/18/2009	954	0	3387	6	2009	4341	2/2012	4341
7/20/2009	1567	0	5104	7	2009	6671	3/2012	6671
8/18/2009	1340	0	3757	8	2009	5097	4/2012	5097
9/17/2009	407	0	5431	9	2009	5838	5/2012	5838
10/16/2009	630	0	2765	10	2009	3395	6/2012	3395
11/17/2009	0	0	204	11	2009	204	7/2012	204
1/19/2010	0	0	0	1	2010	0	8/2012	0
2/18/2010	0	0	0	2	2010	0	9/2012	0
3/23/2010	0	0	0	3	2010	0	10/2012	0
4/20/2010	0	0	0	4	2010	0	11/2012	0
5/19/2010	0	0	0	5	2010	0	12/2012	0
6/18/2010	1132	0	2733	6	2010	3865	1/2013	3865
7/19/2010	2220	0	8476	7	2010	10696	2/2013	10696
8/18/2010	1014	0	5912	8	2010	6926	3/2013	6926
9/20/2010	32	0	710	9	2010	742	4/2013	742
10/20/2010	0	0	252	10	2010	252	5/2013	252
11/18/2010	0	0	0	11	2010	0	6/2013	0
12/20/2010	0	0	0	12	2010	0	7/2013	0
1/19/2011	0	0	0	1	2011	0	8/2013	0
2/17/2011	0	0	0	2	2011	0	9/2013	0
3/21/2011	0	0	0	3	2011	0	10/2013	0
4/20/2011	0	0	0	4	2011	0	11/2013	0
5/19/2011	1263	939	7610	5	2011	9812	12/2013	9812
6/18/2011	630	0	2353	6	2011	2983	1/2014	2983
7/21/2011	1574	0	6583	7	2011	8157		
8/20/2011	956	0	2538	8	2011	3494		
9/19/2011	763	0	2757	9	2011	3520		
10/18/2011	74	0	210	10	2011	284		
11/17/2011	625	0	1497	11	2011	2122		
12/15/2011	0	0	0	12	2011	0		
1/14/2012	0	0	0	1	2012	0		
2/16/2012	0	200	2072	2	2012	2272		
3/19/2012	0	452	624	3	2012	1076		
4/17/2012	0	0	0	4	2012	0		
5/17/2012	208	1296	1926	5	2012	3430		

6/18/2012	1914	0	6316	6	2012	8230
7/18/2012	1773	0	8834	7	2012	10607
8/15/2012	1486	0	5415	8	2012	6901
9/15/2012	423	0	2468	9	2012	2891
10/16/2012	131	0	1503	10	2012	1634
11/15/2012	0	307	0	11	2012	307
12/17/2012	0	121	0	12	2012	121
1/25/2013	0	0	0	1	2013	0
2/5/2013	0	122.2578	0	2	2013	122
3/7/2013	0	793.773	0	3	2013	794
4/7/2013	0	0	0	4	2013	0
5/7/2013	0	466.9542	1429.3026	5	2013	1896
6/6/2013	744.3954	0	695.1492	6	2013	1440
7/8/2013	1020.8304	0	3419.5842	7	2013	4440
8/6/2013	774.8298	0	536.9148	8	2013	1312
9/5/2013	422.9352	0	1018.9872	9	2013	1442
10/6/2013	423.1062	0	771.219	10	2013	1194
41582	832.0248	0	1520.0712	11	2013	2352
41613	0	333.0306	0	12	2013	333
41645	0	953.1252	95.6088	1	2014	1049
Grand Total	**53656.1218**	**16384.1408**	**255113.837**	**727**	**232953**	**325154**

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	44,415	kWh	
2011-2013	22,593	kWh	



Groundwater Well 241 Energy Usage Data

Pages 35 to 38

ExtraColumn	Well 241

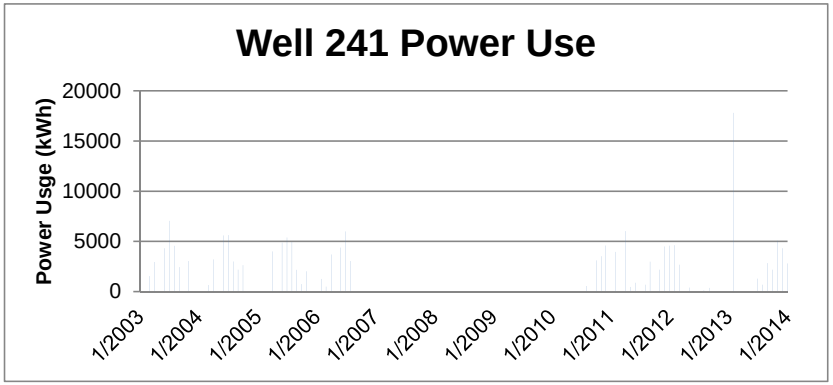
Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Month	Sum of Year	Total kWh Sum of esales
1/23/2003	0	0	0	1	2003	0
2/24/2003	0	0	0	2	2003	0
3/25/2003	0	203	1343	3	2003	1546
4/24/2003	0	209	1816	4	2003	2025
5/23/2003	233	0	2718	5	2003	2951
6/25/2003	235	0	4089	6	2003	4324
7/25/2003	665	0	6376	7	2003	7041
8/22/2003	343	0	4216	8	2003	4559
9/23/2003	239	0	2199	9	2003	2438
10/22/2003	0	0	0	10	2003	0
11/20/2003	172	0	2881	11	2003	3053
12/22/2003	0	0	0	12	2003	0
1/22/2004	0	0	0	1	2004	0
2/23/2004	0	0	0	2	2004	0
3/24/2004	0	317	344	3	2004	661
4/23/2004	0	1075	2127	4	2004	3202
5/21/2004	196	350	2334	5	2004	2880
6/23/2004	304	0	5293	6	2004	5597
7/26/2004	455	0	5175	7	2004	5630
8/23/2004	225	0	2780	8	2004	3005
9/23/2004	223	0	1965	9	2004	2188
10/21/2004	268	0	2368	10	2004	2636
11/20/2004	0	0	0	11	2004	0
12/22/2004	0	0	0	12	2004	0
1/21/2005	0	0	0	1	2005	0
2/22/2005	0	0	0	2	2005	0
3/23/2005	0	0	0	3	2005	0
4/21/2005	0	599	780	4	2005	1379
5/23/2005	227	523	3248	5	2005	3998
6/22/2005	562	0	4311	6	2005	4873
7/22/2005	395	0	4987	7	2005	5382
8/22/2005	415	0	4522	8	2005	4937
9/23/2005	372	0	1808	9	2005	2180
10/21/2005	0	0	754	10	2005	754
11/22/2005	207	0	1816	11	2005	2023
12/21/2005	0	0	0	12	2005	0
1/23/2006	0	0	0	1	2006	0
2/22/2006	0	132	1133	2	2006	1265
3/24/2006	0	0	501	3	2006	501
4/24/2006	0	0	0	4	2006	0
5/23/2006	403	82	3220	5	2006	3705
6/22/2006	341	0	4039	6	2006	4380
7/25/2006	375	0	5628	7	2006	6003
8/22/2006	218	0	2836	8	2006	3054
1/18/2008	0	0	0	1	2008	0

Year	Power Use (kWh)
1/2003	0
2/2003	0
3/2003	1546
4/2003	2025
4/2003	2951
6/2003	4324
7/2003	7041
8/2003	4559
9/2003	2438
10/2003	0
11/2003	3053
12/2003	0
1/2004	0
2/2004	0
3/2004	661
4/2004	3202
4/2004	2880
6/2004	5597
7/2004	5630
8/2004	3005
9/2004	2188
10/2004	2636
11/2004	0
12/2004	0
1/2005	0
2/2005	0
3/2005	0
4/2005	1379
4/2005	3998
6/2005	4873
7/2005	5382
8/2005	4937
9/2005	2180
10/2005	754
11/2005	2023
12/2005	0
1/2006	0
2/2006	1265
3/2006	501
4/2006	0
4/2006	3705
6/2006	4380
7/2006	6003
8/2006	3054
6/2010	0

2/19/2008	0	0	0	2	2008	0	7/2010	0
3/19/2008	0	239	332	3	2008	571	8/2010	571
4/17/2008	0	1003	2108	4	2008	3111	10/2010	3111
5/19/2008	191	358	2977	5	2008	3526	11/2010	3526
6/18/2008	380	0	4208	6	2008	4588	12/2010	4588
7/17/2008	446	0	3504	7	2008	3950	2/2011	3950
8/18/2008	0	0	0	8	2008	0	3/2011	0
9/17/2008	363	0	5671	9	2008	6034	4/2011	6034
10/16/2008	2	0	472	10	2008	474	5/2011	474
11/14/2008	77	0	811	11	2008	888	6/2011	888
1/16/2009	0	0	0	1	2009	0	7/2011	0
3/19/2009	0	140	544	3	2009	684	8/2011	684
4/20/2009	0	1106	1873	4	2009	2979	9/2011	2979
5/19/2009	40	481	1660	5	2009	2181	11/2011	2181
6/18/2009	523	0	3982	6	2009	4505	12/2011	4505
7/20/2009	358	0	4218	7	2009	4576	1/2012	4576
8/18/2009	323	0	4300	8	2009	4623	2/2012	4623
9/17/2009	40	0	2645	9	2009	2685	3/2012	2685
10/16/2009	0	0	0	10	2009	0	4/2012	0
11/17/2009	0	0	402	11	2009	402	5/2012	402
12/17/2009	0	0	0	12	2009	0	6/2012	0
1/19/2010	0	0	0	1	2010	0	7/2012	0
3/23/2010	0	11	121	3	2010	132	8/2012	132
4/20/2010	0	112	267	4	2010	379	9/2012	379
5/19/2010	0	0	0	5	2010	0	10/2012	0
6/18/2010	0	0	0	6	2010	0	11/2012	0
7/19/2010	0	0	0	7	2010	0	12/2012	0
9/20/2010	0	0	0	9	2010	0	1/2013	0
10/20/2010	428	0	17365	10	2010	17793	2/2013	17793
11/18/2010	0	0	0	11	2010	0	3/2013	0
12/20/2010	0	0	0	12	2010	0	4/2013	0
1/19/2011	0	0	0	1	2011	0	5/2013	0
2/17/2011	0	0	0	2	2011	0	6/2013	0
3/21/2011	0	113	1187	3	2011	1300	7/2013	1300
4/20/2011	0	61	630	4	2011	691	8/2013	691
5/19/2011	221	350	2268	5	2011	2839	9/2013	2839
6/18/2011	54	0	2140	6	2011	2194	10/2013	2194
7/21/2011	147	0	4920	7	2011	5067	11/2013	5067
8/20/2011	343	0	3979	8	2011	4322	12/2013	4322
9/19/2011	134	0	2683	9	2011	2817	1/2014	2817
10/18/2011	76	0	1114	10	2011	1190		
11/17/2011	74	0	1351	11	2011	1425		
12/15/2011	0	0	0	12	2011	0		
1/14/2012	0	0	0	1	2012	0		
2/16/2012	0	0	0	2	2012	0		
3/19/2012	0	684	1577	3	2012	2261		
4/17/2012	0	217	340	4	2012	557		
5/17/2012	226	110	2980	5	2012	3316		
6/18/2012	849	0	4976	6	2012	5825		
7/18/2012	1041	0	6657	7	2012	7698		
8/15/2012	224	0	5069	8	2012	5293		

9/15/2012	406	0	4119	9	2012	4525
10/16/2012	3	0	2296	10	2012	2299
11/15/2012	164	0	1495	11	2012	1659
12/17/2012	0	0	0	12	2012	0
1/16/2013	0	0	0	1	2013	0
1/24/2013	0	0	0	1	2013	0
2/5/2013	0	0	0	2	2013	0
3/7/2013	0	547.635	356.396	3	2013	904
4/7/2013	0	238.425	881.52	4	2013	1120
5/7/2013	0	195.219	3141.804	5	2013	3337
6/6/2013	0.175	0	5303.611	6	2013	5304
7/8/2013	19.22	0	6331.151	7	2013	6350
8/6/2013	31.686	0	5370.815	8	2013	5403
9/5/2013	91.914	0	3730.636	9	2013	3823
10/6/2013	0.007	0	3082.1405	10	2013	3082
11/4/2013	183.126	0	4120.535	11	2013	4304
12/5/2013	0	0	747.394	12	2013	747
41645	0	0	0	1	2014	0
Grand Total	**14532.128**	**9456.279**	**227914.0025**	**716**	**228938**	**251903**

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	26,421	kWh	
2011-2013	22,899	kWh	



Groundwater Well 242 Energy Usage Data

Pages 39 to 42

ExtraColumn	Well 242

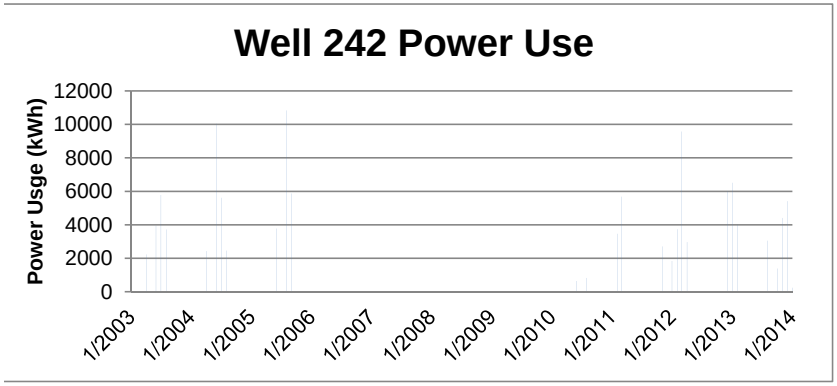
Row Labels	Sum of onpk kwh	Sum of ptpk kwh	Sum of offpk kwh	Sum of Month	Sum of Year	Total kWh Sum of esales
1/24/2003	0	0	0	1	2003	0
2/26/2003	0	0	0	2	2003	0
3/27/2003	0	0	0	3	2003	0
4/28/2003	0	0	0	4	2003	0
5/28/2003	564	0	1669	5	2003	2233
6/26/2003	796	0	3158	6	2003	3954
7/28/2003	716	0	5062	7	2003	5778
8/27/2003	707	0	3016	8	2003	3723
9/25/2003	0	0	0	9	2003	0
10/24/2003	0	0	0	10	2003	0
11/24/2003	0	0	0	11	2003	0
12/24/2003	0	0	0	12	2003	0
1/24/2004	0	0	0	1	2004	0
2/25/2004	0	0	0	2	2004	0
3/25/2004	0	0	0	3	2004	0
4/26/2004	0	1443	985	4	2004	2428
5/25/2004	0	0	0	5	2004	0
6/25/2004	1594	0	8440	6	2004	10034
7/27/2004	1035	0	4578	7	2004	5613
8/25/2004	399	0	2060	8	2004	2459
9/24/2004	0	0	0	9	2004	0
10/25/2004	0	0	0	10	2004	0
11/23/2004	0	0	0	11	2004	0
12/23/2004	0	1	0	12	2004	1
1/25/2005	0	0	0	1	2005	0
2/24/2005	0	0	0	2	2005	0
3/26/2005	0	0	0	3	2005	0
4/27/2005	0	0	0	4	2005	0
5/25/2005	0	0	0	5	2005	0
6/24/2005	625	0	3153	6	2005	3778
7/26/2005	0	0	0	7	2005	0
8/25/2005	1882	0	8946	8	2005	10828
9/27/2005	1120	0	4755	9	2005	5875
10/26/2005	0	0	0	10	2005	0
11/23/2005	0	0	0	11	2005	0
12/23/2005	0	0	0	12	2005	0
1/24/2006	0	0	0	1	2006	0
2/23/2006	0	0	0	2	2006	0
3/27/2006	0	0	0	3	2006	0
4/26/2006	0	0	0	4	2006	0
5/25/2006	0	0	0	5	2006	0
6/26/2006	0	0	0	6	2006	0
7/26/2006	0	0	0	7	2006	0
8/24/2006	0	0	0	8	2006	0
1/22/2008	0	152	495	1	2008	647

Year	Power Use (kWh)
1/2003	0
2/2003	0
3/2003	0
4/2003	0
4/2003	2233
6/2003	3954
7/2003	5778
8/2003	3723
9/2003	0
10/2003	0
11/2003	0
12/2003	0
1/2004	0
2/2004	0
3/2004	0
4/2004	2428
4/2004	0
6/2004	10034
7/2004	5613
8/2004	2459
9/2004	0
10/2004	0
11/2004	0
12/2004	1
1/2005	0
2/2005	0
3/2005	0
4/2005	0
4/2005	0
6/2005	3778
7/2005	0
8/2005	10828
9/2005	5875
10/2005	0
11/2005	0
12/2005	0
1/2006	0
2/2006	0
3/2006	0
4/2006	0
4/2006	0
6/2006	0
7/2006	0
8/2006	0
6/2010	647

2/21/2008	0	0	0	2	2008	0	7/2010	0
3/21/2008	0	0	825	3	2008	825	8/2010	825
4/22/2008	0	0	0	4	2008	0	10/2010	0
5/21/2008	0	0	0	5	2008	0	11/2010	0
6/20/2008	0	0	0	6	2008	0	12/2010	0
7/22/2008	275	0	3185	7	2008	3460	2/2011	3460
8/20/2008	1312	0	4365	8	2008	5677	3/2011	5677
9/19/2008	0	0	0	9	2008	0	4/2011	0
10/21/2008	0	0	0	10	2008	0	5/2011	0
11/18/2008	0	0	0	11	2008	0	6/2011	0
12/19/2008	0	0	0	12	2008	0	7/2011	0
1/19/2009	0	0	0	1	2009	0	8/2011	0
3/24/2009	0	0	0	3	2009	0	9/2011	0
4/22/2009	0	978	1728	4	2009	2706	11/2011	2706
5/21/2009	0	0	0	5	2009	0	12/2011	0
7/22/2009	428	0	1414	7	2009	1842	1/2012	1842
8/20/2009	564	0	3170	8	2009	3734	2/2012	3734
9/21/2009	1676	0	7895	9	2009	9571	3/2012	9571
10/20/2009	281	0	2683	10	2009	2964	4/2012	2964
11/19/2009	0	0	0	11	2009	0	5/2012	0
12/21/2009	0	0	0	12	2009	0	6/2012	0
1/21/2010	0	0	0	1	2010	0	7/2012	0
4/23/2010	0	0	0	4	2010	0	8/2012	0
5/24/2010	0	0	0	5	2010	0	9/2012	0
6/22/2010	0	0	0	6	2010	0	10/2012	0
7/22/2010	0	0	0	7	2010	0	11/2012	0
8/21/2010	1000	0	5003	8	2010	6003	12/2012	6003
9/22/2010	1002	0	5507	9	2010	6509	1/2013	6509
10/22/2010	473	0	3535	10	2010	4008	2/2013	4008
11/20/2010	0	0	0	11	2010	0	3/2013	0
1/21/2011	0	0	0	1	2011	0	4/2013	0
2/19/2011	0	0	0	2	2011	0	5/2013	0
3/23/2011	0	0	0	3	2011	0	6/2013	0
4/23/2011	0	0	0	4	2011	0	7/2013	0
5/21/2011	0	1544	1508	5	2011	3052	8/2013	3052
6/22/2011	0	0	0	6	2011	0	9/2013	0
7/23/2011	395	0	992	7	2011	1387	10/2013	1387
8/23/2011	671	0	3742	8	2011	4413	11/2013	4413
9/21/2011	789	0	4620	9	2011	5409	12/2013	5409
10/20/2011	99	0	141	10	2011	240	1/2014	240
11/18/2011	0	0	0	11	2011	0		
12/20/2011	0	0	0	12	2011	0		
1/19/2012	0	581	358	1	2012	939		
2/21/2012	0	0	0	2	2012	0		
3/21/2012	0	0	120	3	2012	120		
4/18/2012	0	0	0	4	2012	0		
5/21/2012	0	211	366	5	2012	577		
6/19/2012	8	0	228	6	2012	236		
7/21/2012	593	0	3167	7	2012	3760		
8/20/2012	616	0	2427	8	2012	3043		
9/19/2012	617	0	2812	9	2012	3429		

10/19/2012	194	0	175	10	2012	369
11/17/2012	0	1	0	11	2012	1
12/19/2012	0	0	0	12	2012	0
1/18/2013	0	0	0	1	2013	0
2/20/2013	0	0	0	2	2013	0
3/20/2013	0	420	360	3	2013	780
4/20/2013	0	0	9	4	2013	9
5/20/2013	1178	0	3381	5	2013	4559
6/19/2013	1478	0	5656	6	2013	7134
7/19/2013	1192	0	9499	7	2013	10691
8/20/2013	4200	0	6018	8	2013	10218
9/19/2013	3198	0	4020	9	2013	7218
10/8/2013	1270	0	716	10	2013	1986
11/4/2013	577.125	0	192.699	11	2013	770
12/5/2013	0	0	0	12	2013	0
1/6/2014	0	432.943	85.707	1	2014	519
Grand Total	**33524.125**	**5763.943**	**136220.406**	**714**	**224914**	**175509**

Average Annual Usage (kWh)			2006 and 2010 data are not used since not whole year
2003-2005	18,901	kWh	
2011-2013	20,245	kWh	



Groundwater Wells Power Usage (2003-2014) - RAW DATA

Pages 43 to 74

sa id	acct id	meternum	service address	svc descriptor	current	ExtraColumn	num days	e or g	rate	onpk kwh	ptpk kwh	offpk kwh	esales
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/8/2010	Well 059 A&B	49	E	HAG5A	27.503	0	296.701	324
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/8/2010	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/9/2010	Well 059 A&B	32	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/7/2010	Well 059 A&B	29	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/7/2010	Well 059 A&B	31	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/9/2010	Well 059 A&B	32	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/7/2011	Well 059 A&B	60	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/9/2011	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/7/2011	Well 059 A&B	29	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/9/2011	Well 059 A&B	32	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/8/2011	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/10/2011	Well 059 A&B	32	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/8/2011	Well 059 A&B	29	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/7/2011	Well 059 A&B	30	E	HAG5A	0	0	43.617	44
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/6/2011	Well 059 A&B	31	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/6/2011	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/6/2012	Well 059 A&B	31	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/6/2012	Well 059 A&B	31	E	HAG5A	0	0.132	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/7/2012	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/5/2012	Well 059 A&B	29	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/7/2012	Well 059 A&B	32	E	HAG5A	0	250.288	148.099	398
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/6/2012	Well 059 A&B	30	E	HAG5A	79.959	0	248.57	329
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/8/2012	Well 059 A&B	32	E	HAG5A	118.961	0	647.79	767
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/6/2012	Well 059 A&B	29	E	HAG5A	0	0	797.369	797
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/5/2012	Well 059 A&B	30	E	HAG5A	0	0	845.425	845
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/4/2012	Well 059 A&B	29	E	HAG5A	0	0	405.977	406
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/4/2012	Well 059 A&B	31	E	HAG5A	145.364	0	444.159	590
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/5/2012	Well 059 A&B	31	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/6/2013	Well 059 A&B	32	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/5/2013	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/7/2013	Well 059 A&B	30	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/7/2013	Well 059 A&B	31	E	HAG5A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/7/2013	Well 059 A&B	30	E	HAG4A	0	178.664	185.497	364
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/6/2013	Well 059 A&B	30	E	HAG4A	0	0	903.661	904
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/8/2013	Well 059 A&B	32	E	HAG4A	0	0	672.671	673
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/6/2013	Well 059 A&B	29	E	HAG4A	0	0	312.21	312
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/5/2013	Well 059 A&B	30	E	HAG4A	0	0	315.596	316
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/6/2013	Well 059 A&B	31	E	HAG4A	0	0	323.761	324
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/4/2013	Well 059 A&B	29	E	HAG4A	80.064	0	418.473	499
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/5/2013	Well 059 A&B	31	E	HAG4A	0	0	0	0
1487554140	1487554735	1006907530	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/6/2014	Well 059 A&B	32	E	HAG4A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/23/2003	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/24/2003	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/26/2003	Well 059 A&B	30	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/24/2003	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/24/2003	Well 059 A&B	30	E	AG1A	0	0	0	0

7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/25/2003	Well 059 A&B	32	E	AG1A	0	0	0	2080
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/24/2003	Well 059 A&B	29	E	AG1A	0	0	0	468
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/23/2003	Well 059 A&B	30	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/23/2003	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/22/2003	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/20/2003	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/22/2003	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/22/2004	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/23/2004	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/25/2004	Well 059 A&B	31	E	AG1A	0	0	0	5
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/23/2004	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/21/2004	Well 059 A&B	28	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/24/2004	Well 059 A&B	34	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/23/2004	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/24/2004	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/22/2004	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/21/2004	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/20/2004	Well 059 A&B	30	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/22/2004	Well 059 A&B	32	E	AG1A	0	0	0	1
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/22/2005	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/22/2005	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/23/2005	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/23/2005	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/23/2005	Well 059 A&B	30	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/23/2005	Well 059 A&B	31	E	AG1A	0	0	0	1176
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/25/2005	Well 059 A&B	32	E	AG1A	0	0	0	672
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/22/2005	Well 059 A&B	28	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	9/22/2005	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	10/21/2005	Well 059 A&B	29	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	11/22/2005	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	12/22/2005	Well 059 A&B	30	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	1/23/2006	Well 059 A&B	32	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	2/23/2006	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	3/23/2006	Well 059 A&B	28	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	4/25/2006	Well 059 A&B	33	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	5/23/2006	Well 059 A&B	28	E	AG1A	0	0	0	779
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	6/23/2006	Well 059 A&B	31	E	AG1A	0	0	0	0
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	7/24/2006	Well 059 A&B	31	E	AG1A	0	0	0	680
7345508770	7345508181	8015R8	NE 06 07 12, MERCED, CA 95340	#59A D&I 59B 522530	8/22/2006	Well 059 A&B	29	E	AG1A	0	0	0	1064
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	1/23/2003	Well 072	30	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	2/24/2003	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	3/26/2003	Well 072	30	E	AG4B	0	896	2314	3210
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	4/24/2003	Well 072	29	E	AG4B	0	3182	4360	7542
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	5/24/2003	Well 072	30	E	AG4B	19	0	3226	3245
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	6/25/2003	Well 072	32	E	AG4B	1002	0	8579	9581
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	7/24/2003	Well 072	29	E	AG4B	909	0	6392	7301
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	8/23/2003	Well 072	30	E	AG4B	7	0	4449	4456
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	9/23/2003	Well 072	31	E	AG4B	0	0	1908	1908
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	10/22/2003	Well 072	29	E	AG4B	3	0	1643	1646
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA 95	WL 72 D&I 72 522530	11/20/2003	Well 072	29	E	AG4B	40	0	1403	1443

7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	12/22/2003	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	1/22/2004	Well 072	31	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	2/23/2004	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	3/25/2004	Well 072	31	E	AG4B	0	1023	117	1140
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	4/23/2004	Well 072	29	E	AG4B	0	3370	3147	6517
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	5/21/2004	Well 072	28	E	AG4B	1883	1391	6716	9990
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	6/23/2004	Well 072	33	E	AG4B	474	0	7188	7662
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	7/23/2004	Well 072	30	E	AG4B	63	0	4799	4862
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	8/24/2004	Well 072	32	E	AG4B	8	0	3856	3864
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	9/22/2004	Well 072	29	E	AG4B	2	0	1683	1685
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	10/21/2004	Well 072	29	E	AG4B	24	0	2636	2660
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	11/20/2004	Well 072	30	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	12/13/2004	Well 072	23	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	12/20/2004	Well 072	7	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	1/21/2005	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	2/22/2005	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	3/2/2005	Well 072	8	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	3/23/2005	Well 072	21	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	4/23/2005	Well 072	31	E	AG4B	0	0	956	956
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	5/23/2005	Well 072	30	E	AG4B	269	0	3631	3900
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	6/23/2005	Well 072	31	E	AG4B	10	0	3876	3886
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	7/25/2005	Well 072	32	E	AG4B	229	0	8171	8400
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	8/22/2005	Well 072	28	E	AG4B	14	0	4492	4506
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	9/22/2005	Well 072	31	E	AG4B	8	0	3603	3611
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	10/21/2005	Well 072	29	E	AG4B	1	0	2449	2450
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	11/22/2005	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	12/22/2005	Well 072	30	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	1/23/2006	Well 072	32	E	AG4B	0	0	0	0
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	2/23/2006	Well 072	31	E	AG4B	0	299	1054	1353
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	3/23/2006	Well 072	28	E	AG4B	0	339	1217	1556
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	4/25/2006	Well 072	33	E	AG4B	0	827	322	1149
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	5/23/2006	Well 072	28	E	AG4B	758	244	4296	5298
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	6/23/2006	Well 072	31	E	AG4B	559	0	5086	5645
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	7/24/2006	Well 072	31	E	AG4B	6	0	5287	5293
7345508780	7345508181	55M667	NE SE SE 06 07 12, MERCED, CA	95	WL 72	D&I 72	522530	8/22/2006	Well 072	29	E	AG4B	7	0	3820	3827
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	1/18/2008	Well 072	30	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	2/15/2008	Well 072	28	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	3/19/2008	Well 072	33	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	4/18/2008	Well 072	30	E	AG4B	0	129	1	130
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	5/19/2008	Well 072	31	E	AG4B	445	392	435	1272
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	6/18/2008	Well 072	30	E	AG4B	694	0	891	1585
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	7/18/2008	Well 072	30	E	AG4B	1206	0	1824	3030
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	8/18/2008	Well 072	31	E	AG4B	679	0	991	1670
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	9/17/2008	Well 072	30	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	10/16/2008	Well 072	29	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	11/14/2008	Well 072	29	E	AG4B	1	0	3	4
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	12/16/2008	Well 072	32	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	1/16/2009	Well 072	31	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	2/18/2009	Well 072	33	E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic		WL 72	D&I 72	522530	3/19/2009	Well 072	29	E	AG4B	0	0	0	0

7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	4/20/2009	Well	072	32 E	AG4B	0	419	0	419
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	8/18/2009	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	9/17/2009	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	10/16/2009	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	11/18/2009	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	12/17/2009	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	1/16/2010	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	2/18/2010	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	3/22/2010	Well	072	32 E	AG4B	0	65	295	360
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	4/21/2010	Well	072	30 E	AG4B	0	1	881	882
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	5/20/2010	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	7/20/2010	Well	072	32 E	AG4B	0	0	0	0
7345508780	1487554735	55M667	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	8/20/2010	Well	072	31 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	1/20/2011	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	2/17/2011	Well	072	28 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	3/19/2011	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	4/21/2011	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	5/20/2011	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	7/21/2011	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	8/20/2011	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	11/17/2011	Well	072	29 E	AG4B	0	284	536	820
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	12/17/2011	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	1/14/2012	Well	072	28 E	AG4B	0	277	581	858
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	2/16/2012	Well	072	33 E	AG4B	0	229	1340	1569
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	3/16/2012	Well	072	29 E	AG4B	0	511	1150	1661
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	4/17/2012	Well	072	32 E	AG4B	0	390	774	1164
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	5/18/2012	Well	072	31 E	AG4B	342	410	1863	2615
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	7/19/2012	Well	072	33 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	9/17/2012	Well	072	31 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	10/16/2012	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	1007307668	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	12/15/2012	Well	072	30 E	AG4B	0	0	0	0
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	1/16/2013	Well	072	32 E	AG4B	0	0	0	0
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	2/15/2013	Well	072	30 E	AG4B	0	328	190	518
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	3/18/2013	Well	072	31 E	AG4B	0	536	444	980
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	4/18/2013	Well	072	31 E	AG4B	0	0	0	0
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	5/17/2013	Well	072	29 E	AG4B	0	0	0	0
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	6/18/2013	Well	072	32 E	AG4B	0	0	0	0
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	7/18/2013	Well	072	30 E	AG4B	27	0	593	620
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	8/16/2013	Well	072	29 E	AG4B	694	0	1558	2252
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	9/17/2013	Well	072	32 E	AG4B	511	0	1790	2301
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	10/15/2013	Well	072	28 E	AG4B	52	0	719	771
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	11/14/2013	Well	072	30 E	AG4B	48	0	1524	1572
7345508780	1487554735	1009932826	NE SE SE 06 07 12, MID Well, east sic	WL 72	D&I	72	522530	12/17/2013	Well	072	33 E	AG4B	0	0	0	0
1487554158	1487554735	1004508084	SE NW SW 32 6 12, MERCED, CA 9534(	D&I	73		522530	11/4/2013	Well	073	27 E	HAG5B	0	0	0	0
1487554158	1487554735	1004508084	SE NW SW 32 6 12, MERCED, CA 9534(	D&I	73		522530	12/5/2013	Well	073	31 E	HAG5B	0	0	0	0
1487554158	1487554735	1004508084	SE NW SW 32 6 12, MERCED, CA 9534(	D&I	73		522530	1/6/2014	Well	073	32 E	HAG5B	0	81.271	0	81
7509254005	7345508181	2P2299	SE NW SW 32 06 12, MERCED, CA 9	D&I	73		522530	1/27/2003	Well	073	32 E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12, MERCED, CA 9	D&I	73		522530	2/26/2003	Well	073	30 E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12, MERCED, CA 9	D&I	73		522530	3/27/2003	Well	073	29 E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12, MERCED, CA 9	D&I	73		522530	4/28/2003	Well	073	32 E	AG5B	0	0	0	0

7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	5/28/2003	Well 073	30	E	AG5B	454	0	4455	4909
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	6/26/2003	Well 073	29	E	AG5B	1067	0	4349	5416
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	7/28/2003	Well 073	32	E	AG5B	1574	0	8006	9580
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	8/26/2003	Well 073	29	E	AG5B	0	0	2797	2797
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	9/25/2003	Well 073	30	E	AG5B	0	0	808	808
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	10/24/2003	Well 073	29	E	AG5B	0	0	647	647
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	11/24/2003	Well 073	31	E	AG5B	0	599	92	691
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	12/24/2003	Well 073	30	E	AG5B	0	135	21	156
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	1/24/2004	Well 073	31	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	2/25/2004	Well 073	32	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	3/26/2004	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	4/26/2004	Well 073	31	E	AG5B	0	1835	1516	3351
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	5/25/2004	Well 073	29	E	AG5B	211	0	802	1013
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	6/25/2004	Well 073	31	E	AG5B	1108	0	3244	4352
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	7/27/2004	Well 073	32	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	8/25/2004	Well 073	29	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	9/21/2004	Well 073	27	E	AG5B	818	0	4412	5230
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	10/23/2004	Well 073	32	E	AG5B	423	0	334	757
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	11/23/2004	Well 073	31	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	12/23/2004	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	1/25/2005	Well 073	33	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	2/24/2005	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	3/25/2005	Well 073	29	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	4/27/2005	Well 073	33	E	AG5B	0	609	3259	3868
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	5/25/2005	Well 073	28	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	6/24/2005	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	7/26/2005	Well 073	32	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	8/24/2005	Well 073	29	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	9/26/2005	Well 073	33	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	10/25/2005	Well 073	29	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	11/23/2005	Well 073	29	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	12/23/2005	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	12/28/2005	Well 073	5	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	1/25/2006	Well 073	28	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	2/24/2006	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	3/27/2006	Well 073	31	E	AG5B	0	72	44	116
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	4/26/2006	Well 073	30	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	5/25/2006	Well 073	29	E	AG5B	4	0	0	4
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	6/26/2006	Well 073	32	E	AG5B	0	0	0	0
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	7/29/2006	Well 073	33	E	AG5B	2727	0	5593	8320
7509254005	7345508181	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	8/27/2006	Well 073	29	E	AG5B	1452	0	1649	3101
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	1/22/2008	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	2/21/2008	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	3/21/2008	Well 073	29	E	AG5B	0	669	734	1403
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	4/22/2008	Well 073	32	E	AG5B	0	1530	1498	3028
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	5/21/2008	Well 073	29	E	AG5B	0	0	1658	1658
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	6/20/2008	Well 073	30	E	AG5B	206	0	689	895
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	7/22/2008	Well 073	32	E	AG5B	0	0	1	1
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	8/20/2008	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73	522530	9/19/2008	Well 073	30	E	AG5B	0	0	0	0

7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	10/21/2008	Well 073	32	E	AG5B	0	0	1	1
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	11/18/2008	Well 073	28	E	AG5B	295	0	1357	1652
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	12/19/2008	Well 073	31	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	1/19/2009	Well 073	31	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	2/20/2009	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	3/24/2009	Well 073	32	E	AG5B	0	753	1236	1989
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	4/22/2009	Well 073	29	E	AG5B	0	1729	1453	3182
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	5/21/2009	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	6/22/2009	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	7/22/2009	Well 073	30	E	AG5B	333	0	1338	1671
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	9/21/2009	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	10/20/2009	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	11/19/2009	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	1/21/2010	Well 073	31	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	3/24/2010	Well 073	30	E	AG5B	0	0	262	262
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	4/23/2010	Well 073	30	E	AG5B	0	232	19	251
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	7/23/2010	Well 073	31	E	AG5B	0	0	3	3
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	8/21/2010	Well 073	29	E	AG5B	0	0	21	21
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	9/22/2010	Well 073	32	E	AG5B	0	0	700	700
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	10/22/2010	Well 073	30	E	AG5B	0	0	1016	1016
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	11/20/2010	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	1/21/2011	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	2/19/2011	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	3/23/2011	Well 073	32	E	AG5B	0	0	399	399
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	4/23/2011	Well 073	31	E	AG5B	0	58	0	58
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	5/21/2011	Well 073	28	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	6/22/2011	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	7/23/2011	Well 073	31	E	AG5B	34	0	205	239
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	8/23/2011	Well 073	31	E	AG5B	501	0	658	1159
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	9/21/2011	Well 073	29	E	AG5B	441	0	1141	1582
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	10/20/2011	Well 073	29	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	12/20/2011	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	1/19/2012	Well 073	30	E	AG5B	0	1493	1972	3465
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	2/21/2012	Well 073	33	E	AG5B	0	421	341	762
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	3/21/2012	Well 073	29	E	AG1B	0	1870	1956	3826
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	4/18/2012	Well 073	28	E	AG1B	0	450	1598	2048
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	5/21/2012	Well 073	33	E	AG1B	1088	876	4777	6741
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	6/19/2012	Well 073	29	E	AG1B	926	0	1859	2785
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	7/21/2012	Well 073	32	E	AG1B	0	0	9	9
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	8/20/2012	Well 073	30	E	AG1B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	10/19/2012	Well 073	30	E	AG1B	0	0	0	0
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	11/17/2012	Well 073	29	E	AG1B	0	1	0	1
7509254005	1487554735	2P2299	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	12/19/2012	Well 073	32	E	AG1B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	1/18/2013	Well 073	30	E	AG1B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	2/20/2013	Well 073	33	E	AG1B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	3/20/2013	Well 073	28	E	AG1B	0	896	1331	2227
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	4/20/2013	Well 073	31	E	AG5B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	5/20/2013	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	6/19/2013	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12,	MERCED, CA 9	D&I 73 522530	7/19/2013	Well 073	30	E	AG5B	0	0	0	0

7509254005	1487554735	1004508084	SE NW SW 32 06 12, MERCED, CA 9	D&I 73 522530	8/20/2013	Well 073	32	E	AG5B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12, MERCED, CA 9	D&I 73 522530	9/19/2013	Well 073	30	E	AG5B	0	0	0	0
7509254005	1487554735	1004508084	SE NW SW 32 06 12, MERCED, CA 9	D&I 73 522530	10/8/2013	Well 073	19	E	AG5B	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/27/2003	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/26/2003	Well 078	30	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/27/2003	Well 078	29	E	AG4A	0	712	351	1063
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/28/2003	Well 078	32	E	AG4A	0	132	365	497
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/28/2003	Well 078	30	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/26/2003	Well 078	29	E	AG4A	857	0	3723	4580
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/28/2003	Well 078	32	E	AG4A	565	0	2799	3364
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/27/2003	Well 078	30	E	AG4A	286	0	1528	1814
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/25/2003	Well 078	29	E	AG4A	0	0	563	563
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/24/2003	Well 078	29	E	AG4A	142	0	499	641
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/24/2003	Well 078	31	E	AG4A	0	0	360	360
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/23/2003	Well 078	29	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/24/2004	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/25/2004	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/25/2004	Well 078	29	E	AG4A	0	75	0	75
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/26/2004	Well 078	32	E	AG4A	0	843	746	1589
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/25/2004	Well 078	29	E	AG4A	141	0	754	895
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/25/2004	Well 078	31	E	AG4A	765	0	1152	1917
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/27/2004	Well 078	32	E	AG4A	413	0	1589	2002
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/23/2004	Well 078	27	E	AG4A	0	0	333	333
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/24/2004	Well 078	32	E	AG4A	0	0	361	361
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/25/2004	Well 078	31	E	AG4A	267	0	205	472
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/23/2004	Well 078	29	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/23/2004	Well 078	30	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/25/2005	Well 078	33	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/25/2005	Well 078	31	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/26/2005	Well 078	29	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/27/2005	Well 078	32	E	AG4A	0	0	1	1
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/25/2005	Well 078	28	E	AG4A	389	0	324	713
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/24/2005	Well 078	30	E	AG4A	47	0	3	50
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/26/2005	Well 078	32	E	AG4A	131	0	1169	1300
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/26/2005	Well 078	31	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/28/2005	Well 078	33	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/26/2005	Well 078	28	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/23/2005	Well 078	28	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/23/2005	Well 078	30	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/24/2006	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/23/2006	Well 078	30	E	AG4A	0	42	203	245
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/27/2006	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/26/2006	Well 078	30	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/25/2006	Well 078	29	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/26/2006	Well 078	32	E	AG4A	0	0	0	0
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/29/2006	Well 078	33	E	AG4A	220	0	466	686
7345508965	7345508181	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/27/2006	Well 078	29	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/22/2008	Well 078	32	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/21/2008	Well 078	30	E	AG4A	0	1	2	3
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/21/2008	Well 078	29	E	AG4A	0	655	797	1452

7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/22/2008	Well 078	32	E	AG4A	0	567	469	1036
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/21/2008	Well 078	29	E	AG4A	0	0	987	987
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/20/2008	Well 078	30	E	AG4A	0	0	33	33
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/22/2008	Well 078	32	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/20/2008	Well 078	29	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/19/2008	Well 078	30	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/21/2008	Well 078	32	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/18/2008	Well 078	28	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/19/2008	Well 078	31	E	AG4A	0	1	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/22/2009	Well 078	34	E	AG4A	0	1	3	4
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/20/2009	Well 078	29	E	AG4A	0	1	2	3
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/24/2009	Well 078	32	E	AG4A	0	202	230	432
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/22/2009	Well 078	29	E	AG4A	0	548	941	1489
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/21/2009	Well 078	29	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/22/2009	Well 078	32	E	AG4A	0	0	2	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/22/2009	Well 078	30	E	AG4A	121	0	767	888
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/20/2009	Well 078	29	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/21/2009	Well 078	32	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/20/2009	Well 078	29	E	AG4A	0	0	5	5
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/19/2009	Well 078	30	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/21/2009	Well 078	32	E	AG4A	0	0	3	3
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/21/2010	Well 078	31	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/22/2010	Well 078	32	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/24/2010	Well 078	30	E	AG4A	0	1	2	3
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/23/2010	Well 078	30	E	AG4A	0	4	6	10
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/24/2010	Well 078	31	E	AG4A	1	1	8	10
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/22/2010	Well 078	29	E	AG4A	0	0	2	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/23/2010	Well 078	31	E	AG4A	1	0	0	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/21/2010	Well 078	29	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/22/2010	Well 078	32	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/22/2010	Well 078	30	E	AG4A	1	0	608	609
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/20/2010	Well 078	29	E	AG4A	0	1	3	4
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/22/2010	Well 078	32	E	AG4A	0	1	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/21/2011	Well 078	30	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/19/2011	Well 078	29	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/23/2011	Well 078	32	E	AG4A	0	0	194	194
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/23/2011	Well 078	31	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/22/2011	Well 078	60	E	AG4A	1	0	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/23/2011	Well 078	31	E	AG4A	122	0	653	775
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/22/2011	Well 078	30	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/21/2011	Well 078	30	E	AG4A	105	0	260	365
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/20/2011	Well 078	29	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/18/2011	Well 078	29	E	AG4A	2	1	3	6
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/20/2011	Well 078	32	E	AG4A	0	1	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/19/2012	Well 078	30	E	AG4A	0	375	231	606
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/21/2012	Well 078	33	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/21/2012	Well 078	29	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/18/2012	Well 078	28	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/21/2012	Well 078	33	E	AG4A	114	280	813	1207
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/19/2012	Well 078	29	E	AG4A	195	0	31	226

7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/21/2012	Well 078	32	E	AG4A	123	0	433	556
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/20/2012	Well 078	30	E	AG4A	201	0	234	435
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/19/2012	Well 078	30	E	AG4A	2	0	4	6
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/19/2012	Well 078	30	E	AG4A	2	0	3	5
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/17/2012	Well 078	29	E	AG4A	0	1	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/19/2012	Well 078	32	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	1/18/2013	Well 078	30	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	2/20/2013	Well 078	33	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	3/20/2013	Well 078	28	E	AG4A	0	0	0	0
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	4/20/2013	Well 078	31	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	5/20/2013	Well 078	30	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	6/19/2013	Well 078	30	E	AG4A	0	0	2	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	7/19/2013	Well 078	30	E	AG4A	1	0	1	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	8/20/2013	Well 078	32	E	AG4A	1	0	6	7
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	9/19/2013	Well 078	30	E	AG4A	1	0	4	5
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	10/19/2013	Well 078	30	E	AG4A	0	0	2	2
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	11/18/2013	Well 078	30	E	AG4A	0	0	1	1
7345508965	1487554735	M17302	SE NE 31 06 12, MERCED, CA 95340	WL 78 D&I 78 522530	12/19/2013	Well 078	31	E	AG4A	0	0	0	0
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	2/5/2013	Well 144	11	E	HAG5A	0	122.2578	0	122
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	3/7/2013	Well 144	30	E	HAG5A	0	793.773	0	794
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	4/7/2013	Well 144	31	E	HAG5A	0	0	0	0
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	5/7/2013	Well 144	30	E	HAG5A	0	466.9542	1429.3026	1896
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	6/6/2013	Well 144	30	E	HAG5A	744.3954	0	695.1492	1440
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	7/8/2013	Well 144	32	E	HAG5A	1020.8304	0	3419.5842	4440
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	8/6/2013	Well 144	29	E	HAG5A	774.8298	0	536.9148	1312
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	9/5/2013	Well 144	30	E	HAG5A	422.9352	0	1018.9872	1442
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	10/6/2013	Well 144	31	E	HAG5A	423.1062	0	771.219	1194
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	11/4/2013	Well 144	29	E	HAG5A	832.0248	0	1520.0712	2352
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	12/5/2013	Well 144	31	E	HAG5A	0	333.0306	0	333
1487554152	1487554735	1008824847	NW4 SE4 NW4 5 7 12, MERCED, CA 95	#144 D&I 144 522530	1/6/2014	Well 144	32	E	HAG5A	0	953.1252	95.6088	1049
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	1/23/2003	Well 144	31	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	2/24/2003	Well 144	32	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	3/25/2003	Well 144	29	E	AG4A	0	0	1511	1511
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	4/24/2003	Well 144	30	E	AG4A	0	0	1402	1402
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	5/23/2003	Well 144	29	E	AG4A	1680	0	7013	8693
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	6/25/2003	Well 144	33	E	AG4A	1283	0	7962	9245
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	7/25/2003	Well 144	30	E	AG4A	2695	0	12047	14742
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	8/25/2003	Well 144	31	E	AG4A	853	0	6348	7201
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	9/23/2003	Well 144	29	E	AG4A	904	0	5110	6014
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	10/22/2003	Well 144	29	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	11/20/2003	Well 144	29	E	AG4A	586	0	3001	3587
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	12/22/2003	Well 144	32	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	1/22/2004	Well 144	31	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	2/23/2004	Well 144	32	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	3/24/2004	Well 144	30	E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	4/23/2004	Well 144	30	E	AG4A	0	4456	7487	11943
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	5/21/2004	Well 144	28	E	AG4A	690	0	4682	5372
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	6/23/2004	Well 144	33	E	AG4A	1912	0	11370	13282
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	7/26/2004	Well 144	33	E	AG4A	1697	0	9550	11247
7345508625	7345508181	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	8/23/2004	Well 144	28	E	AG4A	972	0	4194	5166

7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	9/23/2004	Well 144	31 E	AG4A	1255	0	6010	7265
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	10/28/2004	Well 144	35 E	AG4A	753	0	2648	3401
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	11/20/2004	Well 144	23 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	12/22/2004	Well 144	32 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	1/21/2005	Well 144	30 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	2/22/2005	Well 144	32 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	3/23/2005	Well 144	29 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	4/21/2005	Well 144	29 E	AG4A	0	459	180	639
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	5/23/2005	Well 144	32 E	AG4A	223	316	1279	1818
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	6/27/2005	Well 144	35 E	AG4A	1120	0	5073	6193
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	7/22/2005	Well 144	25 E	AG4A	1555	0	5569	7124
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	8/22/2005	Well 144	31 E	AG4A	618	0	2624	3242
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	9/23/2005	Well 144	32 E	AG4A	363	0	998	1361
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	10/21/2005	Well 144	28 E	AG4A	255	0	1694	1949
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	11/22/2005	Well 144	32 E	AG4A	204	0	644	848
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	12/21/2005	Well 144	29 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	1/23/2006	Well 144	33 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	2/22/2006	Well 144	30 E	AG4A	0	340	1724	2064
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	3/24/2006	Well 144	30 E	AG4A	0	19	796	815
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	4/24/2006	Well 144	31 E	AG4A	0	0	0	0
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	5/23/2006	Well 144	29 E	AG4A	1037	0	4369	5406
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	6/22/2006	Well 144	30 E	AG4A	1555	0	6589	8144
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	7/25/2006	Well 144	33 E	AG4A	1501	0	7603	9104
7345508625	7345508181	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	8/22/2006	Well 144	28 E	AG4A	1715	0	7741	9456
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	1/18/2008	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	2/19/2008	Well 144	32 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	3/19/2008	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	4/17/2008	Well 144	29 E	AG4A	0	3202	3734	6936
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	5/19/2008	Well 144	32 E	AG4A	835	299	4595	5729
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	6/18/2008	Well 144	30 E	AG4A	584	0	1489	2073
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	7/17/2008	Well 144	29 E	AG4A	438	0	1260	1698
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	8/18/2008	Well 144	32 E	AG4A	816	0	4304	5120
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	9/17/2008	Well 144	30 E	AG4A	182	0	628	810
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	10/16/2008	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	11/14/2008	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	12/16/2008	Well 144	32 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	1/16/2009	Well 144	31 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	2/17/2009	Well 144	32 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	3/19/2009	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	4/20/2009	Well 144	32 E	AG4A	0	846	396	1242
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	5/19/2009	Well 144	29 E	AG4A	41	463	566	1070
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	6/18/2009	Well 144	30 E	AG4A	954	0	3387	4341
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	7/20/2009	Well 144	32 E	AG4A	1567	0	5104	6671
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	8/18/2009	Well 144	29 E	AG4A	1340	0	3757	5097
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	9/17/2009	Well 144	30 E	AG4A	407	0	5431	5838
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	10/16/2009	Well 144	29 E	AG4A	630	0	2765	3395
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	11/17/2009	Well 144	32 E	AG4A	0	0	204	204
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	1/19/2010	Well 144	33 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	2/18/2010	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12,	MERCED, CA 9	#144 D&I 144	522530	3/23/2010	Well 144	33 E	AG4A	0	0	0	0

7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	4/20/2010	Well 144	28 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	5/19/2010	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	6/18/2010	Well 144	30 E	AG4A	1132	0	2733	3865
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	7/19/2010	Well 144	31 E	AG4A	2220	0	8476	10696
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	8/18/2010	Well 144	30 E	AG4A	1014	0	5912	6926
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	9/20/2010	Well 144	33 E	AG4A	32	0	710	742
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	10/20/2010	Well 144	30 E	AG4A	0	0	252	252
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	11/18/2010	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	12/20/2010	Well 144	32 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	1/19/2011	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	2/17/2011	Well 144	29 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	3/21/2011	Well 144	32 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	4/20/2011	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	5/19/2011	Well 144	29 E	AG4A	1263	939	7610	9812
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	6/18/2011	Well 144	30 E	AG4A	630	0	2353	2983
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	7/21/2011	Well 144	33 E	AG4A	1574	0	6583	8157
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	8/20/2011	Well 144	30 E	AG4A	956	0	2538	3494
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	9/19/2011	Well 144	30 E	AG4A	763	0	2757	3520
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	10/18/2011	Well 144	29 E	AG4A	74	0	210	284
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	11/17/2011	Well 144	30 E	AG4A	625	0	1497	2122
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	12/15/2011	Well 144	28 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	1/14/2012	Well 144	30 E	AG4A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	2/16/2012	Well 144	33 E	AG4A	0	200	2072	2272
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	3/19/2012	Well 144	32 E	AG5A	0	452	624	1076
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	4/17/2012	Well 144	29 E	AG5A	0	0	0	0
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	5/17/2012	Well 144	30 E	AG5A	208	1296	1926	3430
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	6/18/2012	Well 144	32 E	AG5A	1914	0	6316	8230
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	7/18/2012	Well 144	30 E	AG5A	1773	0	8834	10607
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	8/15/2012	Well 144	28 E	AG5A	1486	0	5415	6901
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	9/15/2012	Well 144	31 E	AG5A	423	0	2468	2891
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	10/16/2012	Well 144	31 E	AG5A	131	0	1503	1634
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	11/15/2012	Well 144	30 E	AG5A	0	307	0	307
7345508625	1487554735	143M22	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	12/17/2012	Well 144	32 E	AG5A	0	121	0	121
7345508625	1487554735	1008824847	NW SE NW 05 07 12, MERCED, CA 9	#144 D&I 144 522530	1/25/2013	Well 144	39 E	AG5A	0	0	0	0
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/5/2013	Well 241	12 E	HAG4B	0	0	0	0
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/7/2013	Well 241	30 E	HAG4B	0	547.635	356.396	904
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/7/2013	Well 241	31 E	HAG4B	0	238.425	881.52	1120
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/7/2013	Well 241	30 E	HAG4B	0	195.219	3141.804	3337
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/6/2013	Well 241	30 E	HAG4B	0.175	0	5303.611	5304
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/8/2013	Well 241	32 E	HAG4B	19.22	0	6331.151	6350
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/6/2013	Well 241	29 E	HAG4B	31.686	0	5370.815	5403
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/5/2013	Well 241	30 E	HAG4B	91.914	0	3730.636	3823
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/6/2013	Well 241	31 E	HAG4B	0.007	0	3082.1405	3082
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/4/2013	Well 241	29 E	HAG4B	183.126	0	4120.535	4304
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/5/2013	Well 241	31 E	HAG4B	0	0	747.394	747
1487554568	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/6/2014	Well 241	32 E	HAG4B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/23/2003	Well 241	31 E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/24/2003	Well 241	32 E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/25/2003	Well 241	29 E	AG5B	0	203	1343	1546
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/24/2003	Well 241	30 E	AG5B	0	209	1816	2025

7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/23/2003	Well 241	29	E	AG5B	233	0	2718	2951
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/25/2003	Well 241	33	E	AG5B	235	0	4089	4324
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/25/2003	Well 241	30	E	AG5B	665	0	6376	7041
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/22/2003	Well 241	28	E	AG5B	343	0	4216	4559
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/23/2003	Well 241	32	E	AG5B	239	0	2199	2438
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/22/2003	Well 241	29	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/20/2003	Well 241	29	E	AG5B	172	0	2881	3053
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/22/2003	Well 241	32	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/22/2004	Well 241	31	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/23/2004	Well 241	32	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/24/2004	Well 241	30	E	AG5B	0	317	344	661
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/23/2004	Well 241	30	E	AG5B	0	1075	2127	3202
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/21/2004	Well 241	28	E	AG5B	196	350	2334	2880
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/23/2004	Well 241	33	E	AG5B	304	0	5293	5597
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/26/2004	Well 241	33	E	AG5B	455	0	5175	5630
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/23/2004	Well 241	28	E	AG5B	225	0	2780	3005
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/23/2004	Well 241	31	E	AG5B	223	0	1965	2188
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/21/2004	Well 241	28	E	AG5B	268	0	2368	2636
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/20/2004	Well 241	30	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/22/2004	Well 241	32	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/21/2005	Well 241	30	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/22/2005	Well 241	32	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/23/2005	Well 241	29	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/21/2005	Well 241	29	E	AG5B	0	599	780	1379
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/23/2005	Well 241	32	E	AG5B	227	523	3248	3998
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/22/2005	Well 241	30	E	AG5B	562	0	4311	4873
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/22/2005	Well 241	30	E	AG5B	395	0	4987	5382
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/22/2005	Well 241	31	E	AG5B	415	0	4522	4937
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/23/2005	Well 241	32	E	AG5B	372	0	1808	2180
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/21/2005	Well 241	28	E	AG5B	0	0	754	754
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/22/2005	Well 241	32	E	AG5B	207	0	1816	2023
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/21/2005	Well 241	29	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/23/2006	Well 241	33	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/22/2006	Well 241	30	E	AG5B	0	132	1133	1265
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/24/2006	Well 241	30	E	AG5B	0	0	501	501
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/24/2006	Well 241	31	E	AG5B	0	0	0	0
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/23/2006	Well 241	29	E	AG5B	403	82	3220	3705
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/22/2006	Well 241	30	E	AG5B	341	0	4039	4380
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/25/2006	Well 241	33	E	AG5B	375	0	5628	6003
7345508620	7345508181	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/22/2006	Well 241	28	E	AG5B	218	0	2836	3054
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/18/2008	Well 241	30	E	AG5B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/19/2008	Well 241	32	E	AG5B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/19/2008	Well 241	29	E	AG5B	0	239	332	571
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/17/2008	Well 241	29	E	AG4B	0	1003	2108	3111
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/19/2008	Well 241	32	E	AG4B	191	358	2977	3526
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/18/2008	Well 241	30	E	AG4B	380	0	4208	4588
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/17/2008	Well 241	29	E	AG4B	446	0	3504	3950
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/18/2008	Well 241	32	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/17/2008	Well 241	30	E	AG4B	363	0	5671	6034
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/16/2008	Well 241	29	E	AG4B	2	0	472	474

7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/14/2008	Well 241	29	E	AG4B	77	0	811	888
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/16/2009	Well 241	31	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/19/2009	Well 241	30	E	AG4B	0	140	544	684
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/20/2009	Well 241	32	E	AG4B	0	1106	1873	2979
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/19/2009	Well 241	29	E	AG4B	40	481	1660	2181
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/18/2009	Well 241	30	E	AG4B	523	0	3982	4505
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/20/2009	Well 241	32	E	AG4B	358	0	4218	4576
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/18/2009	Well 241	29	E	AG4B	323	0	4300	4623
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/17/2009	Well 241	30	E	AG4B	40	0	2645	2685
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/16/2009	Well 241	29	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/17/2009	Well 241	32	E	AG4B	0	0	402	402
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/17/2009	Well 241	30	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/19/2010	Well 241	33	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/23/2010	Well 241	33	E	AG4B	0	11	121	132
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/20/2010	Well 241	28	E	AG4B	0	112	267	379
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/19/2010	Well 241	29	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/18/2010	Well 241	30	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/19/2010	Well 241	31	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/20/2010	Well 241	32	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/20/2010	Well 241	30	E	AG4B	428	0	17365	17793
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/18/2010	Well 241	29	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/20/2010	Well 241	32	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/19/2011	Well 241	30	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/17/2011	Well 241	29	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/21/2011	Well 241	32	E	AG4B	0	113	1187	1300
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/20/2011	Well 241	30	E	AG4B	0	61	630	691
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/19/2011	Well 241	29	E	AG4B	221	350	2268	2839
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/18/2011	Well 241	30	E	AG4B	54	0	2140	2194
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/21/2011	Well 241	33	E	AG4B	147	0	4920	5067
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/20/2011	Well 241	30	E	AG4B	343	0	3979	4322
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/19/2011	Well 241	30	E	AG4B	134	0	2683	2817
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/18/2011	Well 241	29	E	AG4B	76	0	1114	1190
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/17/2011	Well 241	30	E	AG4B	74	0	1351	1425
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/15/2011	Well 241	28	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/14/2012	Well 241	30	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	2/16/2012	Well 241	33	E	AG4B	0	0	0	0
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	3/19/2012	Well 241	32	E	AG4B	0	684	1577	2261
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	4/17/2012	Well 241	29	E	AG4B	0	217	340	557
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	5/17/2012	Well 241	30	E	AG4B	226	110	2980	3316
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	6/18/2012	Well 241	32	E	AG4B	849	0	4976	5825
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	7/18/2012	Well 241	30	E	AG4B	1041	0	6657	7698
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	8/15/2012	Well 241	28	E	AG4B	224	0	5069	5293
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	9/15/2012	Well 241	31	E	AG4B	406	0	4119	4525
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	10/16/2012	Well 241	31	E	AG4B	3	0	2296	2299
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	11/15/2012	Well 241	30	E	AG4B	164	0	1495	1659
7345508620	1487554735	04R564	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	12/17/2012	Well 241	32	E	AG4B	0	0	0	0
7345508620	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/16/2013	Well 241	30	E	AG4B	0	0	0	0
7345508620	1487554735	1006404344	NE 05 07 12, MERCED, CA 95340	#241 D&I 241 522530	1/24/2013	Well 241	8	E	AG4B	0	0	0	0
1487554147	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242 522530	11/4/2013	Well 242	27	E	HAG4B	577.125	0	192.699	770
1487554147	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242 522530	12/5/2013	Well 242	31	E	HAG4B	0	0	0	0

1487554147	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/6/2014	Well 242	32	E	HAG4B	0	432.943	85.707	519
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	1/24/2003	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	2/26/2003	Well 242	33	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	3/27/2003	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	4/28/2003	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	5/28/2003	Well 242	30	E	AG4B	564	0	1669	2233
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	6/26/2003	Well 242	29	E	AG4B	796	0	3158	3954
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	7/28/2003	Well 242	32	E	AG4B	716	0	5062	5778
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	8/27/2003	Well 242	30	E	AG4B	707	0	3016	3723
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	9/25/2003	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	10/24/2003	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	11/24/2003	Well 242	31	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	12/24/2003	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	1/24/2004	Well 242	31	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	2/25/2004	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	3/25/2004	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	4/26/2004	Well 242	32	E	AG4B	0	1443	985	2428
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	5/25/2004	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	6/25/2004	Well 242	31	E	AG4B	1594	0	8440	10034
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	7/27/2004	Well 242	32	E	AG4B	1035	0	4578	5613
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	8/25/2004	Well 242	29	E	AG4B	399	0	2060	2459
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	9/24/2004	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	10/25/2004	Well 242	31	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	11/23/2004	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	12/23/2004	Well 242	30	E	AG4B	0	1	0	1
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	1/25/2005	Well 242	33	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	2/24/2005	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	3/26/2005	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	4/27/2005	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	5/25/2005	Well 242	28	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	6/24/2005	Well 242	30	E	AG4B	625	0	3153	3778
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	7/26/2005	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	8/25/2005	Well 242	30	E	AG4B	1882	0	8946	10828
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	9/27/2005	Well 242	33	E	AG4B	1120	0	4755	5875
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	10/26/2005	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	11/23/2005	Well 242	28	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	12/23/2005	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	1/24/2006	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	2/23/2006	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	3/27/2006	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	4/26/2006	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	5/25/2006	Well 242	29	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	6/26/2006	Well 242	32	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	7/26/2006	Well 242	30	E	AG4B	0	0	0	0
7345508960	7345508181	5265R7	@ 1/2MI S/E PEACH, & HWY 99 WELL 2	D&I 242	522530	8/24/2006	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/22/2008	Well 242	32	E	AG4B	0	152	495	647
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	2/21/2008	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	3/21/2008	Well 242	29	E	AG4B	0	0	825	825
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/22/2008	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/21/2008	Well 242	29	E	AG4B	0	0	0	0

7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	6/20/2008	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/22/2008	Well 242	32	E	AG4B	275	0	3185	3460
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/20/2008	Well 242	29	E	AG4B	1312	0	4365	5677
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/19/2008	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/21/2008	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	11/18/2008	Well 242	28	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	12/19/2008	Well 242	31	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/19/2009	Well 242	31	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	3/24/2009	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/22/2009	Well 242	29	E	AG4B	0	978	1728	2706
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/21/2009	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/22/2009	Well 242	30	E	AG4B	428	0	1414	1842
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/20/2009	Well 242	29	E	AG4B	564	0	3170	3734
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/21/2009	Well 242	32	E	AG4B	1676	0	7895	9571
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/20/2009	Well 242	29	E	AG4B	281	0	2683	2964
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	11/19/2009	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	12/21/2009	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/21/2010	Well 242	31	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/23/2010	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/24/2010	Well 242	31	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	6/22/2010	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/22/2010	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/21/2010	Well 242	30	E	AG4B	1000	0	5003	6003
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/22/2010	Well 242	32	E	AG4B	1002	0	5507	6509
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/22/2010	Well 242	30	E	AG4B	473	0	3535	4008
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	11/20/2010	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/21/2011	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	2/19/2011	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	3/23/2011	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/23/2011	Well 242	31	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/21/2011	Well 242	28	E	AG4B	0	1544	1508	3052
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	6/22/2011	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/23/2011	Well 242	31	E	AG4B	395	0	992	1387
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/23/2011	Well 242	31	E	AG4B	671	0	3742	4413
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/21/2011	Well 242	29	E	AG4B	789	0	4620	5409
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/20/2011	Well 242	29	E	AG4B	99	0	141	240
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	11/18/2011	Well 242	29	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	12/20/2011	Well 242	32	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/19/2012	Well 242	30	E	AG4B	0	581	358	939
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	2/21/2012	Well 242	33	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	3/21/2012	Well 242	29	E	AG4B	0	0	120	120
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/18/2012	Well 242	28	E	AG4B	0	0	0	0
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/21/2012	Well 242	33	E	AG4B	0	211	366	577
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	6/19/2012	Well 242	29	E	AG4B	8	0	228	236
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/21/2012	Well 242	32	E	AG4B	593	0	3167	3760
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/20/2012	Well 242	30	E	AG4B	616	0	2427	3043
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/19/2012	Well 242	30	E	AG4B	617	0	2812	3429
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/19/2012	Well 242	30	E	AG4B	194	0	175	369
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	11/17/2012	Well 242	29	E	AG4B	0	1	0	1
7345508960	1487554735	57P800	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	12/19/2012	Well 242	32	E	AG4B	0	0	0	0

7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	1/18/2013	Well 242	30	E	AG4B	0	0	0	0
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	2/20/2013	Well 242	33	E	AG4B	0	0	0	0
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	3/20/2013	Well 242	28	E	AG4B	0	420	360	780
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	4/20/2013	Well 242	31	E	AG4B	0	0	9	9
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	5/20/2013	Well 242	30	E	AG4B	1178	0	3381	4559
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	6/19/2013	Well 242	30	E	AG4B	1478	0	5656	7134
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	7/19/2013	Well 242	30	E	AG4B	1192	0	9499	10691
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	8/20/2013	Well 242	32	E	AG4B	4200	0	6018	10218
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	9/19/2013	Well 242	30	E	AG4B	3198	0	4020	7218
7345508960	1487554735	1004508087	1/2MI S/E PEACH, & HWY 99 WELL 242	D&I 242	522530	10/8/2013	Well 242	19	E	AG4B	1270	0	716	1986

erevenue	cr demand	bl demand	onpk kw	ptpk kw	offpk kw	grevenue	thru put	taxes	sa_status_flg	bus_activity_desc	per_id	service_prem_id	end_dt	Month	Year
339.85	15	25	0	0	0			0.07						6	2010
213.69	0	25	0	0	0			0						7	2010
214.64	0	25	0	0	0			0						8	2010
213.22	0	25	0	0	0			0						10	2010
176.56	0	25	0	0	0			0						11	2010
48.14	0	25	0	0	0			0						12	2010
97.87	0	25	0	0	0			0	20		3522769182	4408142916		2	2011
49.73	0	25	0	0	0			0	20		3522769182	4408142916		3	2011
48.72	0	25	0	0	0			0	20		3522769182	4408142916		4	2011
95.28	0	25	0	0	0			0	20		3522769182	4408142916		5	2011
209.69	0	25	0	0	0			0	20		3522769182	4408142916		6	2011
210.64	0	25	0	0	0			0	20		3522769182	4408142916		7	2011
209.22	0	25	0	0	0			0	20		3522769182	4408142916		8	2011
214.85	14	25	0	0	0			0.01	20		3522769182	4408142916		9	2011
179.1	0	25	0	0	0			0	20		3522769182	4408142916		11	2011
49.19	0	25	0	0	0			0	20		3522769182	4408142916		12	2011
51.36	0	25	0	0	0			0	20		3522769182	4408142916		1	2012
58.39	1	25	0	0	0			0	20		3522769182	4408142916		2	2012
57.8	0	25	0	0	0			0	20		3522769182	4408142916		3	2012
57.23	0	25	0	0	0			0	20		3522769182	4408142916		4	2012
146.55	14	25	0	0	0			0.12	20		3522769182	4408142916		5	2012
285.67	14	25	0	0	0			0.1	20	D&I 59B 522530	3522769182	4408142916		6	2012
344.6	14	25	0	0	0			0.22	20	D&I 59B 522530	3522769182	4408142916		7	2012
332.34	14	25	0	0	0			0.23	20	D&I 59B 522530	3522769182	4408142916		8	2012
338.78	13	25	0	0	0			0.25	20	D&I 59B 522530	3522769182	4408142916		9	2012
284.55	14	25	0	0	0			0.12	20	D&I 59B 522530	3522769182	4408142916		10	2012
301.52	13	25	0	0	0			0.17	20	D&I 59B 522530	3522769182	4408142916		11	2012
58.37	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		12	2012
58.89	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		1	2013
57.55	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		2	2013
57.55	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		3	2013
58.12	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		4	2013
114.15	14	25	0	0	0			0.11	20	D&I 59B 522530	3522769182	4408142916		5	2013
288.36	14	25	0	0	0			0.26	20	D&I 59B 522530	3522769182	4408142916		6	2013
255.68	13	25	0	0	0			0.2	20	D&I 59B 522530	3522769182	4408142916		7	2013
201.19	14	25	0	0	0			0.09	20	D&I 59B 522530	3522769182	4408142916		8	2013
202.26	14	25	0	0	0			0.09	20	D&I 59B 522530	3522769182	4408142916		9	2013
204.66	14	25	0	0	0			0.09	20	D&I 59B 522530	3522769182	4408142916		10	2013
230.16	14	25	0	0	0			0.14	20	D&I 59B 522530	3522769182	4408142916		11	2013
38.12	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		12	2013
39.02	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		1	2014
67.22	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		1	2003
67.62	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		2	2003
66.83	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		3	2003
66.43	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		4	2003
70.83	0	25	0	0	0			0	20	D&I 59B 522530	3522769182	4408142916		5	2003

444.11	0	25	0	0	0	0.42	20	D&I 59B 522530	3522769182	4408142916	6	2003
155.01	0	25	0	0	0	0.09	20	D&I 59B 522530	3522769182	4408142916	7	2003
71.83	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	8	2003
72.22	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	9	2003
71.43	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	10	2003
67.98	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	11	2003
67.62	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	12	2003
67.22	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	1	2004
67.62	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	2	2004
68.02	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	3	2004
66.43	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	4	2004
69.79	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	5	2004
79.99	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	6	2004
70.18	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	7	2004
71.36	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	8	2004
70.18	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	9	2004
70.18	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	10	2004
67.41	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	11	2004
66.78	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	12	2004
69.77	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	1	2005
71.22	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	2	2005
70.44	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	3	2005
71.22	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	4	2005
74.86	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	5	2005
258.79	0	25	0	0	0	0.26	20	D&I 59B 522530	3522769182	4408142916	6	2005
180.24	0	25	0	0	0	0.15	20	D&I 59B 522530	3522769182	4408142916	7	2005
75.29	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	8	2005
76.47	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	9	2005
75.68	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	10	2005
73.25	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	11	2005
70.83	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	12	2005
75.03	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	1	2006
75.97	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	2	2006
74.79	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	3	2006
80.16	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	4	2006
216.77	0	25	0	0	0	0.17	20	D&I 59B 522530	3522769182	4408142916	5	2006
86.72	0	25	0	0	0	0	20	D&I 59B 522530	3522769182	4408142916	6	2006
202.25	0	25	0	0	0	0.15	20	D&I 59B 522530	3522769182	4408142916	7	2006
266.69	0	25	0	0	0	0.23	20	D&I 59B 522530	3522769182	4408142916	8	2006
93.41	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	1	2003
94.88	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	2	2003
409.44	40	40	0	40	40	0.65	20	D&I 72 522530	3522769182	4408145002	3	2003
853.39	40	40	0	40	40	1.51	20	D&I 72 522530	3522769182	4408145002	4	2003
552.8	40	41	39	0	40	0.65	20	D&I 72 522530	3522769182	4408145002	5	2003
1379.07	40	41	40	0	40	1.92	20	D&I 72 522530	3522769182	4408145002	6	2003
1129.37	41	41	40	0	41	1.46	20	D&I 72 522530	3522769182	4408145002	7	2003
635.28	41	41	13	0	41	0.89	20	D&I 72 522530	3522769182	4408145002	8	2003
337.39	40	41	0	0	40	0.38	20	D&I 72 522530	3522769182	4408145002	9	2003
334.19	40	41	9	0	40	0.33	20	D&I 72 522530	3522769182	4408145002	10	2003
294.26	40	41	40	0	40	0.29	20	D&I 72 522530	3522769182	4408145002	11	2003

93.13	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2003
92.4	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	1	2004
93.13	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	2	2004
194.23	40	40	0	40	39	0.35	20	D&I 72 522530	3522769182	4408145002	3	2004
607.24	40	40	0	40	40	1.96	20	D&I 72 522530	3522769182	4408145002	4	2004
1263.33	40	41	39	40	40	3	20	D&I 72 522530	3522769182	4408145002	5	2004
928.22	41	41	40	0	41	2.3	20	D&I 72 522530	3522769182	4408145002	6	2004
641.64	40	41	40	0	40	1.46	20	D&I 72 522530	3522769182	4408145002	7	2004
502.03	41	41	20	0	41	1.16	20	D&I 72 522530	3522769182	4408145002	8	2004
285.65	40	41	5	0	40	0.5	20	D&I 72 522530	3522769182	4408145002	9	2004
460.95	40	41	40	0	40	0.8	20	D&I 72 522530	3522769182	4408145002	10	2004
106.5	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	11	2004
69.36	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2004
21.11	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2004
95.61	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	1	2005
97.53	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	2	2005
5.77	0	0	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	3	2005
15.18	0	0	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	3	2005
167.11	40	40	0	0	40	0.21	20	D&I 72 522530	3522769182	4408145002	4	2005
567.58	40	41	40	0	40	0.86	20	D&I 72 522530	3522769182	4408145002	5	2005
502.17	41	41	16	0	41	0.85	20	D&I 72 522530	3522769182	4408145002	6	2005
949.76	41	41	40	0	41	1.85	20	D&I 72 522530	3522769182	4408145002	7	2005
560.1	41	41	21	0	41	0.99	20	D&I 72 522530	3522769182	4408145002	8	2005
520.64	40	41	31	0	40	0.79	20	D&I 72 522530	3522769182	4408145002	9	2005
-151.67	40	41	3	0	40	0.54	20	D&I 72 522530	3522769182	4408145002	10	2005
113.22	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	11	2005
95.68	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2005
43.93	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	1	2006
286.93	40	40	0	40	40	0.3	20	D&I 72 522530	3522769182	4408145002	2	2006
298.5	40	40	0	39	40	0.34	20	D&I 72 522530	3522769182	4408145002	3	2006
282.79	39	40	0	39	39	0.25	20	D&I 72 522530	3522769182	4408145002	4	2006
870.29	40	41	39	39	40	1.17	20	D&I 72 522530	3522769182	4408145002	5	2006
908.24	40	41	39	0	40	1.24	20	D&I 72 522530	3522769182	4408145002	6	2006
711.47	40	41	13	0	40	1.16	20	D&I 72 522530	3522769182	4408145002	7	2006
597.68	40	40	16	0	40	0.84	20	D&I 72 522530	3522769182	4408145002	8	2006
23.58	0	0	0	0	0	0					1	2008
23.18	0	0	0	0	0	0					2	2008
27.33	0	0	0	0	0	0					3	2008
88.55	41	41	0	41	5	0.03					4	2008
444.88	41	41	41	40	41	0.28					5	2008
622.1	41	41	41	0	41	0.35					6	2008
821.13	41	41	41	0	41	0.67					7	2008
627.57	41	41	40	0	41	0.37					8	2008
24.83	0	41	0	0	0	0					9	2008
24	0	41	0	0	0	0					10	2008
24.55	0	41	0	0	0	0					11	2008
26.5	0	41	0	0	0	0					12	2008
25.66	0	41	0	0	0	0					1	2009
27.33	0	41	0	0	0	0					2	2009
24.02	0	41	0	0	0	0					3	2009

123.72	40	40	0	40	0	0.09					4	2009
24.01	0	37	0	0	0	0					8	2009
24.83	0	37	0	0	0	0					9	2009
24	0	37	0	0	0	0					10	2009
27.32	0	40	0	0	0	0					11	2009
24.01	0	40	0	0	0	0					12	2009
24.83	0	40	0	0	0	0					1	2010
27.33	0	40	0	0	0	0					2	2010
121.73	41	41	0	41	41	0.07					3	2010
171.54	40	41	0	5	40	0.19					4	2010
24.01	0	41	0	0	0	0					5	2010
26.5	0	37	0	0	0	0					7	2010
25.67	0	37	0	0	0	0					8	2010
27.32	0	41	0	0	0	0	20		3522769182	4408145002	1	2011
23.18	0	41	0	0	0	0	20		3522769182	4408145002	2	2011
24.85	0	40	0	0	0	0	20		3522769182	4408145002	3	2011
27.33	0	0	0	0	0	0	20		3522769182	4408145002	4	2011
24.01	0	37	0	0	0	0	20		3522769182	4408145002	5	2011
27.33	0	37	0	0	0	0	20		3522769182	4408145002	7	2011
24.83	0	37	0	0	0	0	20		3522769182	4408145002	8	2011
147.29	41	41	0	40	41	0.24	20		3522769182	4408145002	11	2011
24.83	0	0	0	0	0	0	20		3522769182	4408145002	12	2011
180.06	40	40	0	40	40	0.24	20		3522769182	4408145002	1	2012
264.66	40	40	0	40	40	0.46	20		3522769182	4408145002	2	2012
277.71	41	41	0	41	41	0.49	20		3522769182	4408145002	3	2012
227.02	41	41	0	41	41	0.34	20		3522769182	4408145002	4	2012
648.44	41	41	40	40	41	0.76	20		3522769182	4408145002	5	2012
31.45	0	37	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	7	2012
29.54	0	37	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	9	2012
27.63	0	37	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	10	2012
28.58	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2012
30.48	0	41	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	1	2013
154.53	40	41	0	40	40	0.15	20	D&I 72 522530	3522769182	4408145002	2	2013
207.33	40	41	0	40	40	0.28	20	D&I 72 522530	3522769182	4408145002	3	2013
29.54	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	4	2013
27.64	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	5	2013
30.49	0	37	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	6	2013
581.87	41	41	41	0	41	0.18	20	D&I 72 522530	3522769182	4408145002	7	2013
854.41	41	41	41	0	41	0.65	20	D&I 72 522530	3522769182	4408145002	8	2013
844.56	41	41	41	0	41	0.67	20	D&I 72 522530	3522769182	4408145002	9	2013
594.51	40	41	40	0	40	0.22	20	D&I 72 522530	3522769182	4408145002	10	2013
481.9	40	41	40	0	40	0.46	20	D&I 72 522530	3522769182	4408145002	11	2013
31.45	0	40	0	0	0	0	20	D&I 72 522530	3522769182	4408145002	12	2013
31.93	0	0	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	11	2013
36.67	0	0	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	12	2013
71.59	31	31	0	31	0	0.02	20	D&I 73 522530	3522769182	7863435735	1	2014
185.93	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	1	2003
184.48	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	2	2003
20.95	0	0	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	3	2003
23.13	0	0	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	4	2003

733.09	37	37	37	0	37	0.98	20	D&I 73 522530	3522769182	7863435735	5	2003
853.46	37	37	37	0	37	1.08	20	D&I 73 522530	3522769182	7863435735	6	2003
1200.56	37	37	37	0	37	1.92	20	D&I 73 522530	3522769182	7863435735	7	2003
460.25	35	37	0	35	35	0.56	20	D&I 73 522530	3522769182	7863435735	8	2003
320.92	36	37	0	36	35	0.16	20	D&I 73 522530	3522769182	7863435735	9	2003
308.88	36	37	0	36	36	0.13	20	D&I 73 522530	3522769182	7863435735	10	2003
251.58	36	37	0	36	36	0.14	20	D&I 73 522530	3522769182	7863435735	11	2003
191.76	36	36	0	36	36	0.03	20	D&I 73 522530	3522769182	7863435735	12	2003
180.81	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	1	2004
181.53	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	2	2004
180.09	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	3	2004
367.97	37	37	0	37	36	1.01	20	D&I 73 522530	3522769182	7863435735	4	2004
411.06	36	37	36	36	36	0.3	20	D&I 73 522530	3522769182	7863435735	5	2004
704.59	36	37	36	0	36	1.31	20	D&I 73 522530	3522769182	7863435735	6	2004
254.97	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	7	2004
252.8	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	8	2004
709	36	36	36	0	36	1.57	20	D&I 73 522530	3522769182	7863435735	9	2004
434.21	36	36	36	0	36	0.23	20	D&I 73 522530	3522769182	7863435735	10	2004
201.11	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	11	2004
181.89	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	12	2004
193.6	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	1	2005
194.47	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	2	2005
193.75	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	3	2005
396.54	36	36	35	35	36	0.85	20	D&I 73 522530	3522769182	7863435735	4	2005
261.32	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	5	2005
271.52	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	6	2005
272.97	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	7	2005
270.8	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	8	2005
273.7	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	9	2005
15.9	0	30	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	10	2005
197.37	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	11	2005
189.8	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	12	2005
31.64	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	12	2005
38.25	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	1	2006
21.68	0	36	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	2	2006
310.74	37	37	0	37	36	0.02	20	D&I 73 522530	3522769182	7863435735	3	2006
21.69	0	37	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	4	2006
256.79	19	37	19	19	0	0	20	D&I 73 522530	3522769182	7863435735	5	2006
23.13	0	30	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	6	2006
1227.74	36	36	36	0	36	1.83	20	D&I 73 522530	3522769182	7863435735	7	2006
810	36	36	36	0	36	0.68	20	D&I 73 522530	3522769182	7863435735	8	2006
33.25	0	36	0	0	0	0					1	2008
35.48	0	36	0	0	0	0					2	2008
256.06	36	36	0	36	36	0.31					3	2008
376.89	36	36	0	36	35	0.67					4	2008
386.59	35	36	0	0	35	0.36					5	2008
673.39	35	35	34	0	35	0.2					6	2008
85.97	5	35	0	0	5	0					7	2008
34.3	0	35	0	0	0	0					8	2008
35.48	0	35	0	0	0	0					9	2008

77.35	4	35	0	0	4	0					10	2008
390.1	35	36	35	0	34	0.36					11	2008
36.66	0	36	0	0	0	0					12	2008
36.68	0	36	0	0	0	0					1	2009
37.85	0	36	0	0	0	0					2	2009
299.78	35	36	0	35	35	0.44					3	2009
393.43	35	35	0	35	35	0.7					4	2009
34.31	0	35	0	0	0	0					5	2009
37.85	0	30	0	0	0	0					6	2009
827.86	35	35	35	0	35	0.37					7	2009
37.85	0	35	0	0	0	0					9	2009
34.29	0	35	0	0	0	0					10	2009
35.49	0	35	0	0	0	0					11	2009
36.67	0	35	0	0	0	0					1	2010
191.09	35	35	0	0	35	0.06					3	2010
196.45	35	35	0	35	34	0.06					4	2010
69.49	3	30	0	0	3	0					7	2010
361.88	30	30	0	0	30	0					8	2010
456.37	34	34	0	0	34	0.15					9	2010
497.84	36	36	0	0	36	0.22					10	2010
34.29	0	36	0	0	0	0					11	2010
35.48	0	35	0	0	0	0	20		3522769182	7863435735	1	2011
34.3	0	35	0	0	0	0	20		3522769182	7863435735	2	2011
208.27	35	35	0	0	35	0.11	20		3522769182	7863435735	3	2011
184.95	35	35	0	35	0	0.02	20		3522769182	7863435735	4	2011
33.12	0	36	0	0	0	0	20		3522769182	7863435735	5	2011
37.85	0	36	0	0	0	0	20		3522769182	7863435735	6	2011
679.23	35	36	35	0	35	0.07	20		3522769182	7863435735	7	2011
807.3	36	36	36	0	36	0.34	20		3522769182	7863435735	8	2011
812.59	35	36	35	0	35	0.46	20		3522769182	7863435735	9	2011
34.3	0	36	0	0	0	0	20		3522769182	7863435735	10	2011
37.85	0	35	0	0	0	0	20		3522769182	7863435735	12	2011
452.87	34	35	0	34	34	1.01	20		3522769182	7863435735	1	2012
267.84	35	35	0	35	34	0.22	20		3522769182	7863435735	2	2012
650.23	35	35	0	35	35	1.11	20		3522769182	7863435735	3	2012
388.09	35	35	0	34	35	0.59	20		3522769182	7863435735	4	2012
1409.56	35	36	34	34	35	1.95	20		3522769182	7863435735	5	2012
852.12	34	36	34	0	34	0.81	20	D&I 73 522530	3522769182	7863435735	6	2012
43.99	2	36	0	0	2	0	20	D&I 73 522530	3522769182	7863435735	7	2012
22.67	0	35	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	8	2012
22.67	0	34	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	10	2012
27.52	5	35	0	5	0	0	20	D&I 73 522530	3522769182	7863435735	11	2012
24.18	0	35	0	0	0	0	20	D&I 73 522530	3522769182	7863435735	12	2012
22.67	0	35	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	1 2013
24.94	0	35	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	2 2013
416.89	35	35	0	34	35	0.65	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	3 2013
42.78	0	35	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	4 2013
41.4	0	35	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	5 2013
41.39	0	30	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	6 2013
41.39	0	30	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	7 2013

44.16	0	30	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	8	2013
41.39	0	30	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	9	2013
26.22	0	30	0	0	0	0	60	D&I 73 522530	3522769182	7863435735	10/8/2013 00:00:00	10	2013
85.76	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		1	2003
84.53	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		2	2003
197.68	0	30	0	0	0	0.21	20	D&I 78 522530	3522769182	4408183593		3	2003
136.02	0	30	0	0	0	0.1	20	D&I 78 522530	3522769182	4408183593		4	2003
90.13	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		5	2003
796.32	0	30	0	0	0	0.92	20	D&I 78 522530	3522769182	4408183593		6	2003
593.92	0	30	0	0	0	0.67	20	D&I 78 522530	3522769182	4408183593		7	2003
356.44	0	30	0	0	0	0.36	20	D&I 78 522530	3522769182	4408183593		8	2003
149.45	0	30	0	0	0	0.11	20	D&I 78 522530	3522769182	4408183593		9	2003
194.49	0	30	0	0	0	0.13	20	D&I 78 522530	3522769182	4408183593		10	2003
122.2	0	30	0	0	0	0.07	20	D&I 78 522530	3522769182	4408183593		11	2003
83.91	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		12	2003
85.76	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		1	2004
85.77	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		2	2004
90.77	0	30	0	0	0	0.02	20	D&I 78 522530	3522769182	4408183593		3	2004
214.71	0	30	0	0	0	0.48	20	D&I 78 522530	3522769182	4408183593		4	2004
198.02	0	30	0	0	0	0.27	20	D&I 78 522530	3522769182	4408183593		5	2004
445.42	0	30	0	0	0	0.58	20	D&I 78 522530	3522769182	4408183593		6	2004
360.08	0	30	0	0	0	0.6	20	D&I 78 522530	3522769182	4408183593		7	2004
114.39	0	30	0	0	0	0.1	20	D&I 78 522530	3522769182	4408183593		8	2004
119.8	0	30	0	0	0	0.11	20	D&I 78 522530	3522769182	4408183593		9	2004
197.16	0	30	0	0	0	0.14	20	D&I 78 522530	3522769182	4408183593		10	2004
83.9	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		11	2004
83.33	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		12	2004
89.96	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		1	2005
90.25	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		2	2005
89.01	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		3	2005
90.95	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		4	2005
253.58	0	30	0	0	0	0.16	20	D&I 78 522530	3522769182	4408183593		5	2005
111.57	0	30	0	0	0	0.01	20	D&I 78 522530	3522769182	4408183593		6	2005
235.61	0	30	0	0	0	0.29	20	D&I 78 522530	3522769182	4408183593		7	2005
96.55	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		8	2005
97.78	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		9	2005
-10.47	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		10	2005
89.52	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		11	2005
89.63	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		12	2005
95.37	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		1	2006
114.89	0	30	0	0	0	0.05	20	D&I 78 522530	3522769182	4408183593		2	2006
96.86	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		3	2006
100.57	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		4	2006
107.18	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		5	2006
110.07	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		6	2006
231.99	0	30	0	0	0	0.15	20	D&I 78 522530	3522769182	4408183593		7	2006
108.21	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593		8	2006
60.64	0	30	0	0	0	0						1	2008
38.32	0	30	0	0	0	0						2	2008
202.49	0	30	0	0	0	0.32						3	2008

159.73	0	30	0	0	0	0.23					4	2008
229.16	0	30	0	0	0	0.22					5	2008
149.34	0	30	0	0	0	0.01					6	2008
146.79	0	30	0	0	0	0					7	2008
144.7	0	30	0	0	0	0					8	2008
145.39	0	30	0	0	0	0					9	2008
149.28	0	30	0	0	0	0					10	2008
76.44	0	30	0	0	0	0					11	2008
39.24	0	30	0	0	0	0					12	2008
44.52	0	30	0	0	0	0					1	2009
38.84	0	30	0	0	0	0					2	2009
90.69	0	30	0	0	0	0.09					3	2009
208.65	0	30	0	0	0	0.33					4	2009
124.31	0	30	0	0	0	0					5	2009
159.34	0	30	0	0	0	0					6	2009
286.85	0	30	0	0	0	0.2					7	2009
157.12	0	30	0	0	0	0					8	2009
159.09	0	30	0	0	0	0					9	2009
157.62	0	30	0	0	0	0					10	2009
82.64	0	30	0	0	0	0					11	2009
40.91	0	30	0	0	0	0					12	2009
41.31	0	30	0	0	0	0					1	2010
42.8	0	30	0	0	0	0					2	2010
41.67	0	30	0	0	0	0					3	2010
42.55	0	30	0	0	0	0					4	2010
140.33	0	30	0	0	0	0					5	2010
163.24	0	30	0	0	0	0					6	2010
163.79	0	30	0	0	0	0					7	2010
162.23	0	30	0	0	0	0					8	2010
164.19	0	30	0	0	0	0					9	2010
242.79	0	30	0	0	0	0.13					10	2010
78.39	0	30	0	0	0	0					11	2010
42.34	0	30	0	0	0	0					12	2010
41.86	0	30	0	0	0	0	20		3522769182	4408183593	1	2011
41.5	0	30	0	0	0	0	20		3522769182	4408183593	2	2011
65.71	0	30	0	0	0	0.06	20		3522769182	4408183593	3	2011
42.3	0	30	0	0	0	0	20		3522769182	4408183593	4	2011
298.26	0	30	0	0	0	0	20		3522769182	4408183593	6	2011
286.76	0	30	0	0	0	0.22	20		3522769182	4408183593	7	2011
163.09	0	30	0	0	0	0	20		3522769182	4408183593	8	2011
228.25	0	30	0	0	0	0.11	20		3522769182	4408183593	9	2011
162.4	0	30	0	0	0	0	20		3522769182	4408183593	10	2011
88.07	0	30	0	0	0	0	20		3522769182	4408183593	11	2011
43.25	0	30	0	0	0	0	20		3522769182	4408183593	12	2011
127.55	0	30	0	0	0	0.17	20		3522769182	4408183593	1	2012
50.13	0	30	0	0	0	0	20		3522769182	4408183593	2	2012
47.09	0	30	0	0	0	0	20		3522769182	4408183593	3	2012
46.17	0	30	0	0	0	0	20		3522769182	4408183593	4	2012
326.38	0	30	0	0	0	0.35	20		3522769182	4408183593	5	2012
251.1	0	30	0	0	0	0.07	20	D&I 78 522530	3522769182	4408183593	6	2012

288.2	0	30	0	0	0	0.17	20	D&I 78 522530	3522769182	4408183593	7	2012
282.23	0	30	0	0	0	0.13	20	D&I 78 522530	3522769182	4408183593	8	2012
187.24	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	9	2012
187.1	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	10	2012
104.47	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	11	2012
49.34	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	12	2012
47.87	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	1	2013
50.13	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	2	2013
46.17	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	3	2013
48.67	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	4	2013
143.09	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	5	2013
190.84	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	6	2013
191.03	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	7	2013
193.34	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	8	2013
191.47	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	9	2013
193.32	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	10	2013
106.93	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	11	2013
49.15	0	30	0	0	0	0	20	D&I 78 522530	3522769182	4408183593	12	2013
40	36	36	0	0	0	0.04	20	D&I 144 522530	3522769182	4408112669	2	2013
169.06	37	37	0	0	0	0.23	20	D&I 144 522530	3522769182	4408112669	3	2013
66.22	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	4	2013
336.35	37	37	0	0	0	0.55	20	D&I 144 522530	3522769182	4408112669	5	2013
563.9	36	36	0	0	0	0.42	20	D&I 144 522530	3522769182	4408112669	6	2013
977.54	36	36	0	0	0	1.29	20	D&I 144 522530	3522769182	4408112669	7	2013
550.88	36	36	0	0	0	0.38	20	D&I 144 522530	3522769182	4408112669	8	2013
525.23	36	36	0	0	0	0.42	20	D&I 144 522530	3522769182	4408112669	9	2013
496.06	36	36	0	0	0	0.35	20	D&I 144 522530	3522769182	4408112669	10	2013
665.24	36	36	0	0	0	0.68	20	D&I 144 522530	3522769182	4408112669	11	2013
112.21	37	37	0	0	0	0.1	20	D&I 144 522530	3522769182	4408112669	12	2013
207.26	37	37	0	0	0	0.31	20	D&I 144 522530	3522769182	4408112669	1	2014
85.15	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	1	2003
85.77	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	2	2003
230.87	0	30	0	0	0	0.3	20	D&I 144 522530	3522769182	4408112669	3	2003
220.88	0	30	0	0	0	0.28	20	D&I 144 522530	3522769182	4408112669	4	2003
1430.95	0	30	0	0	0	1.74	20	D&I 144 522530	3522769182	4408112669	5	2003
1402.48	0	30	0	0	0	1.85	20	D&I 144 522530	3522769182	4408112669	6	2003
2347.82	0	30	0	0	0	2.95	20	D&I 144 522530	3522769182	4408112669	7	2003
1073.68	0	30	0	0	0	1.44	20	D&I 144 522530	3522769182	4408112669	8	2003
960.14	0	30	0	0	0	1.2	20	D&I 144 522530	3522769182	4408112669	9	2003
89.91	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	10	2003
599.35	0	30	0	0	0	0.72	20	D&I 144 522530	3522769182	4408112669	11	2003
85.77	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	12	2003
85.15	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	1	2004
85.77	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	2	2004
84.53	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	3	2004
1026.13	0	30	0	0	0	3.58	20	D&I 144 522530	3522769182	4408112669	4	2004
696.56	0	30	0	0	0	1.61	20	D&I 144 522530	3522769182	4408112669	5	2004
1673.87	0	30	0	0	0	3.99	20	D&I 144 522530	3522769182	4408112669	6	2004
1446.34	0	30	0	0	0	3.37	20	D&I 144 522530	3522769182	4408112669	7	2004
759.95	0	30	0	0	0	1.55	20	D&I 144 522530	3522769182	4408112669	8	2004

1007.53	0	30	0	0	0	2.18	20	D&I 144 522530	3522769182	4408112669	9	2004
576.49	0	30	0	0	0	1.02	20	D&I 144 522530	3522769182	4408112669	10	2004
64.46	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	11	2004
84.56	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	12	2004
87.74	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	1	2005
90.87	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	2	2005
89.02	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	3	2005
144.43	0	30	0	0	0	0.14	20	D&I 144 522530	3522769182	4408112669	4	2005
305.36	0	30	0	0	0	0.4	20	D&I 144 522530	3522769182	4408112669	5	2005
898.69	0	30	0	0	0	1.36	20	D&I 144 522530	3522769182	4408112669	6	2005
1041.28	0	30	0	0	0	1.57	20	D&I 144 522530	3522769182	4408112669	7	2005
512.33	0	30	0	0	0	0.71	20	D&I 144 522530	3522769182	4408112669	8	2005
296.79	0	30	0	0	0	0.3	20	D&I 144 522530	3522769182	4408112669	9	2005
-206.12	0	30	0	0	0	0.43	20	D&I 144 522530	3522769182	4408112669	10	2005
208.85	0	30	0	0	0	0.19	20	D&I 144 522530	3522769182	4408112669	11	2005
89.01	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	12	2005
95.67	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	1	2006
257.68	0	30	0	0	0	0.45	20	D&I 144 522530	3522769182	4408112669	2	2006
158.22	0	30	0	0	0	0.18	20	D&I 144 522530	3522769182	4408112669	3	2006
100.65	0	30	0	0	0	0	20	D&I 144 522530	3522769182	4408112669	4	2006
858.78	0	30	0	0	0	1.19	20	D&I 144 522530	3522769182	4408112669	5	2006
1252.35	0	30	0	0	0	1.79	20	D&I 144 522530	3522769182	4408112669	6	2006
1322.39	0	30	0	0	0	2	20	D&I 144 522530	3522769182	4408112669	7	2006
1409.93	0	30	0	0	0	2.08	20	D&I 144 522530	3522769182	4408112669	8	2006
65.13	0	30	0	0	0	0					1	2008
39.39	0	30	0	0	0	0					2	2008
37.49	0	30	0	0	0	0					3	2008
829.09	0	30	0	0	0	1.53					4	2008
879.06	0	30	0	0	0	1.26					5	2008
475.03	0	30	0	0	0	0.46					6	2008
409.07	0	30	0	0	0	0.37					7	2008
873.4	0	30	0	0	0	1.13					8	2008
267.73	0	30	0	0	0	0.18					9	2008
146.68	0	30	0	0	0	0					10	2008
94.86	0	30	0	0	0	0					11	2008
39.69	0	30	0	0	0	0					12	2008
39.46	0	30	0	0	0	0					1	2009
40.59	0	30	0	0	0	0					2	2009
39.19	0	30	0	0	0	0					3	2009
191.44	0	30	0	0	0	0.27					4	2009
253.88	0	30	0	0	0	0.23					5	2009
847.21	0	30	0	0	0	0.96					6	2009
1234.88	0	30	0	0	0	1.47					7	2009
1001.86	0	30	0	0	0	1.12					8	2009
944.44	0	30	0	0	0	1.28					9	2009
678.35	0	30	0	0	0	0.74					10	2009
119.5	0	30	0	0	0	0.04					11	2009
42.49	0	30	0	0	0	0					1	2010
41.29	0	30	0	0	0	0					2	2010
43.38	0	30	0	0	0	0					3	2010

39.91	0	30	0	0	0	0						4	2010
122.55	0	30	0	0	0	0						5	2010
860.11	0	30	0	0	0	0.85						6	2010
1920.98	0	30	0	0	0	2.35						7	2010
1233.07	0	30	0	0	0	1.52						8	2010
267.28	0	30	0	0	0	0.16						9	2010
195.83	0	30	0	0	0	0.06						10	2010
86.31	0	30	0	0	0	0						11	2010
42.09	0	30	0	0	0	0						12	2010
41.64	0	30	0	0	0	0	20		3522769182	4408112669		1	2011
41.5	0	30	0	0	0	0	20		3522769182	4408112669		2	2011
43.19	0	30	0	0	0	0	20		3522769182	4408112669		3	2011
41.59	0	30	0	0	0	0	20		3522769182	4408112669		4	2011
1591.42	0	30	0	0	0	2.84	20		3522769182	4408112669		5	2011
660.83	0	30	0	0	0	0.87	20		3522769182	4408112669		6	2011
1503.56	0	30	0	0	0	2.36	20		3522769182	4408112669		7	2011
779.35	0	30	0	0	0	1.01	20		3522769182	4408112669		8	2011
753.42	0	30	0	0	0	1.02	20		3522769182	4408112669		9	2011
211.93	0	30	0	0	0	0.08	20		3522769182	4408112669		10	2011
460.01	0	30	0	0	0	0.62	20		3522769182	4408112669		11	2011
40.21	0	30	0	0	0	0	20		3522769182	4408112669		12	2011
44.47	0	30	0	0	0	0	20		3522769182	4408112669		1	2012
333.37	0	30	0	0	0	0.66	20		3522769182	4408112669		2	2012
200.84	0	30	0	0	0	0.32	20		3522769182	4408112669		3	2012
71.86	0	30	0	0	0	0	20		3522769182	4408112669		4	2012
635.97	0	30	0	0	0	1	20		3522769182	4408112669		5	2012
1515.2	0	30	0	0	0	2.39	20	D&I 144 522530	3522769182	4408112669		6	2012
1784.11	0	30	0	0	0	3.08	20	D&I 144 522530	3522769182	4408112669		7	2012
1294.17	0	30	0	0	0	2	20	D&I 144 522530	3522769182	4408112669		8	2012
687.33	0	30	0	0	0	0.84	20	D&I 144 522530	3522769182	4408112669		9	2012
501	0	30	0	0	0	0.47	20	D&I 144 522530	3522769182	4408112669		10	2012
218.71	0	30	0	0	0	0.09	20	D&I 144 522530	3522769182	4408112669		11	2012
89.77	0	30	0	0	0	0.04	20	D&I 144 522530	3522769182	4408112669		12	2012
94.21	0	30	0	0	0	0	60	D&I 144 522530	3522769182	4408112669	1/25/2013 00:00:00	1	2013
9.07	0	0	0	0	0	0	20	D&I 241 522530	3522769182	4408111626		2	2013
179.37	32	32	0	32	32	0.26	20	D&I 241 522530	3522769182	4408111626		3	2013
195.57	31	31	0	31	31	0.32	20	D&I 241 522530	3522769182	4408111626		4	2013
481.49	31	31	0	31	31	0.97	20	D&I 241 522530	3522769182	4408111626		5	2013
925.94	32	32	1	0	32	1.54	20	D&I 241 522530	3522769182	4408111626		6	2013
1183.52	32	32	31	0	32	1.84	20	D&I 241 522530	3522769182	4408111626		7	2013
965.58	32	32	32	0	32	1.57	20	D&I 241 522530	3522769182	4408111626		8	2013
872.65	31	31	31	0	31	1.11	20	D&I 241 522530	3522769182	4408111626		9	2013
599.64	32	32	0	0	32	0.89	20	D&I 241 522530	3522769182	4408111626		10	2013
902.51	32	32	31	0	32	1.25	20	D&I 241 522530	3522769182	4408111626		11	2013
156.03	31	31	0	0	31	0.22	20	D&I 241 522530	3522769182	4408111626		12	2013
24.18	0	0	0	0	0	0	20	D&I 241 522530	3522769182	4408111626		1	2014
189.61	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626		1	2003
190.33	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626		2	2003
293.07	38	38	0	32	38	0.31	20	D&I 241 522530	3522769182	4408111626		3	2003
325.72	38	38	0	32	38	0.4	20	D&I 241 522530	3522769182	4408111626		4	2003

571.08	38	39	38	0	38	0.59	20	D&I 241 522530	3522769182	4408111626	5	2003
703.8	38	38	38	0	38	0.86	20	D&I 241 522530	3522769182	4408111626	6	2003
936.81	38	38	38	0	38	1.41	20	D&I 241 522530	3522769182	4408111626	7	2003
727.75	38	38	38	0	38	0.92	20	D&I 241 522530	3522769182	4408111626	8	2003
570.69	38	38	38	0	38	0.49	20	D&I 241 522530	3522769182	4408111626	9	2003
269.86	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	10	2003
477.88	38	38	38	0	38	0.61	20	D&I 241 522530	3522769182	4408111626	11	2003
190.33	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	12	2003
189.6	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	1	2004
190.33	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	2	2004
226.79	32	38	0	32	32	0.2	20	D&I 241 522530	3522769182	4408111626	3	2004
357.05	38	38	0	38	38	0.96	20	D&I 241 522530	3522769182	4408111626	4	2004
498.02	38	38	38	32	38	0.86	20	D&I 241 522530	3522769182	4408111626	5	2004
702.57	38	38	38	0	38	1.68	20	D&I 241 522530	3522769182	4408111626	6	2004
715.27	38	38	38	0	38	1.69	20	D&I 241 522530	3522769182	4408111626	7	2004
548.69	38	38	38	0	38	0.9	20	D&I 241 522530	3522769182	4408111626	8	2004
504.78	37	38	37	0	37	0.66	20	D&I 241 522530	3522769182	4408111626	9	2004
531.15	37	38	37	0	37	0.79	20	D&I 241 522530	3522769182	4408111626	10	2004
212.94	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	11	2004
187.67	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	12	2004
195.26	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	1	2005
200.59	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	2	2005
198.41	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	3	2005
274.86	38	38	0	38	38	0.3	20	D&I 241 522530	3522769182	4408111626	4	2005
583.8	38	38	38	38	38	0.88	20	D&I 241 522530	3522769182	4408111626	5	2005
709.25	38	38	38	0	38	1.08	20	D&I 241 522530	3522769182	4408111626	6	2005
714.97	37	38	37	0	37	1.18	20	D&I 241 522530	3522769182	4408111626	7	2005
696.65	38	38	38	0	38	1.09	20	D&I 241 522530	3522769182	4408111626	8	2005
543.44	37	38	37	0	37	0.48	20	D&I 241 522530	3522769182	4408111626	9	2005
324.54	32	38	0	0	32	0.16	20	D&I 241 522530	3522769182	4408111626	10	2005
388.87	37	38	37	0	37	0.45	20	D&I 241 522530	3522769182	4408111626	11	2005
198.42	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	12	2005
77.63	0	38	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	1	2006
367.19	37	38	0	37	32	0.28	20	D&I 241 522530	3522769182	4408111626	2	2006
292.3	32	38	0	0	32	0.11	20	D&I 241 522530	3522769182	4408111626	3	2006
22.41	0	37	0	0	0	0	20	D&I 241 522530	3522769182	4408111626	4	2006
707.67	38	38	38	32	38	0.81	20	D&I 241 522530	3522769182	4408111626	5	2006
778.22	37	38	37	0	37	0.96	20	D&I 241 522530	3522769182	4408111626	6	2006
871.7	37	38	37	0	37	1.32	20	D&I 241 522530	3522769182	4408111626	7	2006
689.12	37	37	37	0	37	0.67	20	D&I 241 522530	3522769182	4408111626	8	2006
29.97	0	37	0	0	0	0					1	2008
37.85	0	37	0	0	0	0					2	2008
182.94	32	37	0	32	32	0.12					3	2008
373.14	37	37	0	37	37	0.68					4	2008
617.37	37	38	37	37	37	0.77					5	2008
883.34	37	37	37	0	37	1.01					6	2008
819.33	37	37	37	0	37	0.87					7	2008
26.5	0	37	0	0	0	0					8	2008
1037.75	37	37	37	0	37	1.33					9	2008
290.07	32	37	8	0	32	0.11					10	2008

282.26	31	37	31	0	31	0.2						11	2008
25.66	0	37	0	0	0	0						1	2009
131.26	32	37	0	32	32	0.16						3	2009
371.99	37	37	0	37	37	0.66						4	2009
530.55	37	37	37	37	37	0.48						5	2009
954.4	37	37	37	0	37	0.99						6	2009
948.15	37	37	37	0	37	1.01						7	2009
947.57	37	37	37	0	37	1.02						8	2009
699.73	37	37	36	0	37	0.59						9	2009
24	0	37	0	0	0	0						10	2009
71.79	0	37	0	0	0	0.09						11	2009
24.83	0	37	0	0	0	0						12	2009
27.33	0	37	0	0	0	0						1	2010
84.36	31	37	0	31	31	0.03						3	2010
109	32	32	0	32	32	0.08						4	2010
24.02	0	37	0	0	0	0						5	2010
24.84	0	37	0	0	0	0						6	2010
25.68	0	37	0	0	0	0						7	2010
26.5	0	30	0	0	0	0						9	2010
2533.1	37	37	37	0	37	3.91						10	2010
24.01	0	37	0	0	0	0						11	2010
26.5	0	32	0	0	0	0						12	2010
24.85	0	32	0	0	0	0	20		3522769182	4408111626		1	2011
24.01	0	32	0	0	0	0	20		3522769182	4408111626		2	2011
206.94	32	32	0	31	32	0.38	20		3522769182	4408111626		3	2011
141.04	31	32	0	31	31	0.2	20		3522769182	4408111626		4	2011
633.91	37	37	37	37	37	0.82	20		3522769182	4408111626		5	2011
657.52	37	37	37	0	37	0.64	20		3522769182	4408111626		6	2011
1012.36	37	37	37	0	37	1.46	20		3522769182	4408111626		7	2011
938.74	37	37	37	0	37	1.25	20		3522769182	4408111626		8	2011
739.43	37	37	37	0	37	0.82	20		3522769182	4408111626		9	2011
538.58	37	37	37	0	37	0.35	20		3522769182	4408111626		10	2011
360.4	37	37	37	0	37	0.41	20		3522769182	4408111626		11	2011
23.18	0	32	0	0	0	0	20		3522769182	4408111626		12	2011
26.58	0	32	0	0	0	0	20		3522769182	4408111626		1	2012
31.45	0	32	0	0	0	0	20		3522769182	4408111626		2	2012
339.54	37	37	0	37	37	0.66	20		3522769182	4408111626		3	2012
141.12	31	37	0	31	31	0.16	20		3522769182	4408111626		4	2012
700.97	37	37	37	31	37	0.96	20		3522769182	4408111626		5	2012
1232.72	37	37	37	0	37	1.69	20	D&I 241 522530	3522769182	4408111626		6	2012
1481.61	38	38	37	0	38	2.23	20	D&I 241 522530	3522769182	4408111626		7	2012
1097.93	37	38	37	0	37	1.53	20	D&I 241 522530	3522769182	4408111626		8	2012
1025.11	37	38	37	0	37	1.31	20	D&I 241 522530	3522769182	4408111626		9	2012
584.41	32	38	12	0	32	0.67	20	D&I 241 522530	3522769182	4408111626		10	2012
416.29	31	38	31	0	31	0.48	20	D&I 241 522530	3522769182	4408111626		11	2012
30.49	0	37	0	0	0	0	20	D&I 241 522530	3522769182	4408111626		12	2012
28.58	0	37	0	0	0	0	60	D&I 241 522530	3522769182	4408111626	1/24/2013 00:00:00	1	2013
7.63	0	37	0	0	0	0	60	D&I 241 522530	3522769182	4408111626	1/24/2013 00:00:00	1	2013
569.18	39	39	39	0	39	0.22	20	D&I 242 522530	3522769182	4408182550		11	2013
23.43	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550		12	2013

99.54	34	34	0	34	34	0.15	20	D&I 242 522530	3522769182	4408182550	1	2014
85.7	0	37	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	1	2003
88.61	0	37	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	2	2003
85.7	0	37	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	3	2003
23.13	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	4	2003
516.43	33	36	33	33	33	0.45	20	D&I 242 522530	3522769182	4408182550	5	2003
726.89	33	33	33	0	33	0.79	20	D&I 242 522530	3522769182	4408182550	6	2003
908.04	34	34	33	0	34	1.16	20	D&I 242 522530	3522769182	4408182550	7	2003
696.88	34	34	34	0	34	0.74	20	D&I 242 522530	3522769182	4408182550	8	2003
119.56	0	34	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	9	2003
119.57	0	34	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	10	2003
44.67	0	34	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	11	2003
21.68	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	12	2003
22.41	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	1	2004
23.13	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	2	2004
20.96	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	3	2004
281.24	36	36	0	33	36	0.73	20	D&I 242 522530	3522769182	4408182550	4	2004
114.65	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	5	2004
1234.52	33	34	33	0	33	3.01	20	D&I 242 522530	3522769182	4408182550	6	2004
801.4	33	34	33	0	33	1.68	20	D&I 242 522530	3522769182	4408182550	7	2004
455.88	33	33	33	0	33	0.74	20	D&I 242 522530	3522769182	4408182550	8	2004
115.73	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	9	2004
116.46	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	10	2004
89.52	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	11	2004
83.69	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	12	2004
89.6	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	1	2005
88.64	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	2	2005
88.65	0	36	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	3	2005
23.13	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	4	2005
110.7	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	5	2005
612.75	38	38	33	0	38	0.83	20	D&I 242 522530	3522769182	4408182550	6	2005
139.41	0	38	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	7	2005
1321.59	33	38	33	0	33	2.38	20	D&I 242 522530	3522769182	4408182550	8	2005
838.88	33	38	33	0	33	1.29	20	D&I 242 522530	3522769182	4408182550	9	2005
232.95	33	38	33	0	33	0	20	D&I 242 522530	3522769182	4408182550	10	2005
41	0	38	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	11	2005
21.68	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	12	2005
23.14	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	1	2006
21.68	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	2	2006
23.13	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	3	2006
21.69	0	0	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	4	2006
20.96	0	38	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	5	2006
23.13	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	6	2006
21.68	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	7	2006
20.96	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	8	2006
157.12	33	33	0	33	33	0.14					1	2008
24.83	0	33	0	0	0	0					2	2008
140.05	33	33	0	0	33	0.18					3	2008
26.5	0	33	0	0	0	0					4	2008
24.02	0	34	0	0	0	0					5	2008

24.83	0	34	0	0	0	0					6	2008
718.68	33	33	33	0	33	0.76					7	2008
1054.22	35	35	33	0	35	1.25					8	2008
24.83	0	35	0	0	0	0					9	2008
26.5	0	35	0	0	0	0					10	2008
23.18	0	35	0	0	0	0					11	2008
25.66	0	33	0	0	0	0					12	2008
25.68	0	33	0	0	0	0					1	2009
26.5	0	0	0	0	0	0					3	2009
337.85	34	34	0	33	34	0.6					4	2009
24.02	0	35	0	0	0	0					5	2009
605.86	33	35	33	0	33	0.41					7	2009
830.59	33	33	33	0	33	0.82					8	2009
1595.61	33	33	33	0	33	2.11					9	2009
717.67	33	33	33	0	33	0.65					10	2009
24.85	0	34	0	0	0	0					11	2009
26.5	0	34	0	0	0	0					12	2009
25.67	0	34	0	0	0	0					1	2010
24.83	0	0	0	0	0	0					4	2010
25.67	0	33	0	0	0	0					5	2010
24.02	0	33	0	0	0	0					6	2010
24.85	0	33	0	0	0	0					7	2010
1168.4	34	34	33	0	34	1.32					8	2010
1233.44	34	34	34	0	34	1.43					9	2010
876.87	33	34	33	0	33	0.88					10	2010
24.01	0	34	0	0	0	0					11	2010
24.84	0	0	0	0	0	0	20		3522769182	4408182550	1	2011
24.01	0	0	0	0	0	0	20		3522769182	4408182550	2	2011
26.49	0	0	0	0	0	0	20		3522769182	4408182550	3	2011
25.66	0	0	0	0	0	0	20		3522769182	4408182550	4	2011
374.61	34	34	0	34	33	0.89	20		3522769182	4408182550	5	2011
26.49	0	34	0	0	0	0	20		3522769182	4408182550	6	2011
560.04	34	34	33	0	34	0.4	20		3522769182	4408182550	7	2011
941.14	33	34	33	0	33	1.28	20		3522769182	4408182550	8	2011
1069.53	33	34	33	0	33	1.57	20		3522769182	4408182550	9	2011
387.54	33	34	33	0	33	0.07	20		3522769182	4408182550	10	2011
24.01	0	34	0	0	0	0	20		3522769182	4408182550	11	2011
26.5	0	0	0	0	0	0	20		3522769182	4408182550	12	2011
186.45	33	33	0	33	33	0.27	20		3522769182	4408182550	1	2012
31.45	0	33	0	0	0	0	20		3522769182	4408182550	2	2012
93.25	32	33	0	0	32	0.04	20		3522769182	4408182550	3	2012
26.68	0	33	0	0	0	0	20		3522769182	4408182550	4	2012
239.65	34	34	0	34	33	0.17	20		3522769182	4408182550	5	2012
409.13	33	34	30	0	33	0.07	20	D&I 242 522530	3522769182	4408182550	6	2012
908.71	33	33	33	0	33	1.09	20	D&I 242 522530	3522769182	4408182550	7	2012
820.5	33	33	33	0	33	0.88	20	D&I 242 522530	3522769182	4408182550	8	2012
867.53	33	33	33	0	33	0.99	20	D&I 242 522530	3522769182	4408182550	9	2012
454.33	33	33	33	0	33	0.11	20	D&I 242 522530	3522769182	4408182550	10	2012
29.71	2	33	0	2	0	0	20	D&I 242 522530	3522769182	4408182550	11	2012
30.49	0	33	0	0	0	0	20	D&I 242 522530	3522769182	4408182550	12	2012

28.59	0	32	0	0	0	0	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	1	2013
31.45	0	32	0	0	0	0	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	2	2013
169.98	33	33	0	33	32	0.23	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	3	2013
79.97	30	33	0	0	30	0	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	4	2013
975.6	33	33	33	0	33	1.32	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	5	2013
1456.39	33	33	33	0	33	2.07	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	6	2013
1873.13	33	33	33	0	33	3.1	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	7	2013
2160.36	36	36	36	0	34	2.96	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	8	2013
1828.7	49	49	49	0	36	2.09	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	9	2013
656.94	35	49	35	0	35	0.57	60	D&I 242 522530	3522769182	4408182550	10/8/2013 00:00:00	10	2013

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-5

Merced IRWM Plan Ground Recharge Feasibility Study

MERCED IRWMP

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Merced Integrated Regional Water Management Plan

Groundwater Recharge Feasibility Study

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Exp 11/2014
STATE OF CALIFORNIA

August 2013

Technical Memorandum

Merced IRWM Plan Development

Subject: **Groundwater Recharge Feasibility Study**

Prepared For: Merced Regional Water Management Group

Prepared by: Jim Blanke

Reviewed by: Ali Taghavi

Date: August 2013

1 Introduction

The Merced Integrated Regional Water Management (Merced IRWM) program is a collaborative effort to identify water management issues, needs, objectives, actions, and priorities to meet the long-term water needs of the Merced Region─ generally the area of Merced County bounded by the Merced River and watershed (Dry Creek) to the northwest, the San Joaquin River to the southwest, the Chowchilla River to the southeast, and the Merced county line to the northeast (see Figure 1). The City of Merced, County of Merced, and the Merced Irrigation District have joined together to lead the program with the support of numerous other stakeholders. Figure 2 shows the numerous water purveyors in the Merced Region. The three governing entities comprise the Regional Water Management Group and expect to complete the Merced IRWM Plan in 2013. With the IRWM Plan in place, the Merced Region will be eligible to compete for additional state grants to support local and regional projects. This technical memorandum was developed as part of the planning process to identify projects and programs to address regional water needs, including surface water, groundwater, water quality, wastewater management, flood management, recreation, and natural resources. Specifically, this technical memorandum focuses on the identification of groundwater recharge areas.

The Merced Region has a history of groundwater recharge activities. Recharge from irrigation of agricultural fields, recharge from unlined canals, development of artificial recharge facilities, and the development of recharge studies such as this effort and previous efforts (e.g., *MAGPI Conjunctive Use Site Assessment* (WRIME, Inc., 2003)) indicate a long history of recognition of the benefits of groundwater recharge and actions to realize those benefits.

The purpose of this technical study was to define areas with high potential for recharge by evaluating physical characteristics (e.g., soil type, depth to water, hydrogeology) and anthropogenic (human-influenced) conditions. The information can be used by the RWMG to identify potential locations for artificial recharge facilities, or to define where additional management practices should be considered as part of the overall groundwater management and protection program.

An understanding of areas with high potential for recharge and factors that influence recharge assists in identifying where recharge projects should be considered, where recharge is occurring currently and where existing land use has impacted recharge. Identification of recharge areas and mechanisms can also assist in preserving and managing important natural features such as riparian areas or stream channels. Anthropogenic recharge, particularly deep percolation from agricultural irrigation and earthen-lined canals, is a key source of recharge in the Merced Region. Identifying where this and other human-influenced recharge is occurring can provide an assessment of current recharge and assist in the recognition of the effects of land use change.

This memorandum presents an analysis of the various physical conditions and recharge processes to identify areas with high and low recharge potential. The analysis is tied to potential recharge rates and the overall goals for the Merced IRWM to help identify projects to meet those goals.

Figure 1 Merced IRWM Region

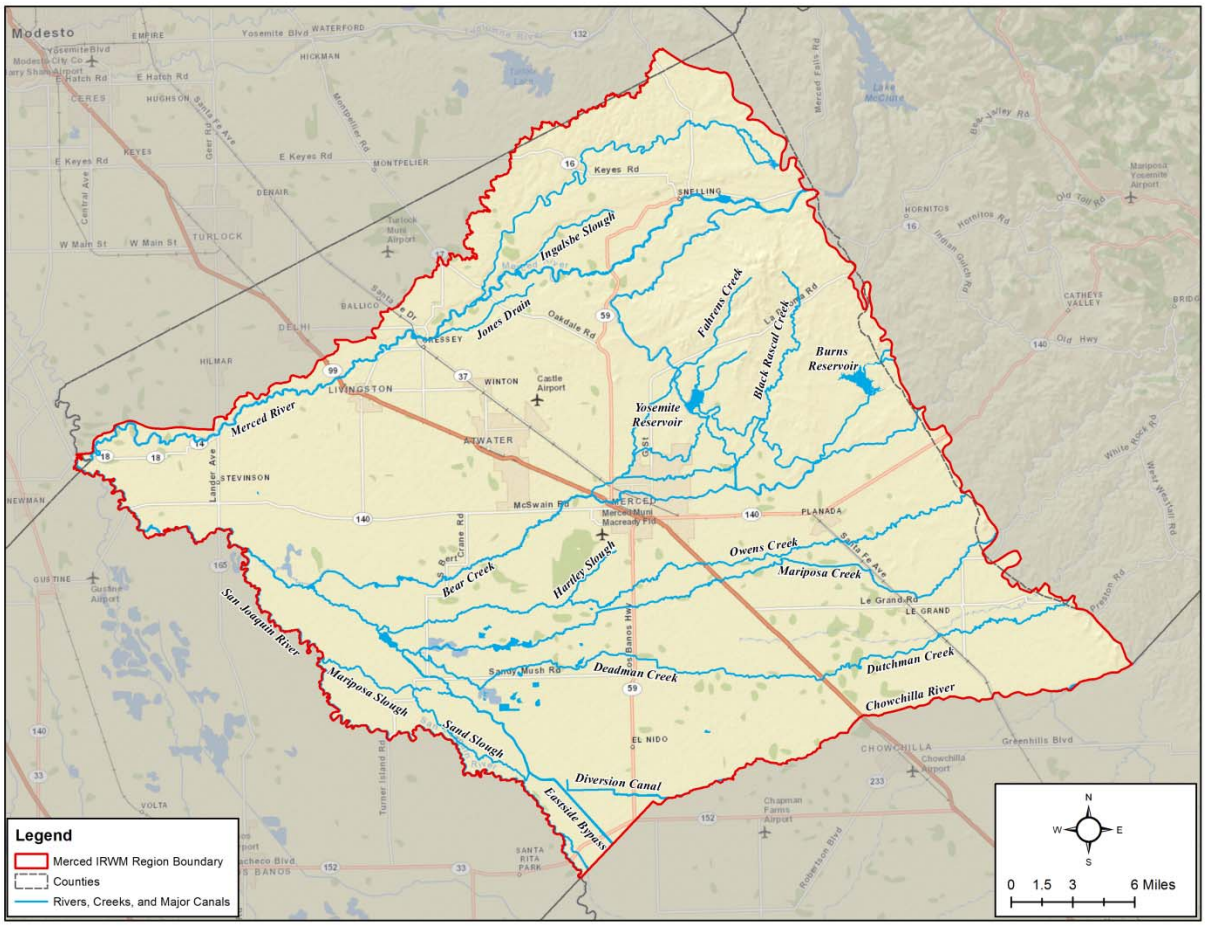
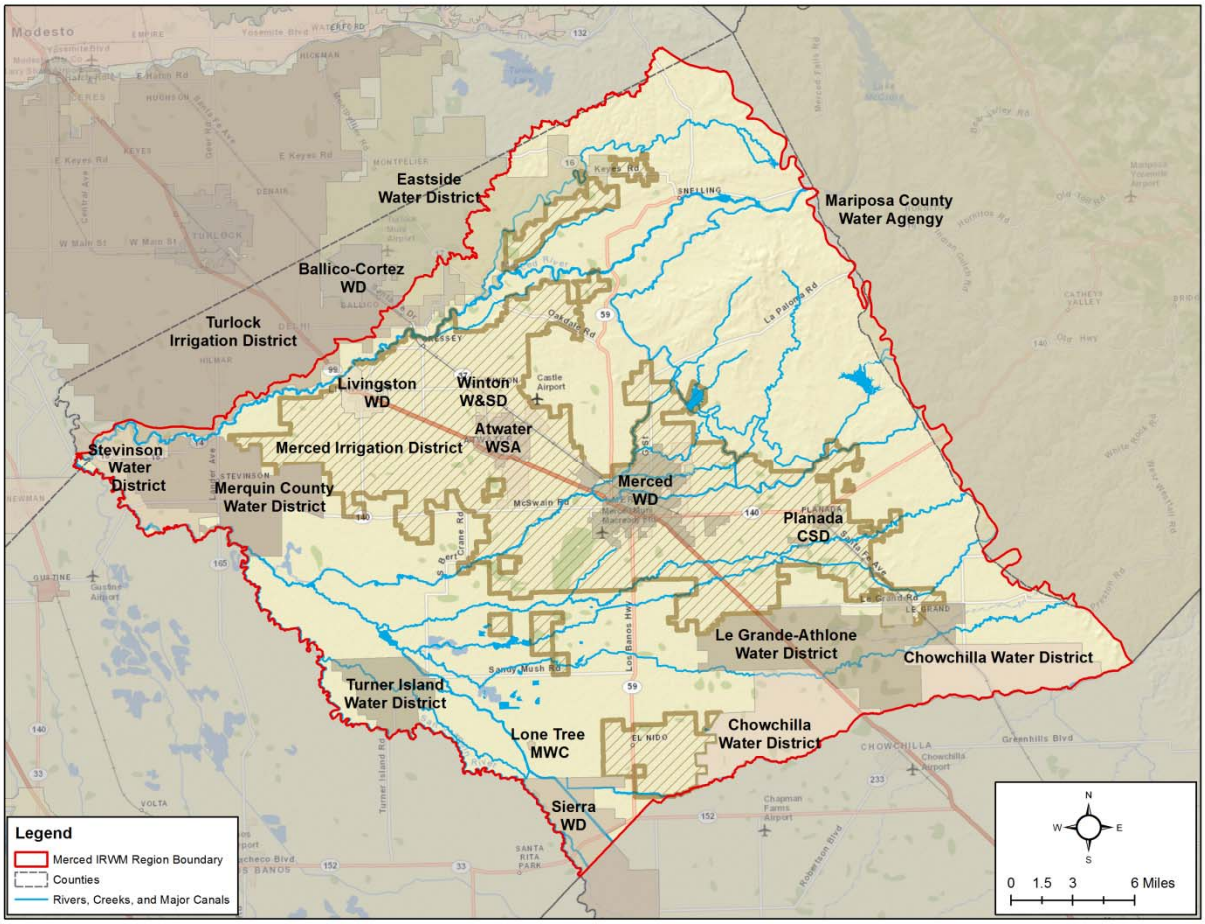


Figure 2 Water Purveyors



2 Vision and Objectives

The Regional Advisory Committee (RAC) developed 12 IRWM Objectives with associated performance measures. Eleven of these objectives have direct relevance to groundwater recharge, as indicated in Table 1, including correcting groundwater overdraft conditions. Recharge, including natural recharge, human-induced (anthropogenic) recharge, and artificial recharge, are important components of water management. These 11 objectives can be met in whole or in part through

- Protection of existing recharge,
- Incorporation of recharge benefits into multi-benefit projects or programs, or
- Development of artificial recharge, including spreading basins and in-lieu recharge.

Together, these recharge components will be an important part of balancing the groundwater budget in the Merced Basin. The groundwater budget is an accounting method of showing the difference between what goes into the groundwater basin (e.g., recharge from precipitation and irrigation, recharge from rivers, subsurface flows from adjacent basins) and what goes out of the groundwater basin (e.g., groundwater pumping, discharge to rivers, subsurface flow to adjacent basins). If the groundwater budget is negative over a long time period (e.g., decades), then there is a long-term trend towards reduced groundwater in storage and declining groundwater levels. If the groundwater budget is positive over a long time period, then there is a long-term trend towards increased groundwater in storage and rising groundwater levels. A groundwater budget showing little difference between inflows and outflows is considered balanced, with stable volumes of groundwater in storage and regionally stable groundwater levels.

In the Merced Region, the current understanding of the groundwater budget indicates a long-term decline in storage (AMEC Geomatrix, 2008). Development of a detailed water budget is planned as part of the development of the new regional integrated water resources model (see Section 6.1.1). Preserving existing recharge and developing artificial recharge can assist in meeting objectives, including correcting groundwater overdraft conditions and others. The RAC has not identified the extent to which it expects groundwater recharge to meet the goal of correcting overdraft conditions, so this memorandum will take the approach of looking at the potential of using recharge as the exclusive tool to meet that goal, while in reality a variety of tools will likely be used, such as conservation and usage of alternate supplies.

Groundwater recharge may occur through three primary methods: spreading basins, in-lieu recharge, and injection.

- The development of spreading basins is the focus of this document. Spreading basins involve the construction of a detention basin, and associated water delivery infrastructure, that allows water to percolate from the ground surface to aquifers used for water supply. The siting of such basins is complex as it requires an understanding of surface and subsurface conditions from the ground surface down to the water supply aquifer.
- In-lieu recharge substitutes alternate water supplies for groundwater production, allowing the groundwater that would have been pumped to stay in the aquifer. This method is simpler as there is no need for the water to migrate down through the subsurface, but the volume that can be recharged is limited to the timing and overall demand for groundwater pumping in the identified area.
- Injection of groundwater, often referred to as Aquifer Storage and Recovery (ASR), uses wells to inject water directly into the subsurface. Like in-lieu, injection avoids the complexity of moving recharge water down through the subsurface, but the injection process is more sensitive to differences in water quality and typically required more facilities although on a small footprint.

The following analysis is focused on the use of spreading basins, although in-lieu and injection remain options for the region.

Table 1 Merced Region IRWM Objectives and Performance Measures

Merced Region IRWM Objective	Performance Measures	Contribution of Groundwater Recharge
A. Manage flood flows for public safety, water supply, recharge, and natural resource management	1. Occurrence of flooding at the Bear Creek, Black Rascal Creek diversion, Deadman Creek, Dry Creek, Fahrens Creek, Lake Yosemite, Mariposa Creek, Merced River, and San Joaquin River 2. Volume of flood water stored and / or recharged 3. Flood-related damages (extent and frequency)	Allow for increased storage and recharge of flood flows to benefit long-term water supplies
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.	1. Curtailment of voluntary and/or mandatory water use restrictions 2. Stability of groundwater levels 3. Ability to meet instream flow requirements	Assist in stabilizing groundwater levels through increased recharge during wetter periods
C. Correct groundwater overdraft conditions.	1. Groundwater surface elevation 2. Volume of water recharged 3. Reduction in groundwater subsidence 4. Improvement in groundwater quality	Assist in stabilizing groundwater levels through increased recharge during wetter periods
D. Improve coordination of land use and water resources planning.	1. Number of cooperative planning meetings held between land use and water resource planning entities 2. Number of General Plans with water resource elements	Inform planners on the importance of areas of recharge and of existing land use.
E. Maximize water use efficiency.	1. Estimated annual savings from demand management programs 2. Volume of water per year put to beneficial reuse 3. Percent of water users with meters and commodity pricing 4. Urban per capita water use (in accordance with provisions of SBx7-7)	Provide an understanding on how improved efficiency may reduce groundwater recharge.

Merced Region IRWM Objective	Performance Measures	Contribution of Groundwater Recharge
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.	1. New 303(d) listings and / or delistings 2. Surface water and groundwater quality	Maintain or improve groundwater quality through selection of recharge water and recharge sites
G. Protect, restore, and improve natural resources.	1. Acres of habitat protection / restoration / enhancement completed 2. Development trends in the largest and most ecologically sensitive areas of Merced County (including the Merced and San Joaquin River corridors and Eastside Grasslands)	Create recharge benefits to allow for cost-effective implementation of multi-benefit projects
H. Address water-related needs of disadvantaged communities (DACs).	1. Programs implemented that focus on meeting critical water-related needs of DACs 2. Percent of population with drinking water that complies with all applicable standards	Improve the quantity of groundwater and maintain or improve the quality of groundwater through recharge
I. Protect and enhance water-associated recreation opportunities.	1. Number of programs that include water-associated recreation opportunities	Create recharge benefits to allow for cost-effective implementation of multi-benefit projects
J. Establish and maintain effective communication among water resource stakeholders in the Region.	1. Number of stakeholders or their representatives and members of the public attending IRWM-related meetings 2. Number of collaborative projects jointly implemented by multiple entities	Not directly applicable to recharge
K. Effectively address climate change adaptation and/or mitigation in water resource management.	1. Number of projects implemented that address climate change	Increase storage through groundwater recharge to meet changes in surface water flows that may result from climate change
L. Enhance public understanding of water management issues and needs.	1. Number of educational programs / number of people participating in water-focused educational events in the Region	Potential for incorporation of education components into recharge facilities

3 Setting and Recharge Suitability

The setting related to identification of groundwater recharge areas were developed through the collection and integration of Geographic Information System (GIS) datasets. Available GIS datasets relevant to recharge were assembled. These include:

- Land use
- Hydrologic soil groups
- Slope
- Texture of subsurface materials
- Presence and thickness of the Corcoran Clay
- Depth to groundwater
- Groundwater flow direction

These categories are further described in the following subsections. Within each dataset, the data were ranked based on the information's relation to recharge (not including recharge from canals and surface water courses). Further, the overall dataset was weighted based on its relative importance to groundwater recharge compared to the other datasets. The ranking and the weighting varies within the three types of recharge considered: natural, anthropogenic, and facility siting. Natural recharge is an estimate of where recharge was more focused prior to development. Anthropogenic recharge is an estimate of where recharge occurs, taking into account current land use and water use practices. The Facility Siting index is a measure of locations that may be better suited for new spreading basins. All three of the indices use information contained in all or most of the seven GIS datasets. Section 0 summarizes the ranking, weighting, and results.

Additional datasets are important for recharge, but due to limitations within the datasets these datasets are presented as information but not incorporated into the indices. These datasets include:

- Subsidence, which has historically been less of an issue on the east side of the San Joaquin Valley compared to the more impacted west side. Ongoing work by the USGS has suggested subsidence may be more of a concern than previously thought, but the results of these studies has not been released. Historical subsidence has been greatest in the El Nido area of the Merced Region.
- Groundwater quality, which plays an important role in the recovery and use of recharged water. The suitability of existing groundwater quality is quite site specific and the resolution of the available data makes it difficult to incorporate into the index, particularly a lack of readily available data on the depth of the screened intervals for many of the sampled wells. Rather than including the results in the index, summary maps are provided to show general regional conditions.

3.1 Land Use

Land use can be used to estimate differences in the amount of applied water and in the impact of impervious surfaces. Land use data from 2002 is the most recent available from DWR (DWR, 2004), which provides information on 9 agricultural classes, 6 urban classes, 5 native classes, and 3 designations for unclassified land. The map for the Merced Area is shown as Figure 3, with classes grouped as relevant to recharge.

Ranking is performed for anthropogenic recharge and recharge facility siting. Ranking was not performed for natural recharge, as the 2002 land use is not relevant for natural recharge. Ranking for anthropogenic recharge is shown in Figure 4 and includes the contribution to recharge from irrigated agriculture and also the impact of impervious surfaces in urban areas. Figure 5 shows the rankings for

recharge facility siting, which provides higher ranking for areas which may be less costly to purchase and convert into recharge basins, which may have less impact to surrounding land uses, and which may have fewer environmental or contamination issues.

Figure 3: Land Use

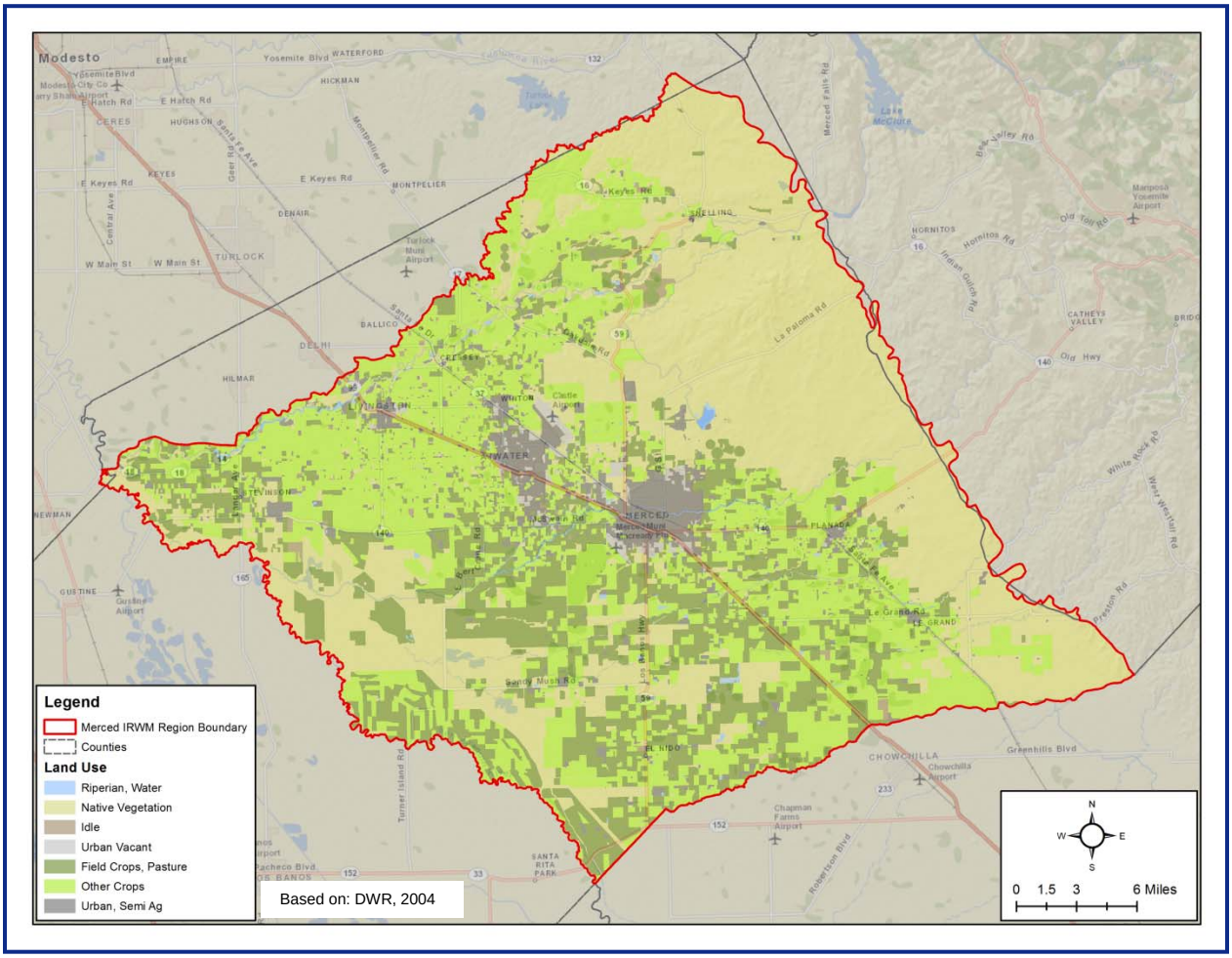


Figure 4: Ranked Land Use – Anthropogenic Recharge

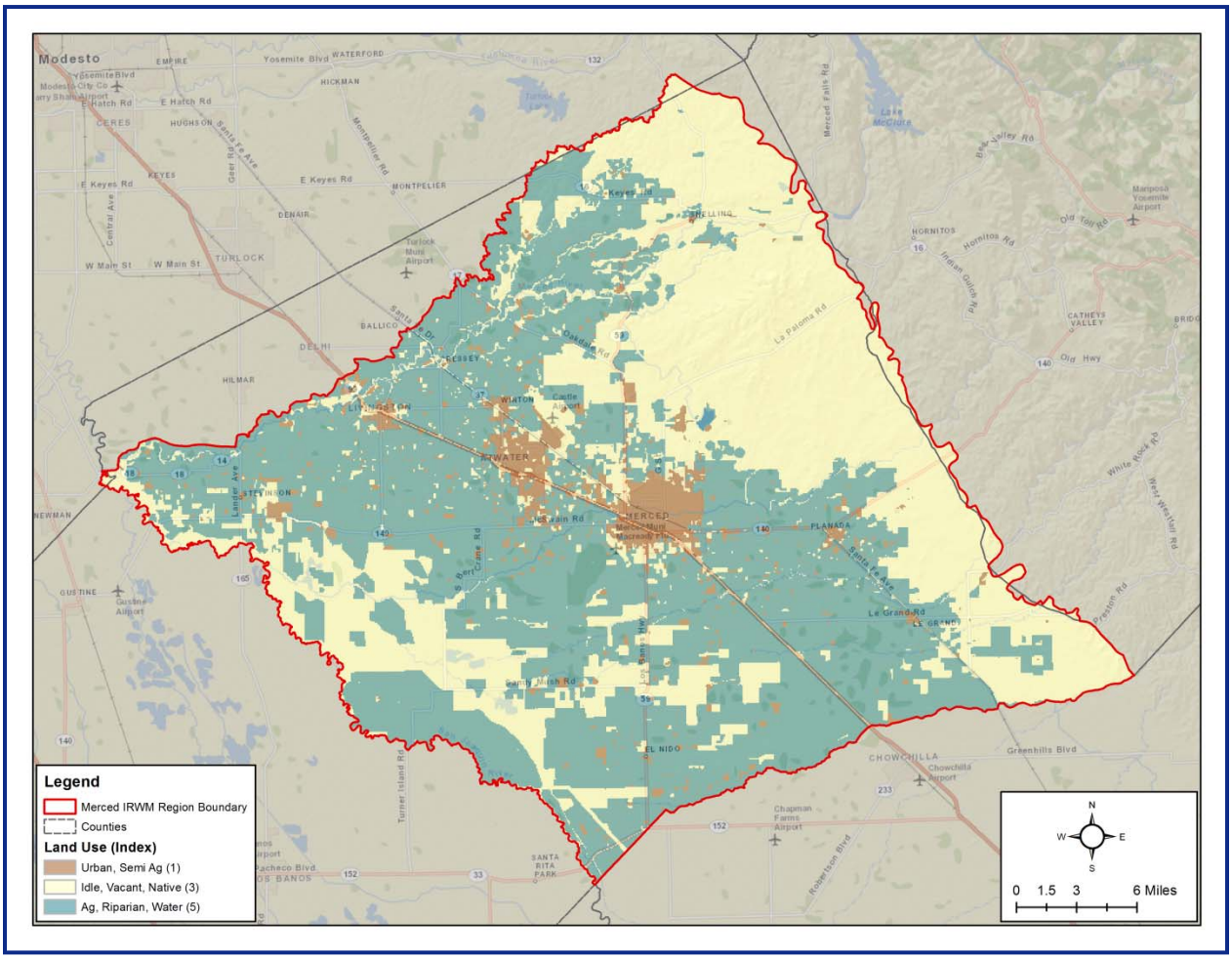
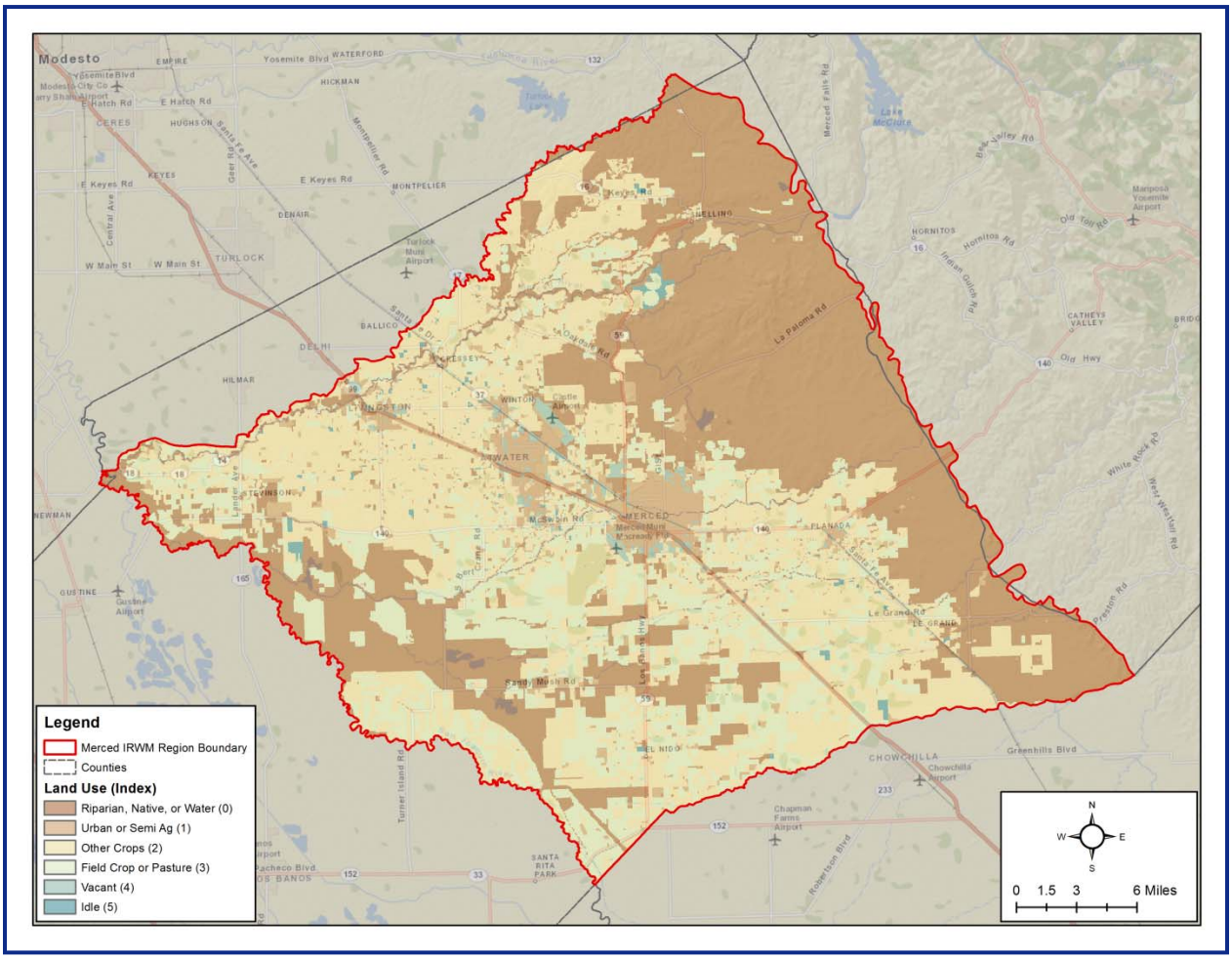


Figure 5: Ranked Land Use – Recharge Facility Siting



3.2 Hydrologic Soil Groups

Hydrologic soil groups are a classification defined by the USDA-NRCS and based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

- **Group A.** Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
- **Group B.** Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
- **Group C.** Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

- **Group D.** Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes (USDA-NRCS, 2012). Work is being performed by researchers at the University of California-Davis to provide information on where group D soils are likely to have been ripped to improve conditions for agriculture. These modifications to the soils will increase permeability. Final maps are not available at the time of writing.

The description of soils typically extends as to a depth related to the depth of rooting to be expected for perennial plants (Soil Survey Division Staff, 1993). This becomes an important factor for natural recharge. It is also important for anthropogenic recharge, although it must be recognized that deep ripping typically performed prior to planning deep rooted crops such as orchards can result in a significant increase in the ability to infiltrate water through the removal of restrictive layers. The designation is less important for facility siting, as the soils can often be removed to build the recharge facility.

Figure 6 shows the USDA-NRCS hydrologic soil group classifications for the Merced Region (U.S. Department of Agriculture, Natural Resources Conservation Service, 2008). Figure 7 shows the ranking for natural recharge, anthropogenic recharge, and recharge facility siting.

Figure 6: Hydrologic Soil Groups

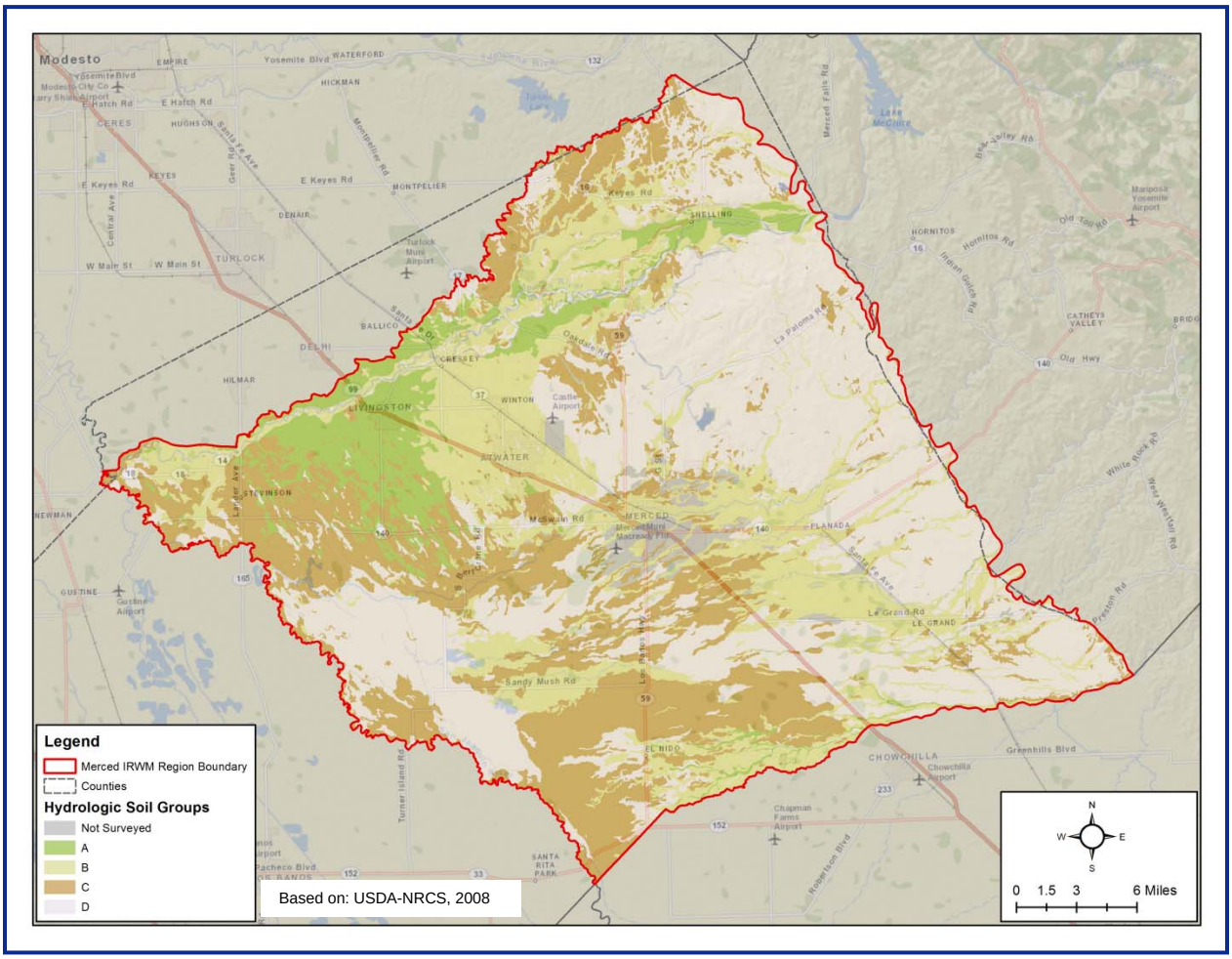
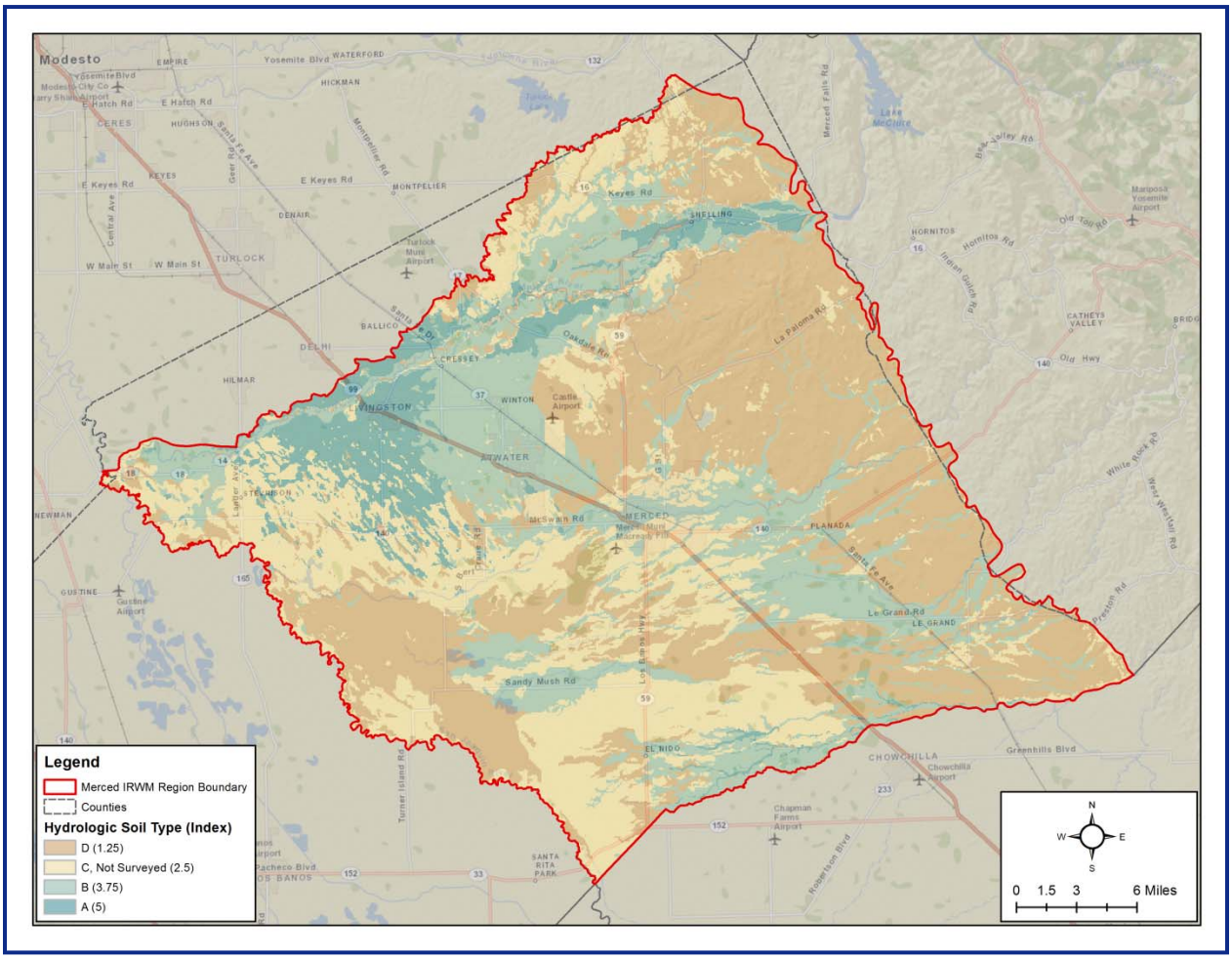


Figure 7: Ranked Hydrologic Soil Groups



3.3 Surface Slope

The slope of the land surface impacts the amount of recharge for an area. The slope of the soil surface is not considered by the USDA when assigning hydrologic soil groups (USDA-NRCS, 2007). Slope data from a digital elevation model (DEM) (U.S. Geological Survey, 2009) was utilized to calculate the slope of the land surface at a regional scale. The DEM is at a 10 meter scale and thus does not include detailed, site-specific slope information which can play an important role in recharge and runoff processes.

Figure 8 shows the slope for the Merced Region. Figure 9 shows the ranking, which is the same for natural recharge, anthropogenic recharge, and recharge facility siting.

Figure 8: Surface Slope

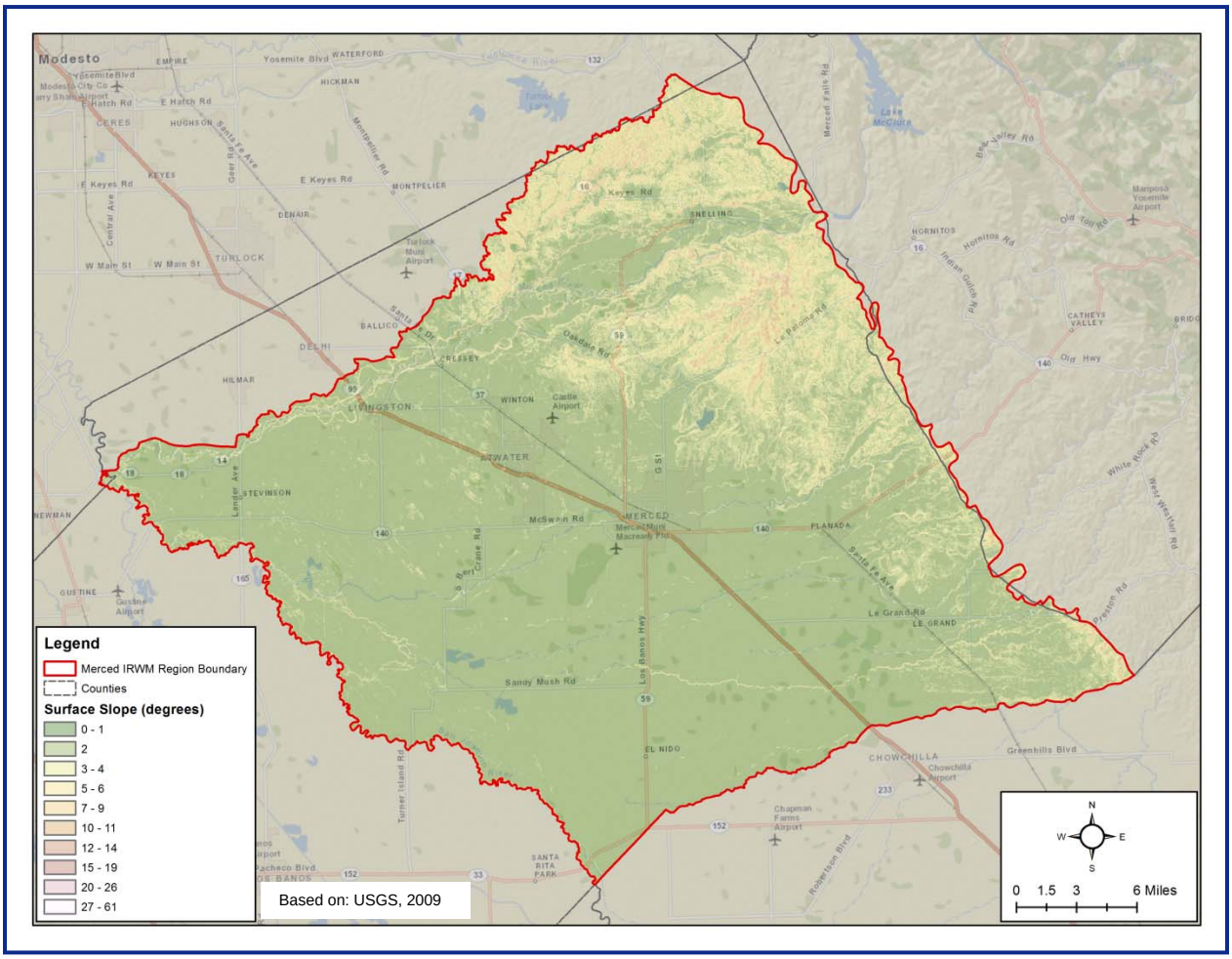
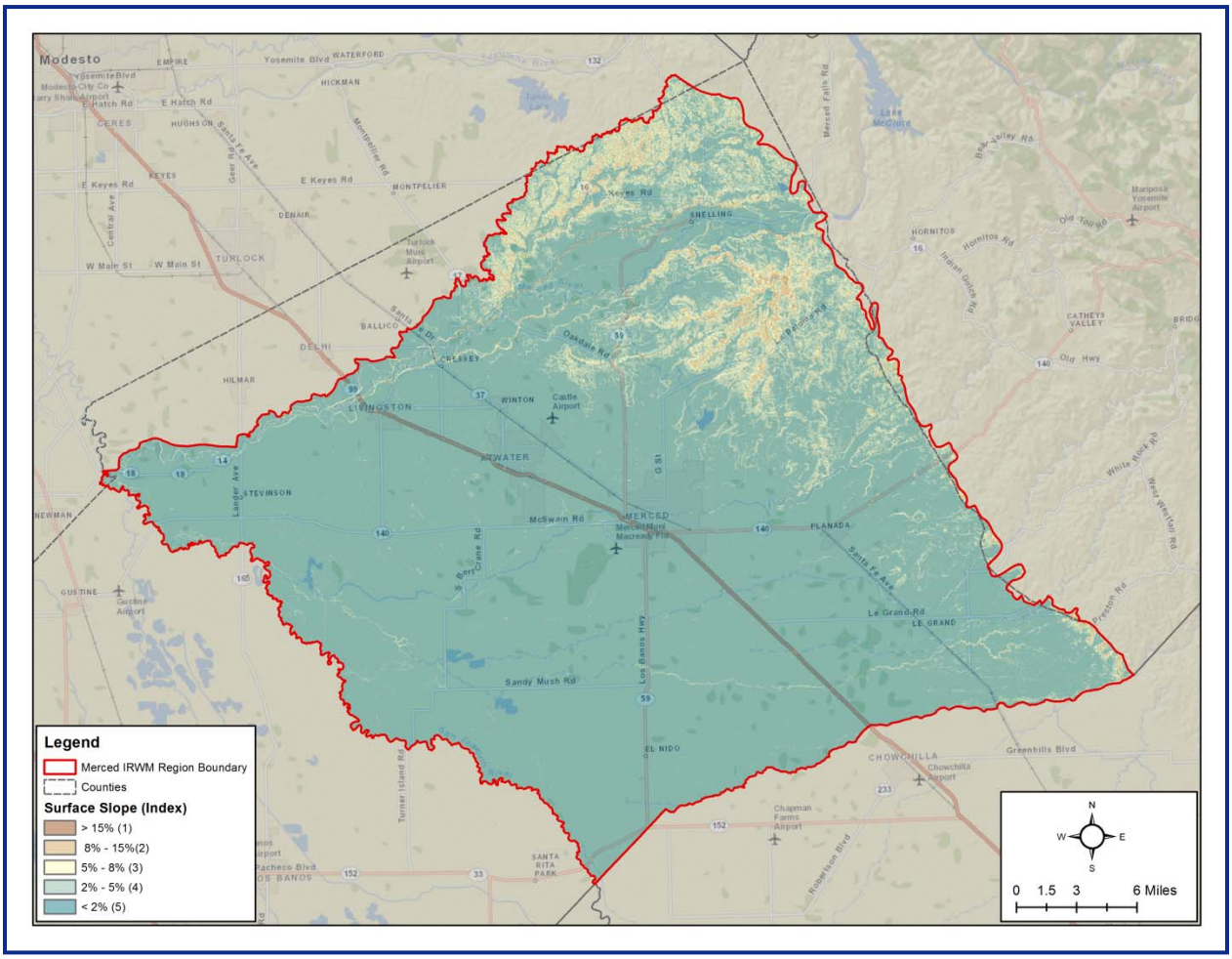


Figure 9: Ranked Surface Slope



3.4 Texture of subsurface materials

Subsurface permeability impacts the ability for water to migrate through the subsurface to the aquifer system. Texture of subsurface materials can be used as a surrogate for permeability data, which is not available at the same level of detail. Coarser grained materials (e.g., gravels and sands) allow water to pass more easily than finer grained materials (e.g., clays and silts).

Texture data was utilized from a USGS effort that developed a three-dimensional texture model of the Central Valley using approximately 8,500 drillers' logs, describing lithologies up to 950 meters below land surface simplified into a binary classification of coarse- and fine-grained materials. Statistical methods (i.e., kriging) were used to estimate the percent coarse across the Central Valley on a 1.6-kilometer spatial grid at 15-meter depth intervals from land surface down to 700 meters below land surface (Faunt, Belitz, & Hanson, Development of a three-dimensional model of sedimentary texture in valley-fill deposits of Central Valley, California, USA, 2010).

For this effort, the upper three intervals (0 – 50 ft, 50 – 100 ft, and 100 – 150 ft) of percent coarse were compiled for the Merced Region (see Figure 10, Figure 12, and Figure 14, respectively). The ranking for these intervals are shown in the following figures:

- 0 to 50 feet: Figure 11
- 50 to 100 feet: Figure 13
- 100 to 150 feet: Figure 15

Rankings are the same across all three categories.

Figure 10: Texture of Subsurface Materials, 0 – 50 ft below ground surface

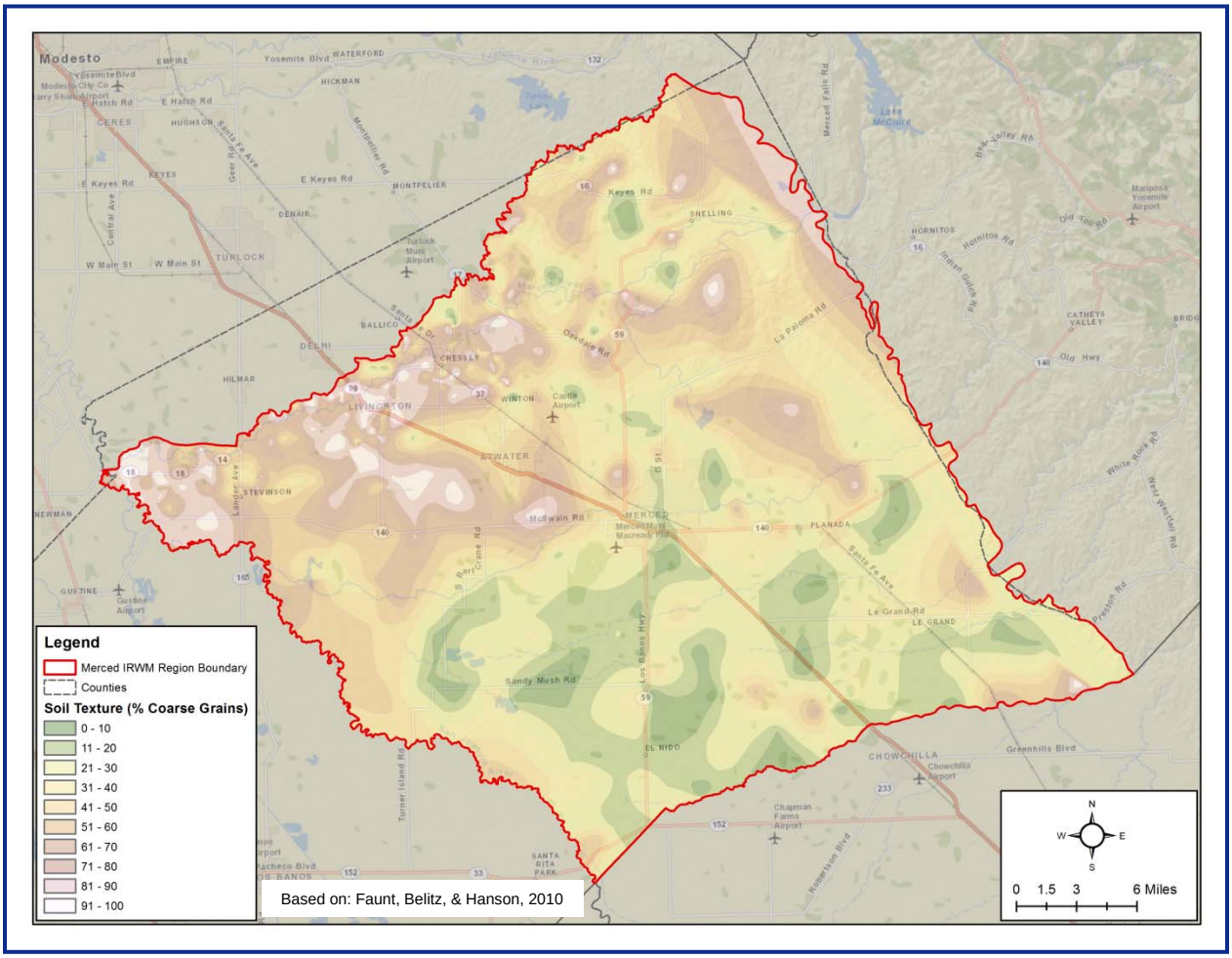


Figure 11: Ranked Texture of Subsurface Materials, 0 – 50 ft below ground surface

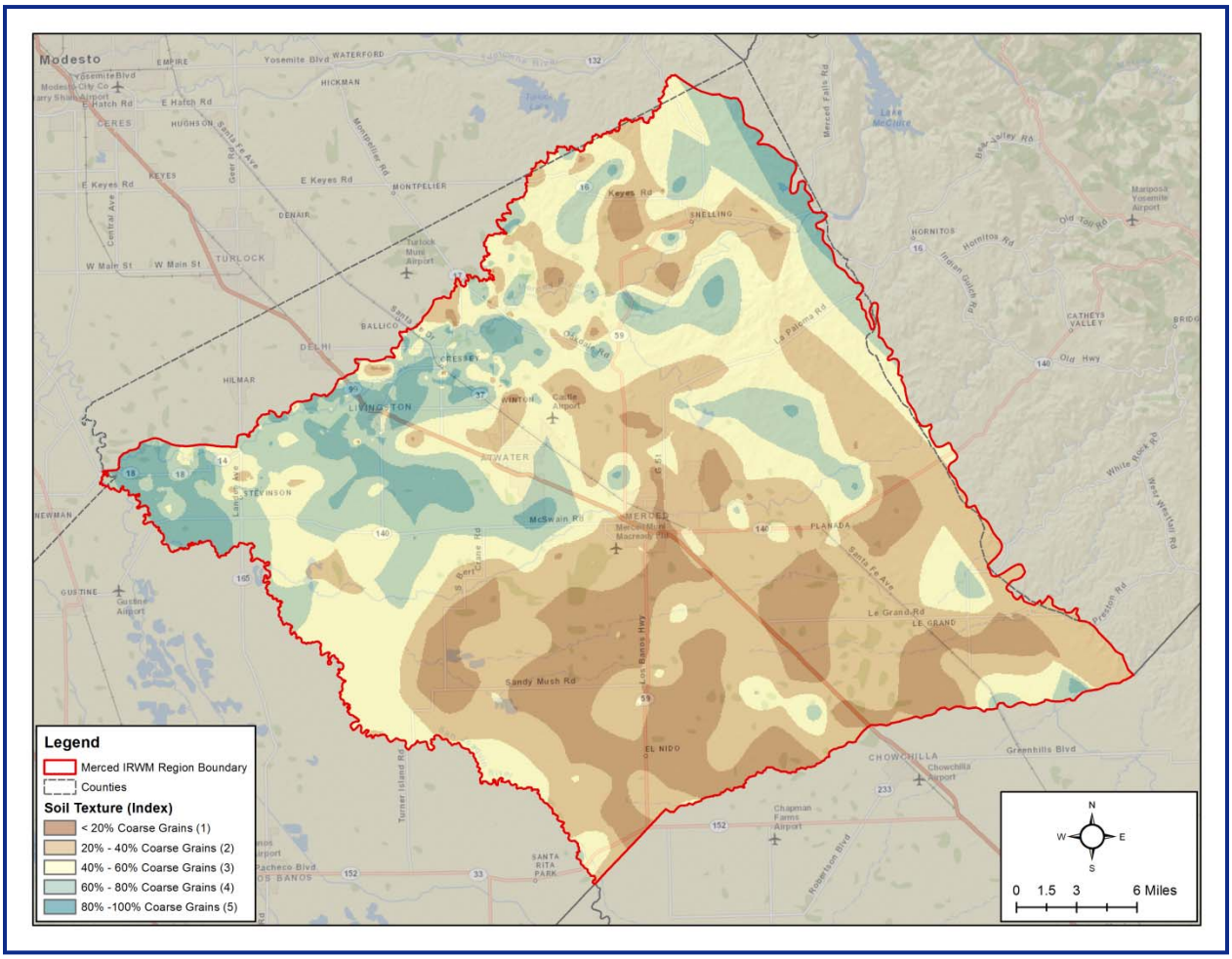


Figure 12: Texture of Subsurface Materials, 50 – 100 ft below ground surface

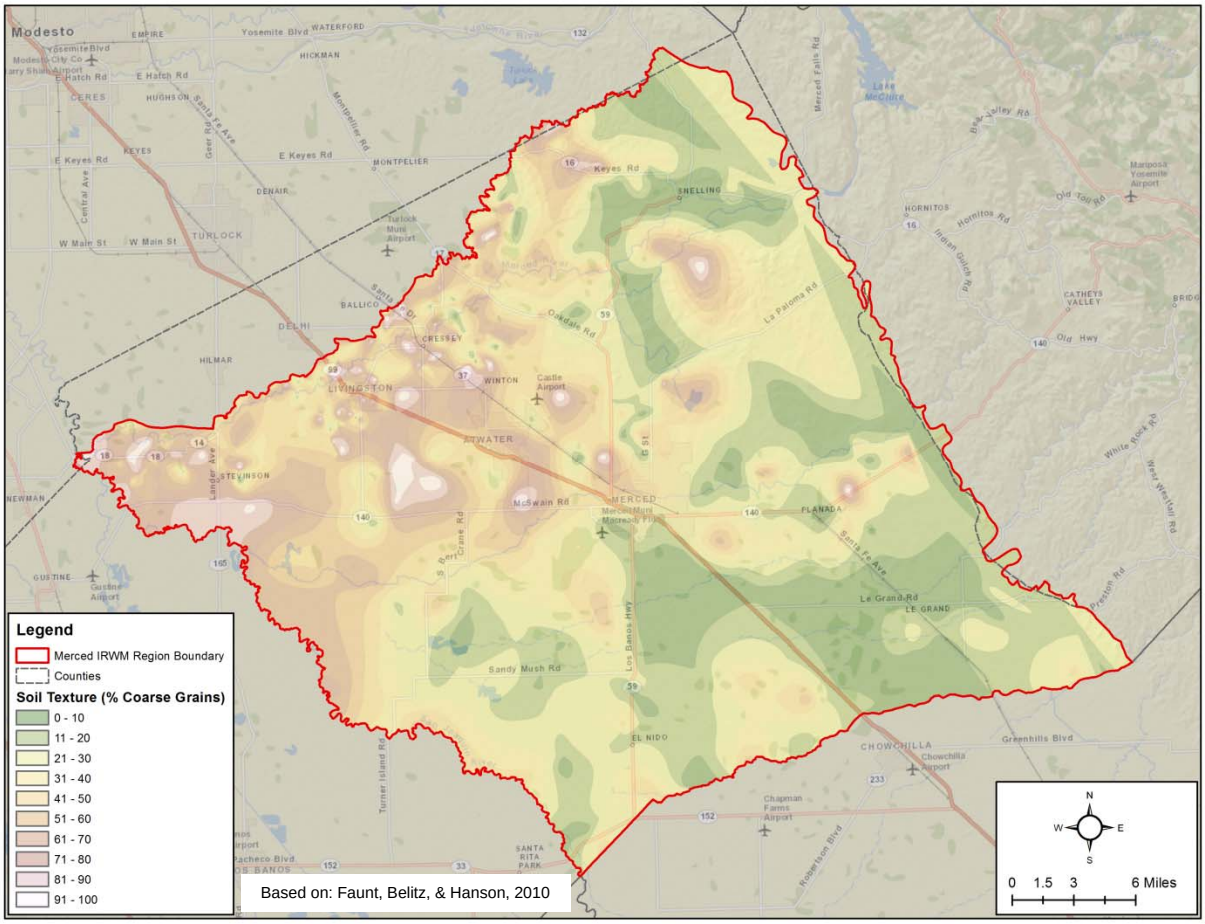


Figure 13: Ranked Texture of Subsurface Materials, 50 – 100 ft below ground surface

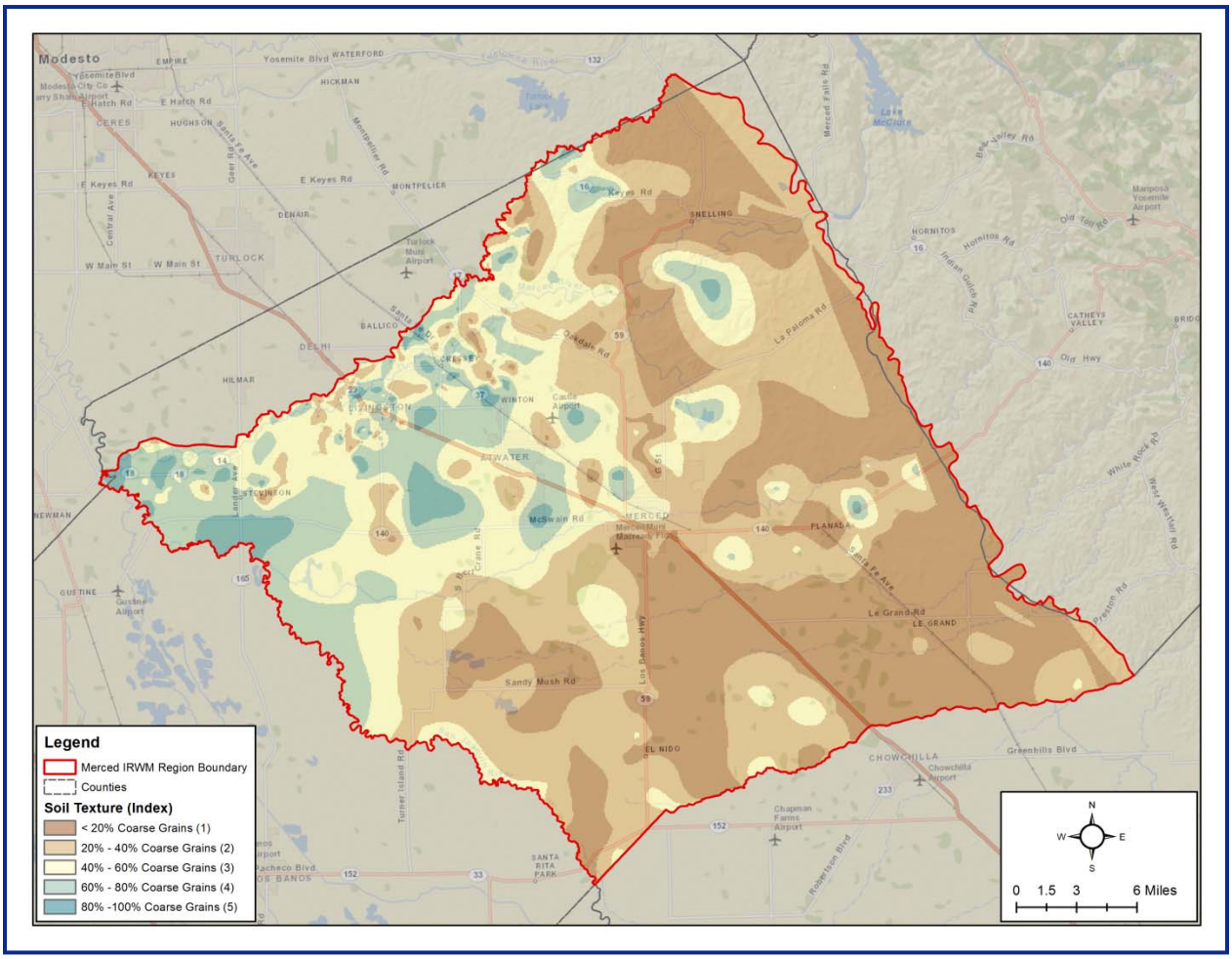


Figure 14: Texture of Subsurface Materials, 100 – 150 ft below ground surface

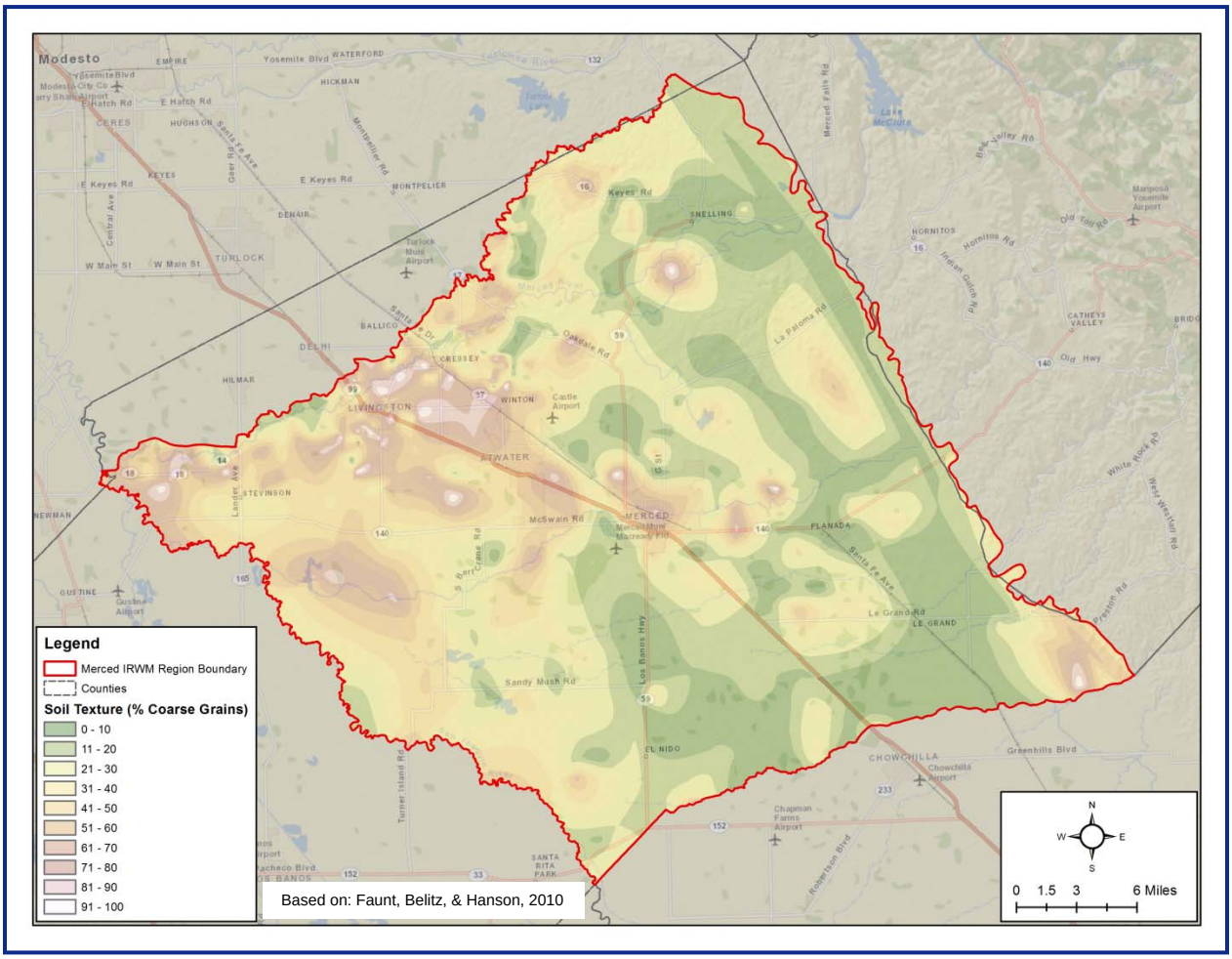
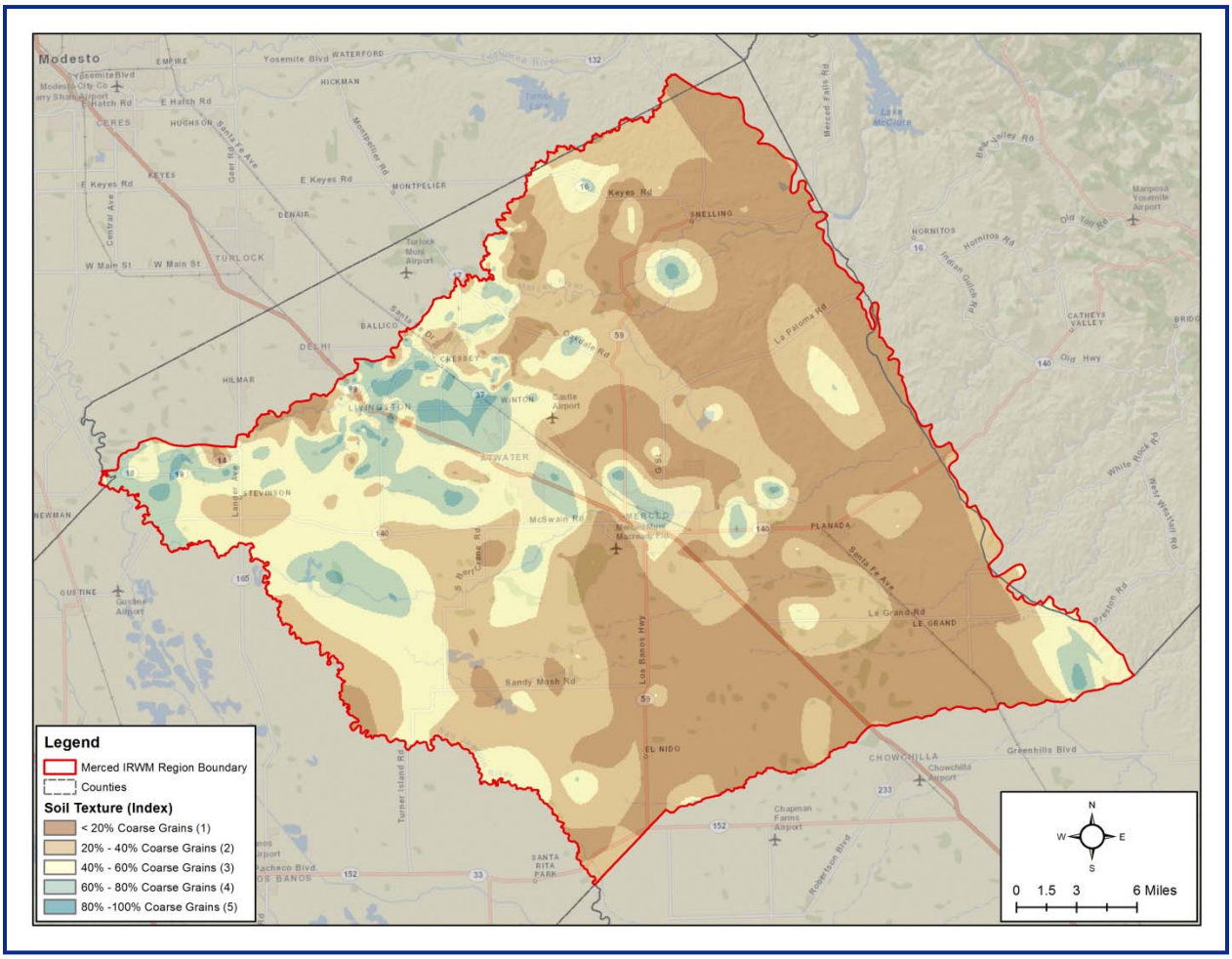


Figure 15: Ranked Texture of Subsurface Materials, 100 – 150 ft below ground surface



3.5 Corcoran Clay Thickness

While the average texture, as discussed in Section 3.4, is important to groundwater recharge, more important is how finer grained materials are distributed in the subsurface. An extensive horizontal layer of fine-grained materials can greatly inhibit the downward flow of water through the subsurface, even within a large deposit of coarse-grained materials. The Corcoran Clay is a regionally extensive fine-grained unit that is typically present along the axis of the San Joaquin Valley. The diatomaceous clay unit underlies approximately 5,000 square miles and ranges in thickness from zero to at least 160 ft beneath the present bed of Tulare Lake. The extensive drilling of wells through the Corcoran Clay is thought to have reduced the confining nature of the unit, as water can pass through the bores in the clay (Bertoldi, Johnston, & Evenston, 1991; Faunt, Hanson, & Belitz, 2009).

The impact of a confining layer is related to the level to which it restricts flow and to the level to which that impacts beneficial uses. Within the Merced Region, groundwater production occurs both above and below the Corcoran Clay (AMEC Geomatrix, 2008). Production above the clay, such as in the semi-confined leaky aquifer, could capture recharged water that may pool on top of this feature. While consideration will need to be given to the depth of the unsaturated zone and the ability to store water without harming crops or other uses, the ability to utilize groundwater above the Corcoran Clay limits its negative impact. While outside the scope of this effort, localized study of the depth of production wells

and local groundwater levels can assist in identifying the impact of the Corcoran Clay at individual site locations.

Thickness of the Corcoran Clay is shown in Figure 16 (Page & Balding, 1973). The ranking is the same across the three categories, as shown in Figure 17. The highest ranking given to no Corcoran Clay; lowest rankings are given to the thickest Corcoran Clay (> 60 ft thick).

The depth to the top of the Corcoran Clay is show in Figure 18, although this is not incorporated into the development of the recharge suitability indices.

Figure 16: Thickness of Corcoran Clay

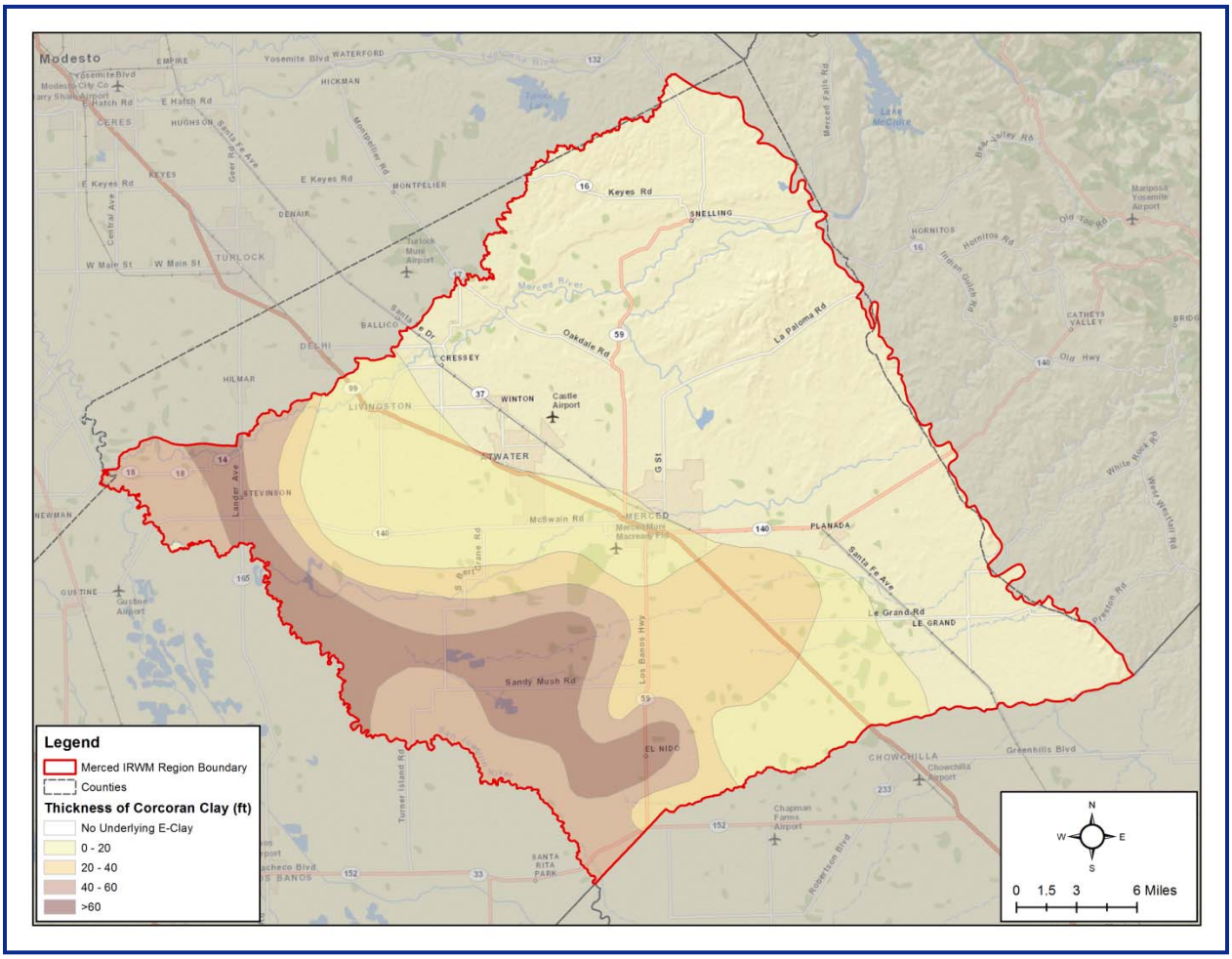


Figure 17: Ranked Thickness of Corcoran Clay

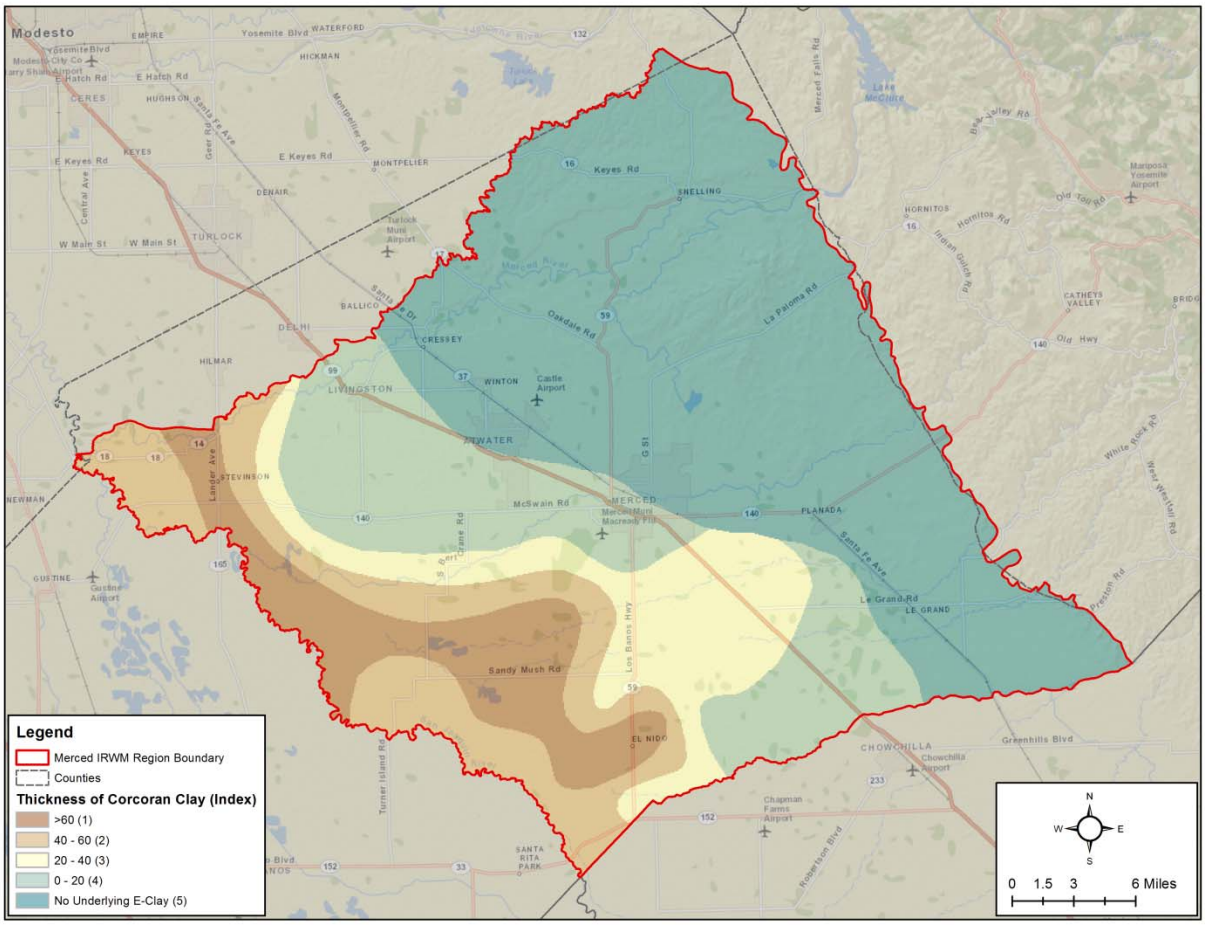
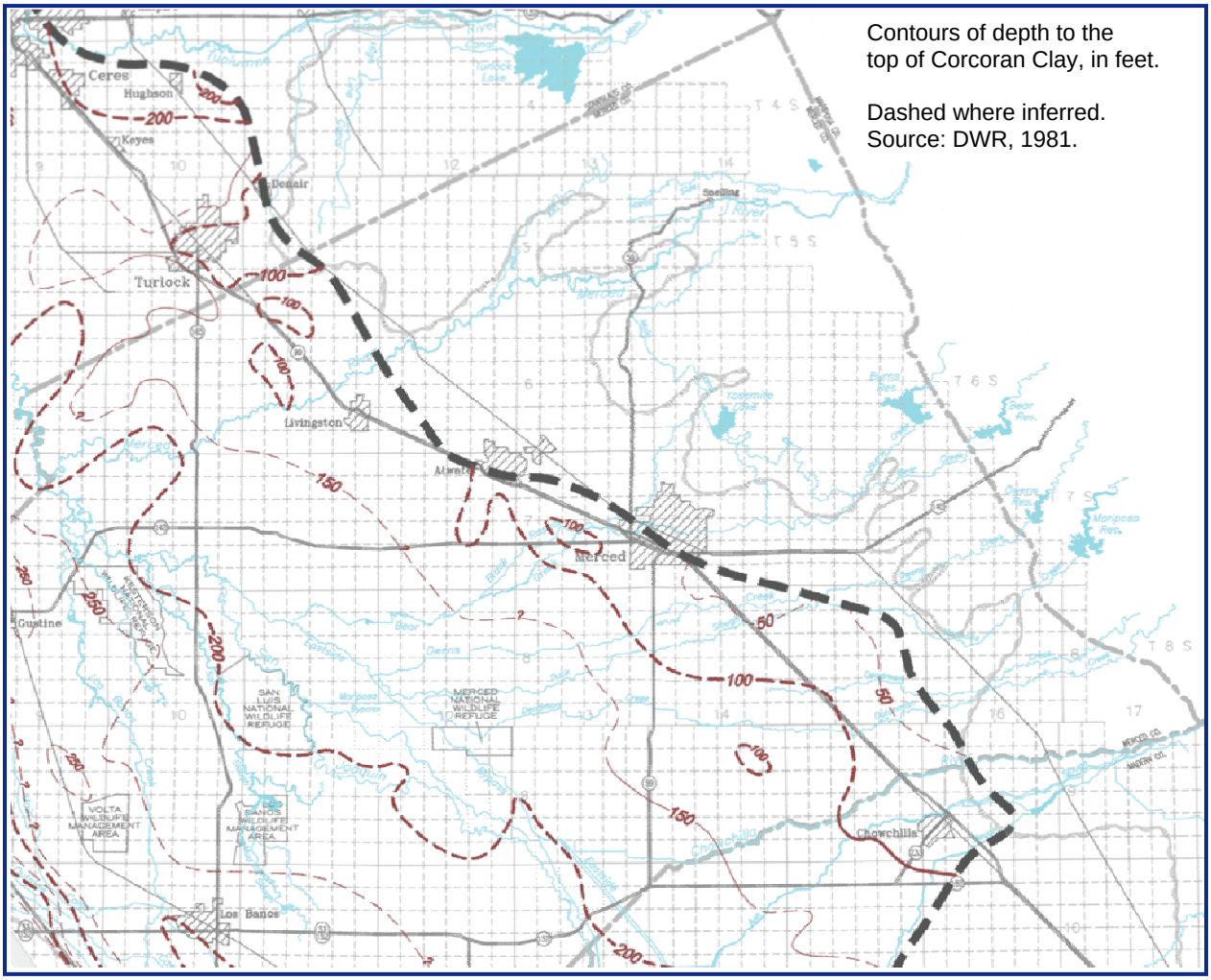


Figure 18: Depth to Top of Corcoran Clay

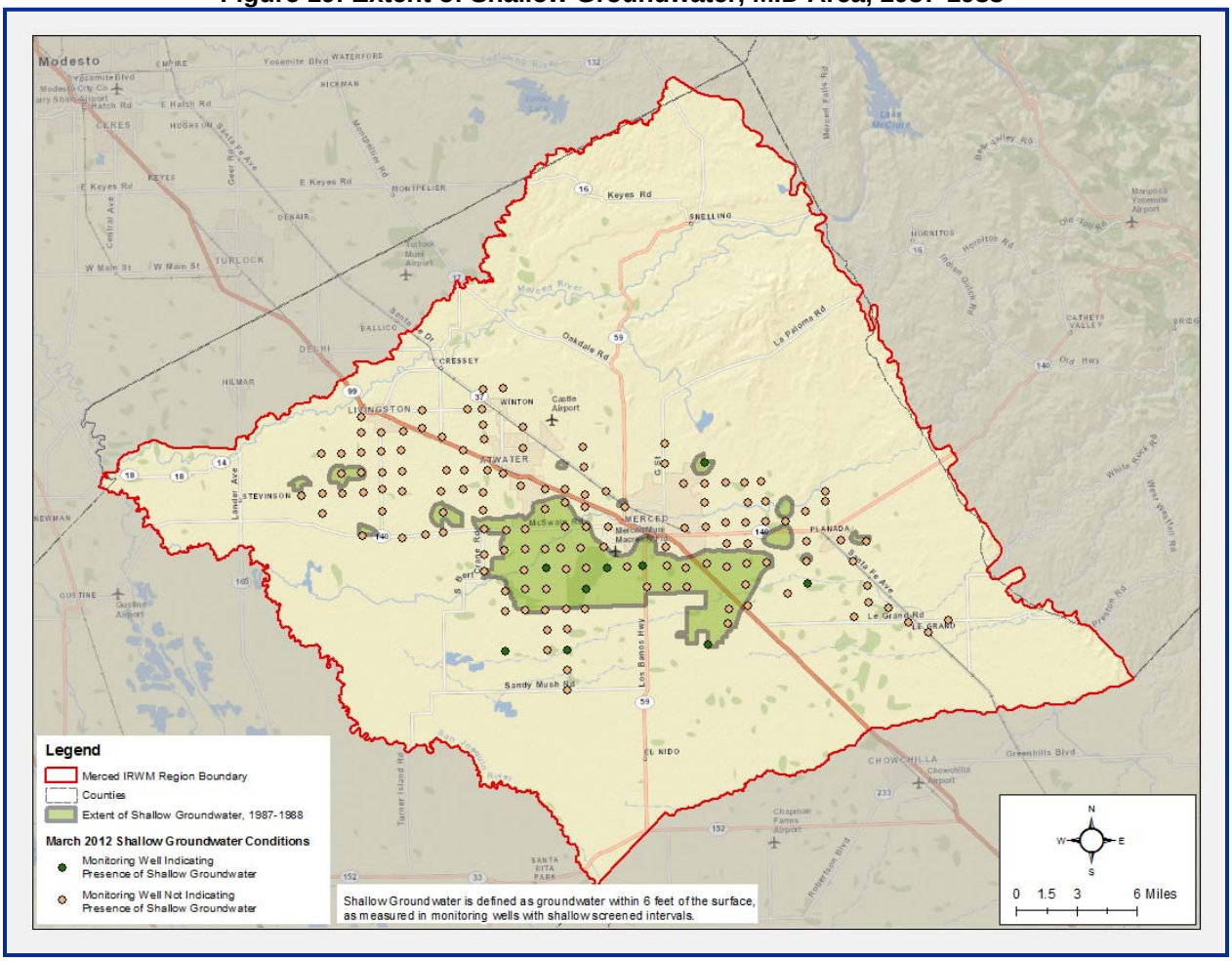


3.6 Depth to Groundwater

Depth to groundwater controls part of the ability to physically store water in the subsurface, along with the per-unit-volume ability to store water within that unsaturated zone and the ability of the water to move away from the basin and be captured by wells. If there is insufficient depth to groundwater, stored groundwater may raise groundwater to a level that results in waterlogging of crops or other negative impacts. In the Merced Region, historically waterlogging impacts have been seen in areas generally between the cities of Atwater and Livingston, south of Highway 99 and north of Highway 140 (AMEC Geomatrix, 2008). Figure 19 shows the maximum extent of shallow groundwater (within 6 feet of the ground surface) shown through a monitoring effort undertaken by MID. The figure shows the maximum extent of shallow groundwater (groundwater within 6 feet of the surface) during monthly monitoring events in 1987 and 1988. This period was immediately before an extended drought, during which many of these areas of shallow groundwater went away. Recent MID monitoring does not show laterally extensive shallow groundwater conditions, but shallow groundwater does exist at isolated wells, which are also shown in Figure 19 based on the March 2012 monitoring event. While it is understood that shallow groundwater levels have been less of an issue in more recent years, these areas should be approached with caution prior to developing recharge projects in this area. Areas prone to waterlogging or areas that could result in waterlogging with the addition of significant additional recharged water

should be avoided or managed through the careful placement and operation of extraction wells. As the shallow groundwater map does not cover the full Merced Region, this map is not included in the ranking process, but is included in maps later in the document to guide the decision process when utilizing the ranking maps in the future.

Figure 19: Extent of Shallow Groundwater, MID Area, 1987-1988



Depth to groundwater data for the full Merced Region are from DWR, which maps groundwater elevation annually and provides maps of depth to groundwater for 2000 and 2010. These data typically represent groundwater levels in the water supply aquifer and thus may not reflect shallow, perched aquifer conditions. However, these deeper groundwater level data are also important when considering the ability to store water in the subsurface. Figure 20 shows the depth to groundwater for the most recent year, 2010 (DWR, 2010).

The ranking of depth to groundwater varies by the recharge category. For natural recharge and anthropogenic recharge, the most critical feature is the lack of a high water table that would impact recharge. Thus, the weighting is focused on differentiating between shallow groundwater and groundwater that is deeper (see Figure 21). For groundwater recharge facility siting, there is a benefit to having a very thick unsaturated zone (high depth to groundwater) through greater capacity for storage, and thus the ranking is more evenly distributed to show increasing benefits with increasing depths (see Figure 22).

Figure 20: Depth to Groundwater

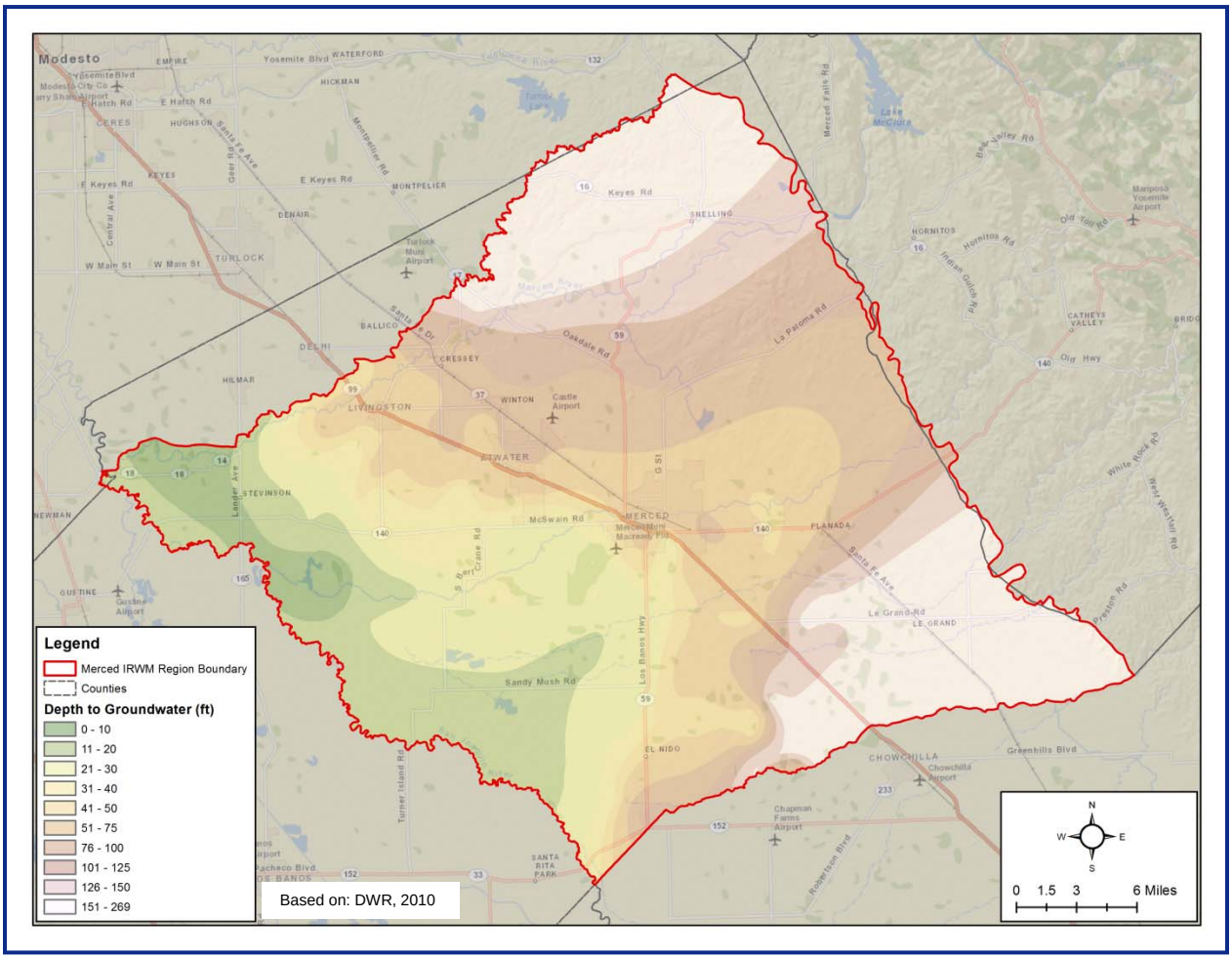


Figure 21: Ranked Depth to Groundwater – Natural and Anthropogenic Recharge

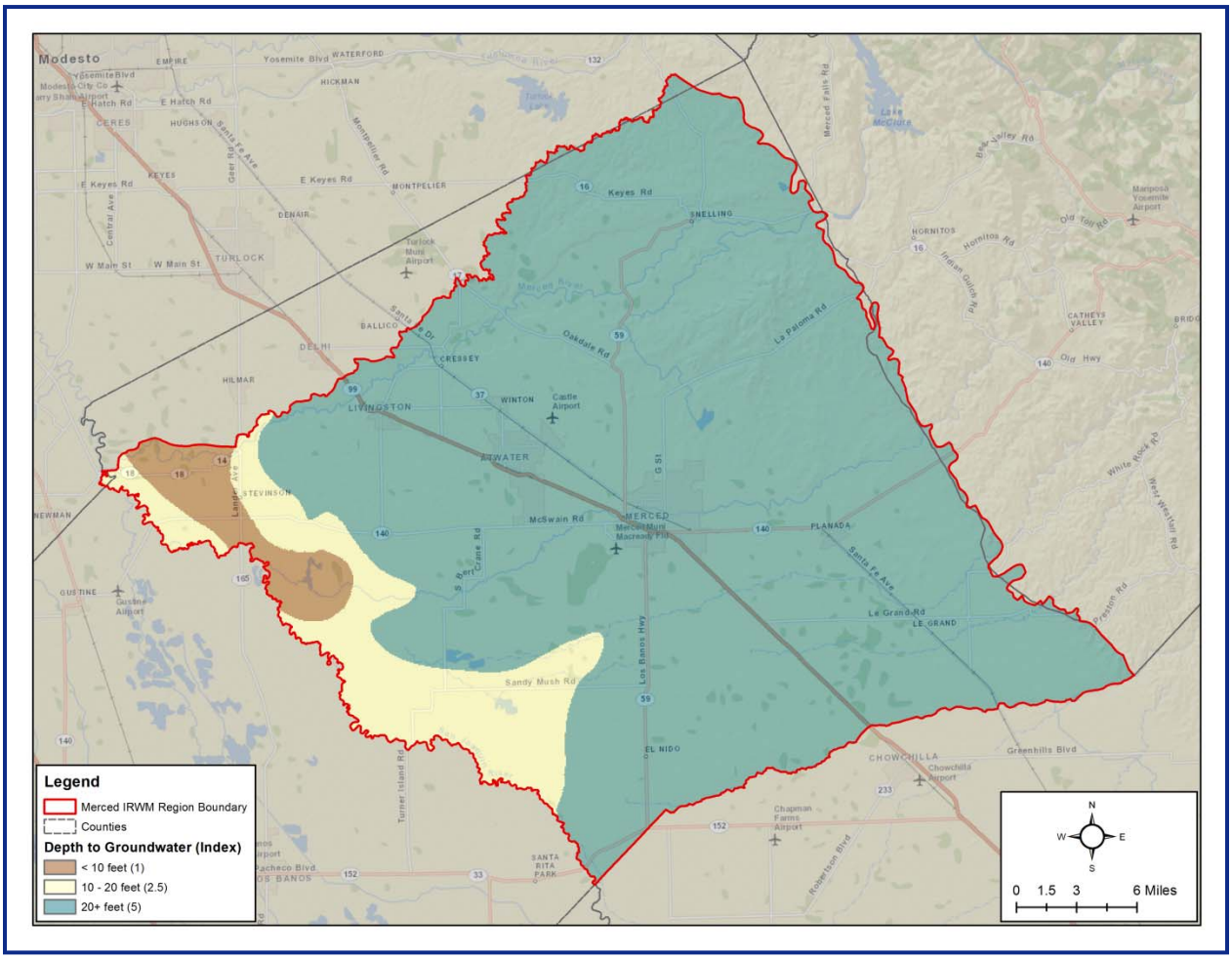
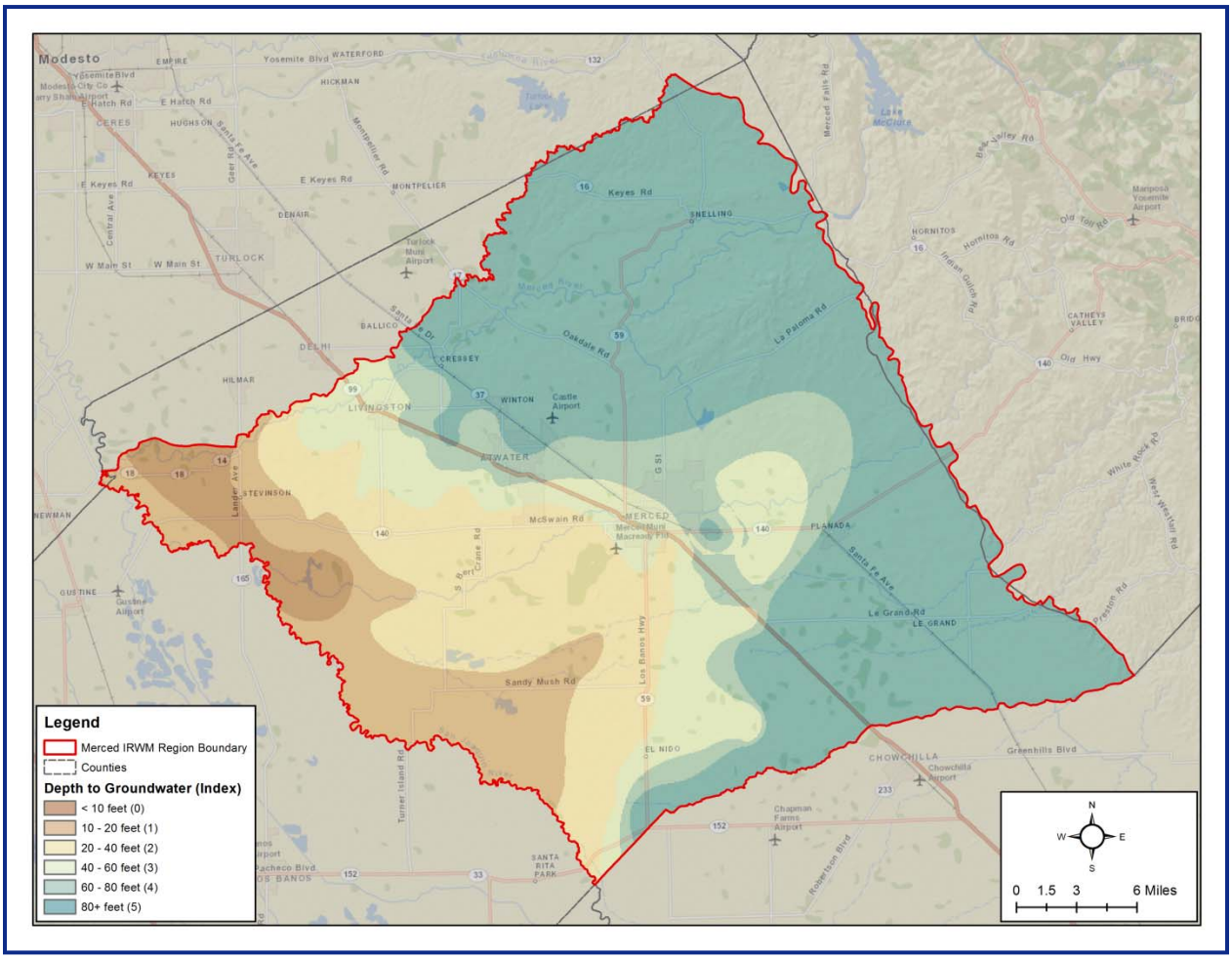


Figure 22: Ranked Depth to Groundwater – Recharge Facility Siting



3.7 Groundwater Flow Direction

Consideration of groundwater flow direction is necessary to estimate whether recharged water will be recoverable by project proponents. Generally, two conditions are to be avoided to meet goals within the Merced Region:

- Groundwater flows towards gaining rivers and streams and is lost to the surface water system
- Groundwater flows beyond the boundaries of the Merced Region and becomes lost to extraction by those not involved in funding the facilities.

Groundwater flow direction is based on groundwater elevation data available from DWR (DWR, 2010). The 2010 data are the most recent available from DWR and show similar regional flow direction as prior years (Figure 23). Generalized flow direction is shown in Figure 24, with flow direction assumed to be perpendicular to the groundwater elevation contours.

Flow direction was considered only for recharge facility siting, as the need for recovery of recharged water is only relevant to this category. Flow directions were ranked based on whether flow is towards the middle of the basin where recovery is likely, whether flow is of a low to moderate slope allowing for potential capture prior to leaving the Merced Region, or whether flow is out of the basin or toward nearby surface water bodies, making recovery unlikely. The rankings are shown in Figure 25.

Figure 23: Groundwater Elevation Contour Map

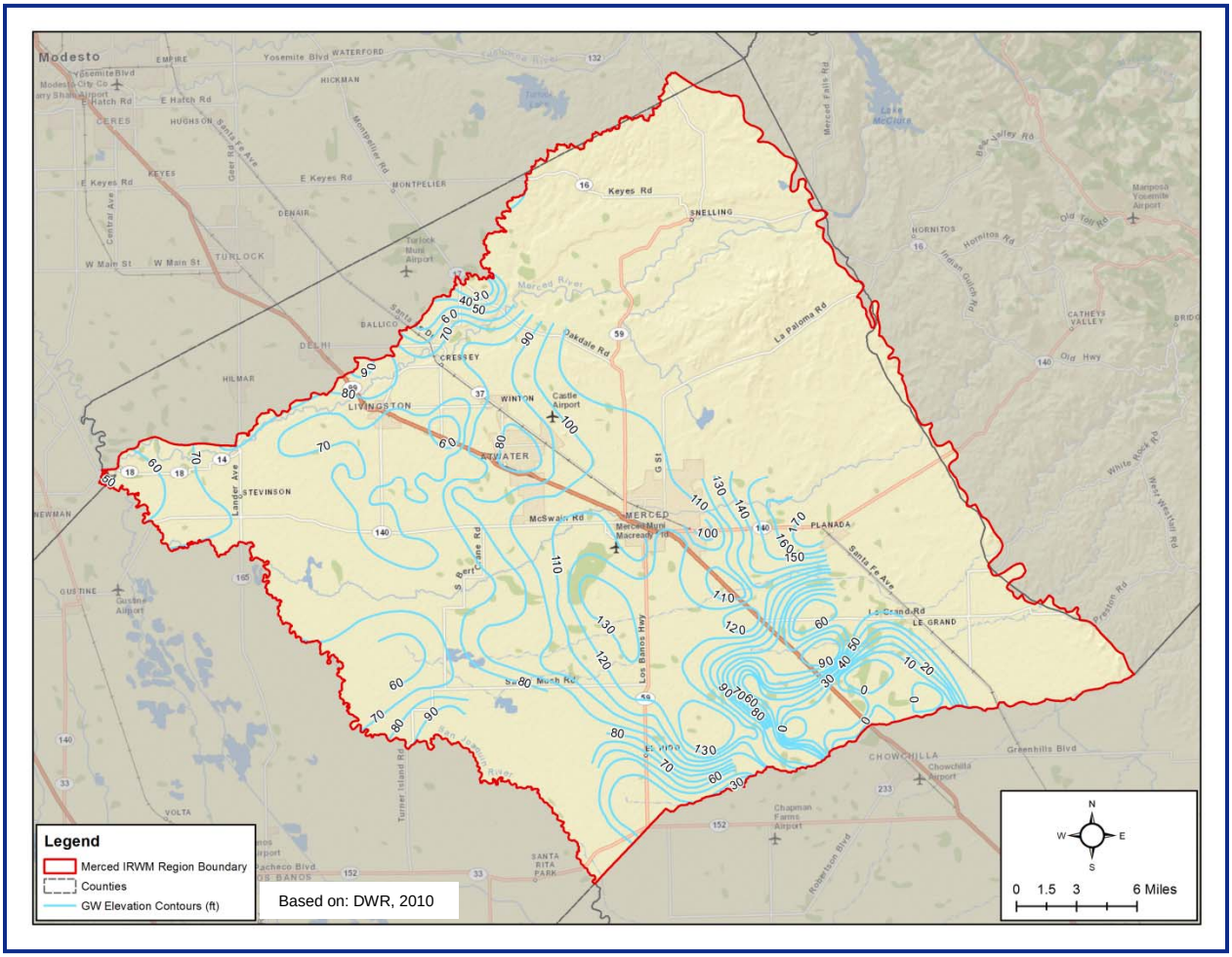


Figure 24: Groundwater Elevation Contour Map and Generalized Flow Directions

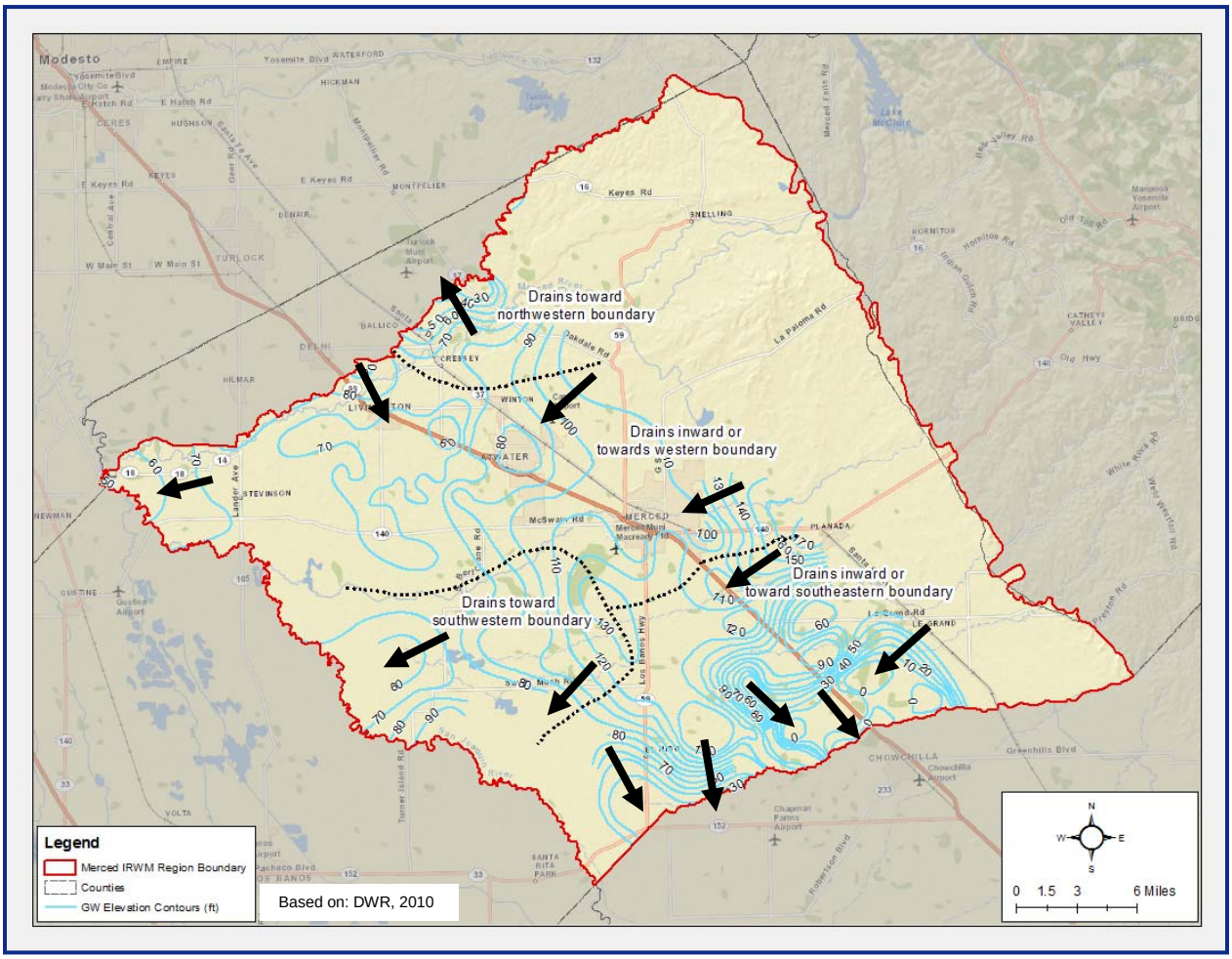
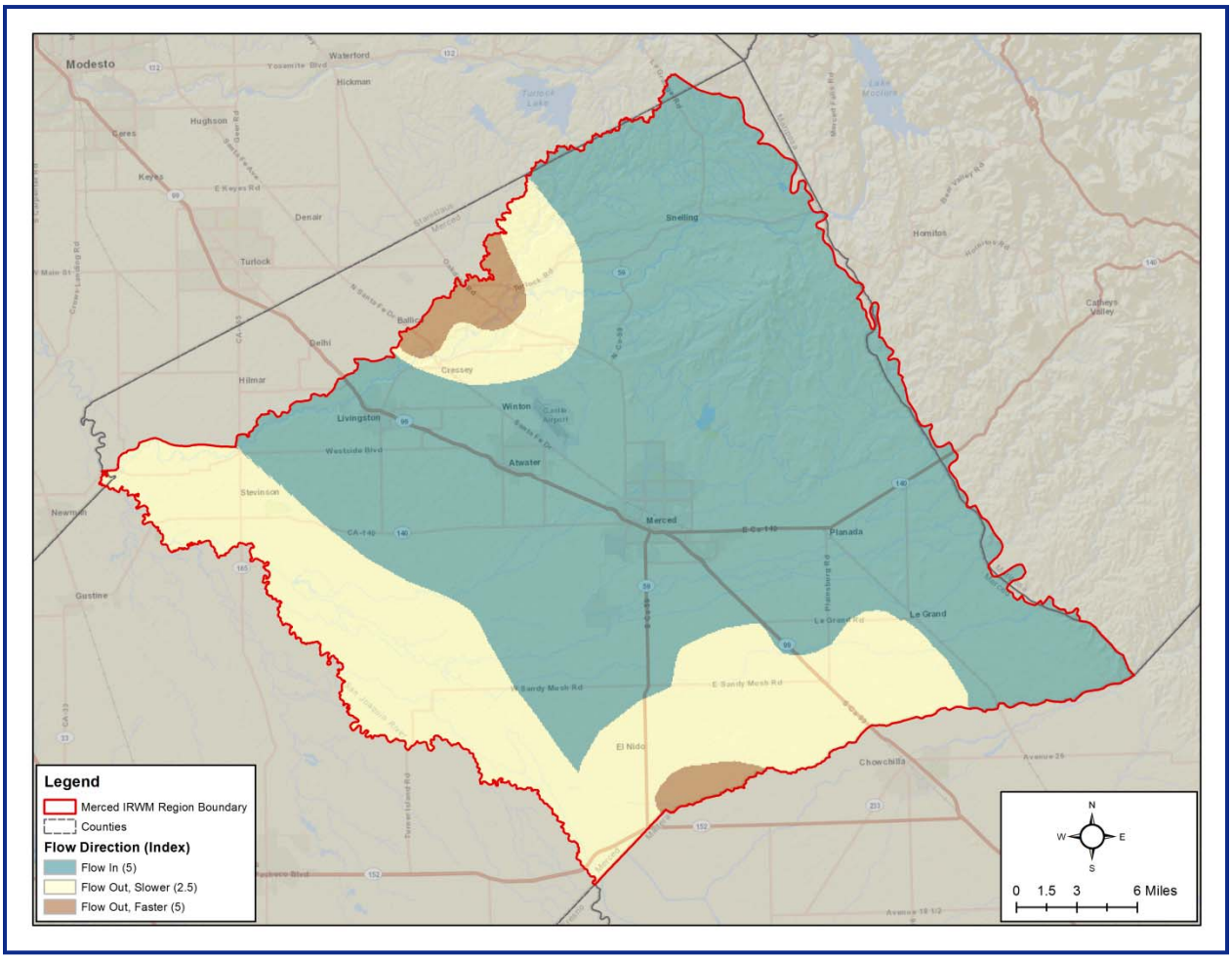


Figure 25: Ranked Groundwater Flow Direction



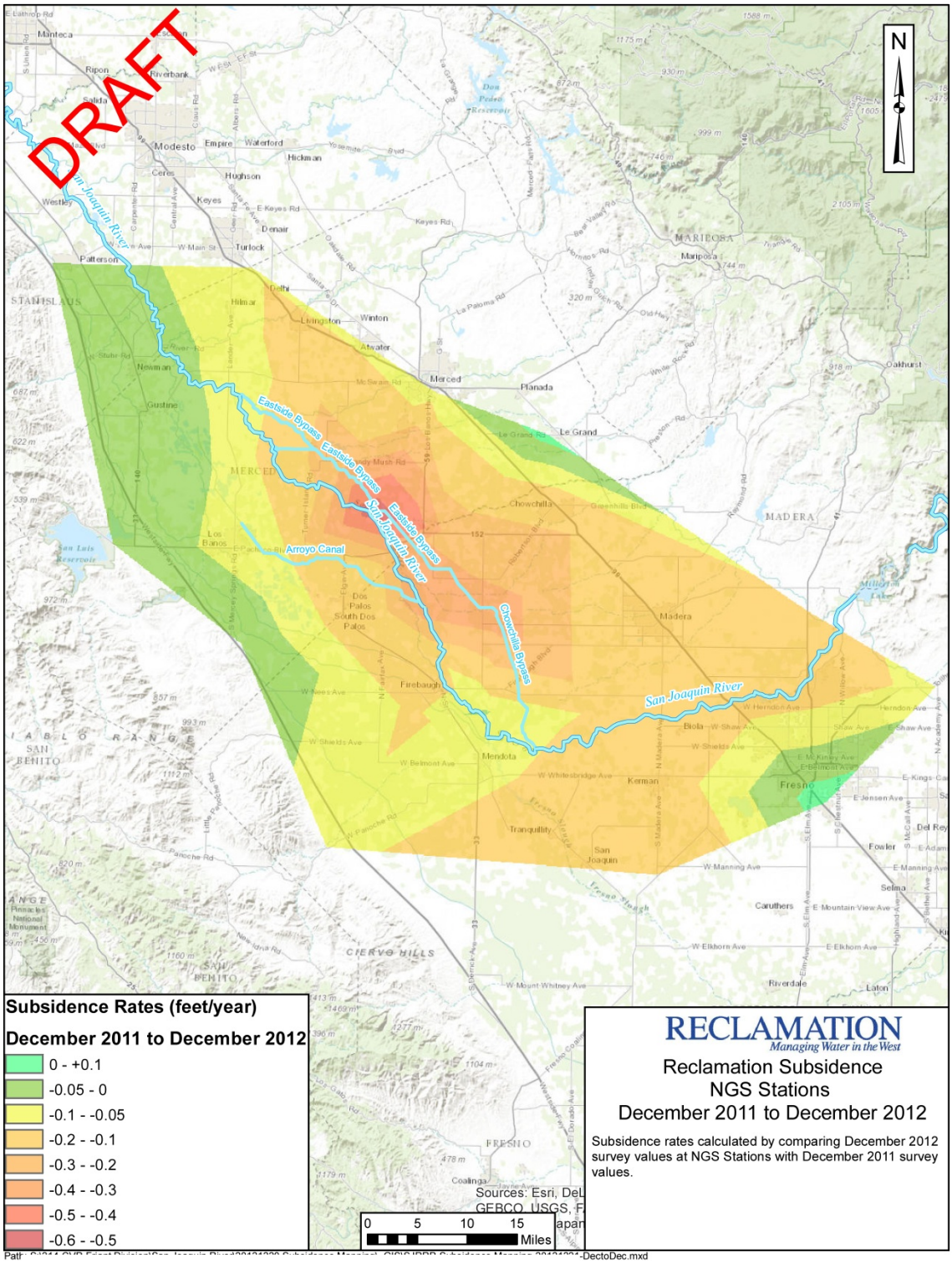
3.8 Subsidence

Subsidence was not included as part of this study as it does not play a significant role in the suitability for recharge. However, recharge activities can prevent subsidence or reduce the magnitude of subsidence. Previous reports (Ireland, Poland, & Riley, 1984) show that historical subsidence has been focused to the southwest of the Merced Region, near Kettleman City. More recent efforts have been undertaken by the US Bureau of Reclamation as part of the San Joaquin River Restoration Project to better understand current subsidence rates in in the vicinity of the San Joaquin River. These efforts show subsidence of up to ½ foot per year in the southernmost portion of the Merced Region, with subsidence of more than 0.1 feet per year occurring over most of the Merced Region west of Highway 99 (See Figure 26). The US Army Corps of Engineers completed a study of longer-term historical subsidence in the area. Their estimates of annual average subsidence over the 1931-2002 time period are shown in Figure 27.

It should be noted the difference in impact of regional, uniform subsidence versus differential subsidence. Regional, uniform subsidence occurs over a large area. This subsidence generally has little impact on structures (although it can impact large-scale infrastructure). Differential subsidence occurs where some areas subside faster than others, damaging structures and other local infrastructure.

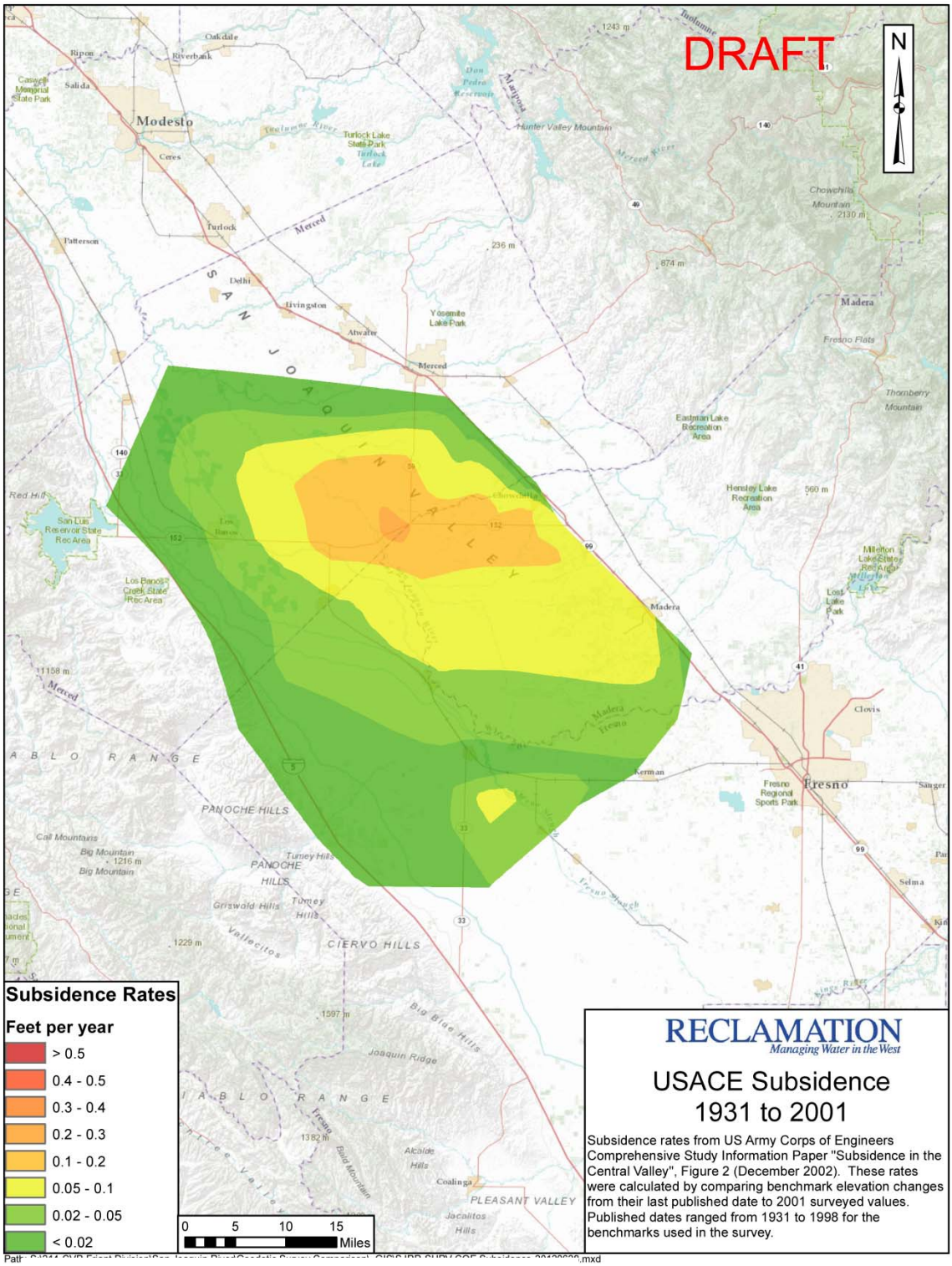
Managing water levels in the southeastern portions of the Merced Region may reduce future subsidence, particularly with regards to dewatering of sensitive clay units.

Figure 26: Land Subsidence in the San Joaquin River Area, December 2011 – December 2012



Source: (US Bureau of Reclamation, 2012)

Figure 27: Average Annual Land Subsidence in the San Joaquin River Area, 1931 – 2001



Source: (US Bureau of Reclamation, 2012)

3.9 Groundwater Quality

Groundwater quality was not included in the ranking analysis as water quality is highly variable and regional water quality data is typically insufficient for understanding the local conditions around a recharge basin. In general, groundwater quality in the Merced Region is good. Maps of regional groundwater conditions based on averaged data from the past 5 years are shown for the primary regional (i.e., non-point source) contaminants in the basin, based on information in the Salt and Nutrient Study (AMEC and RMC, 2013). Note that, to protect the privacy of groundwater supply well owners, the data were composited by Township and Range or by assessor's parcel number, thus the results are averaged across space and time and should be used for regional perspective rather than to identify concentrations at any individual location.

- TDS (Figure 28). Values can be compared to the secondary maximum contamination level (SMCL)
    - 500 mg/l (recommended)
    - 1,000 mg/l (upper) and
    - 1,500 mg/l (short term)
- Chloride (Figure 29). Values can be compared to the SMCL
    - 250 mg/l (recommended)
    - 500 mg/l (upper) and
    - 600 mg/l (short term)
- Nitrate (Figure 30). Values can be compared to the maximum contamination level (MCL), 45 mg/l (as nitrate)
- Arsenic (Figure 31). Values can be compared to the MCL, 10 ug/l

Individual contaminated sites can also impact the drinking water aquifer. The water quality data should be taken into consideration when siting recharge facilities, but localized studies will be necessary to obtain the proper level of detail spatially and with depth.

Figure 28: TDS Concentrations

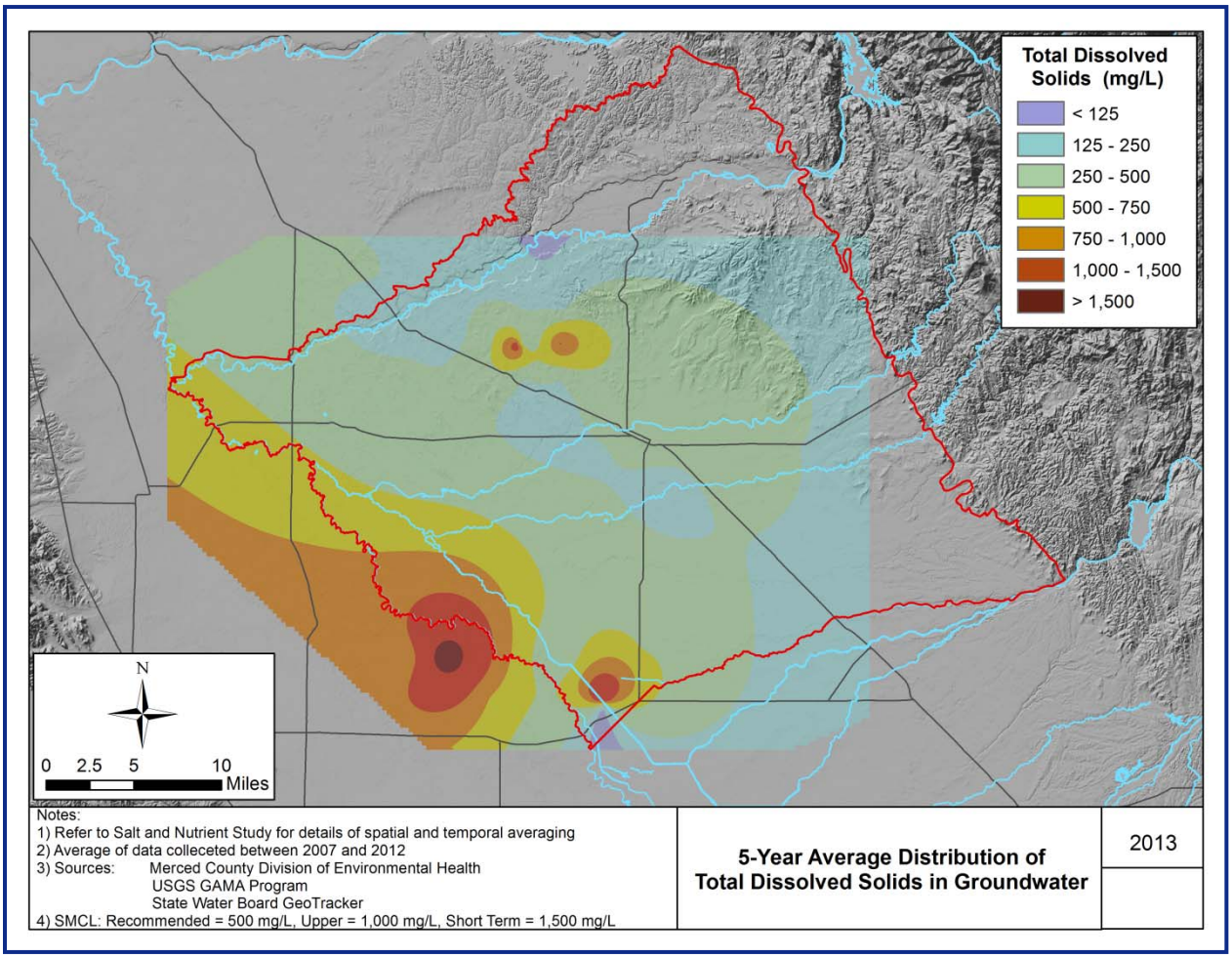


Figure 29: Chloride Concentrations

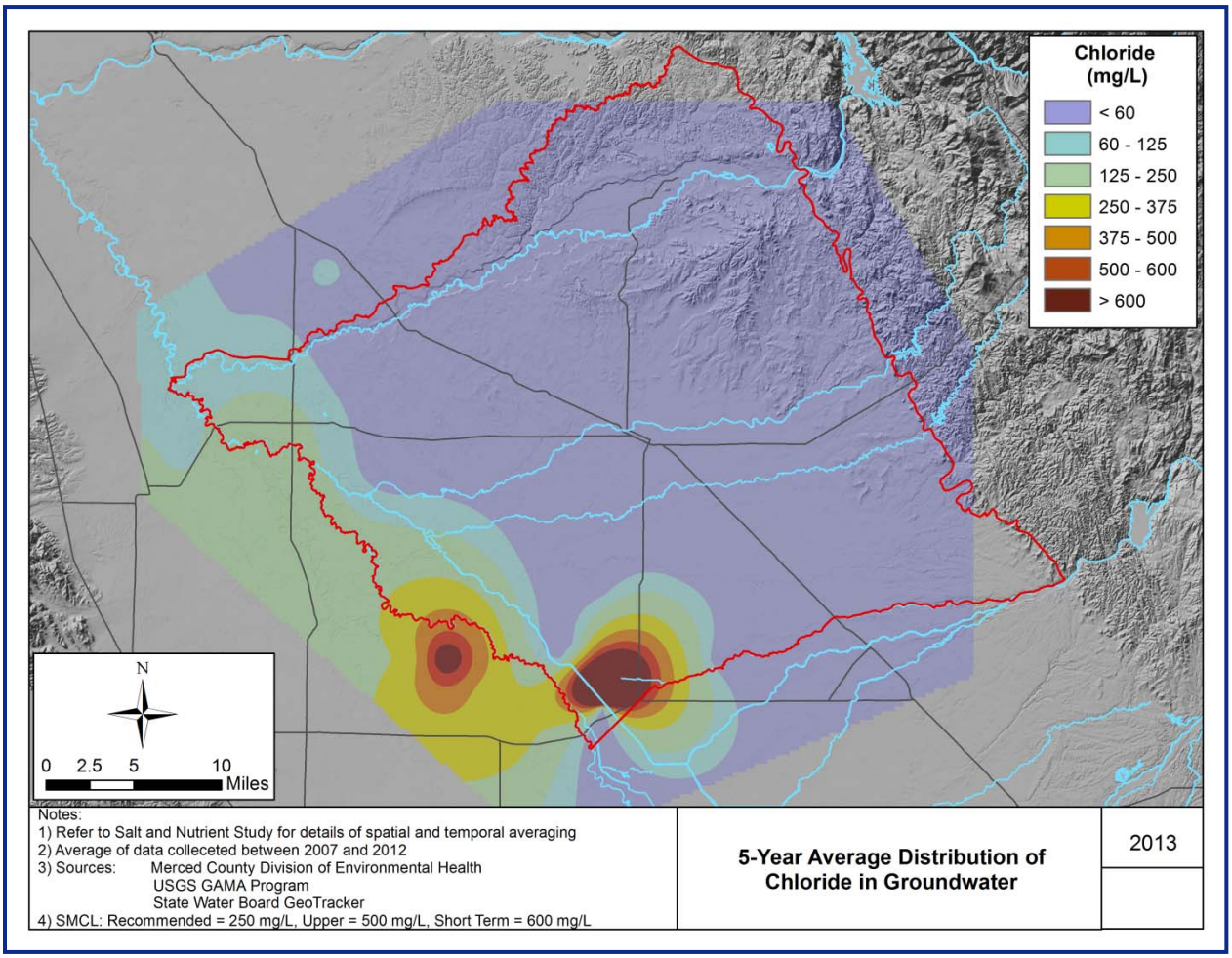


Figure 30: Nitrate Concentrations

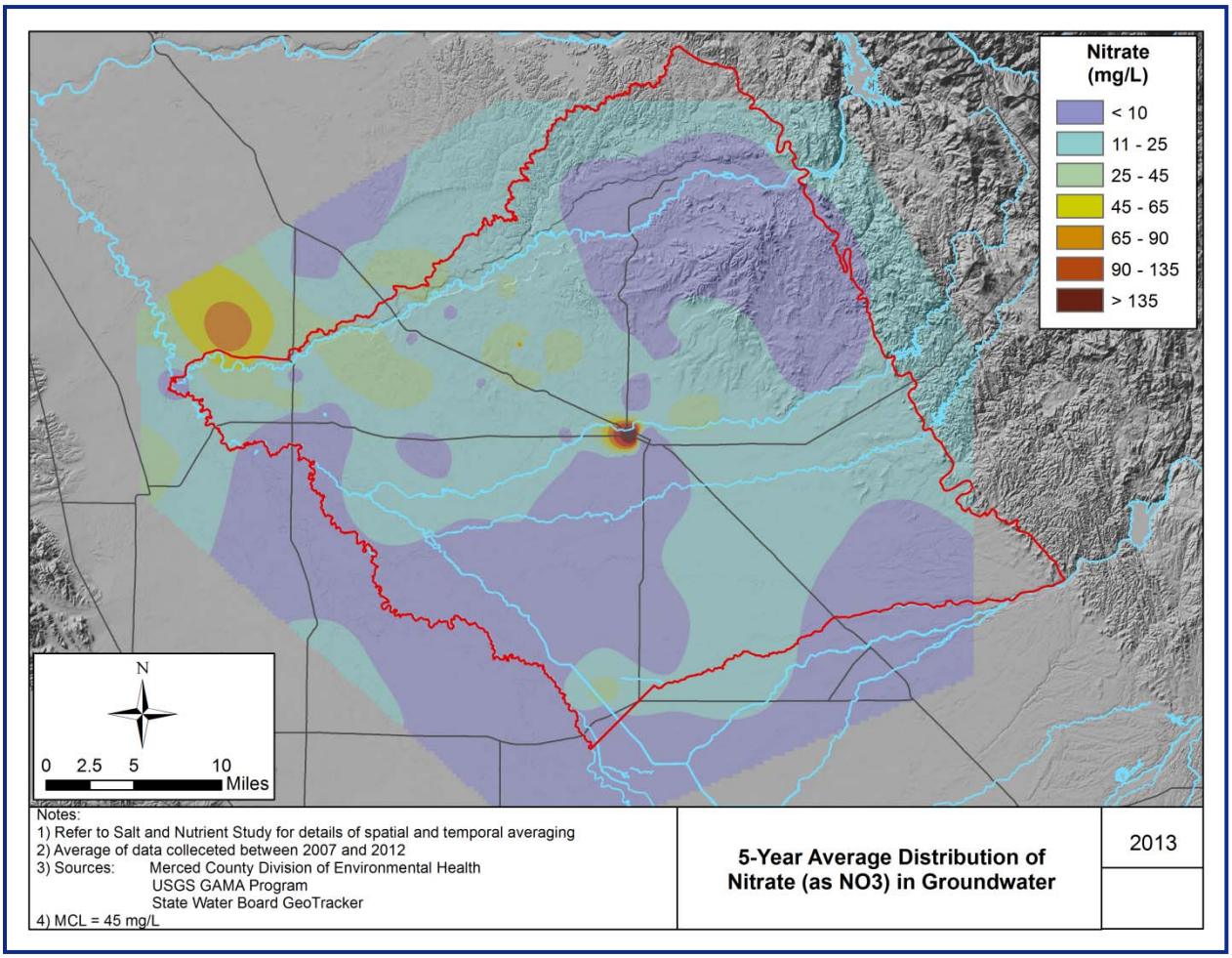
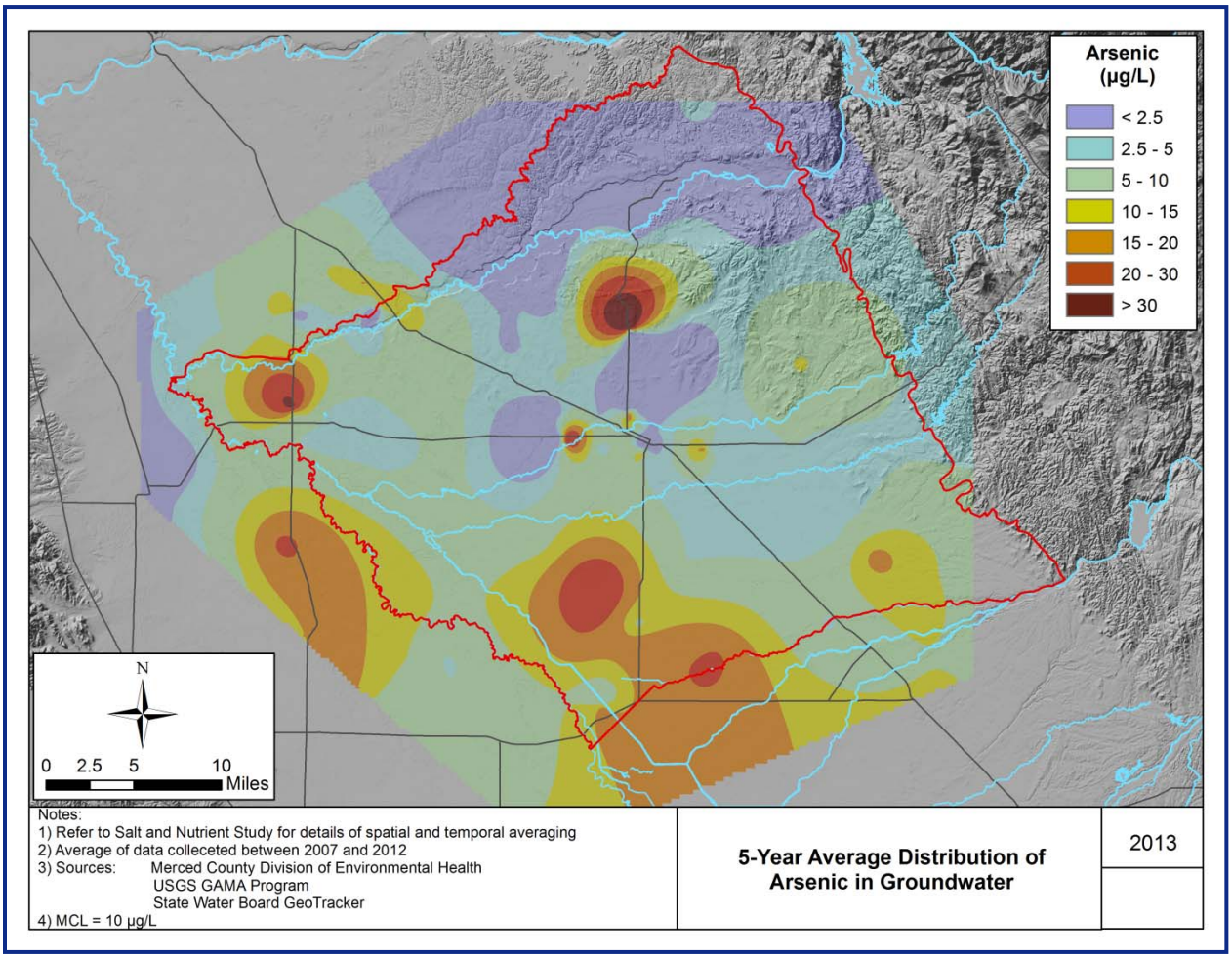


Figure 31: Arsenic Concentrations



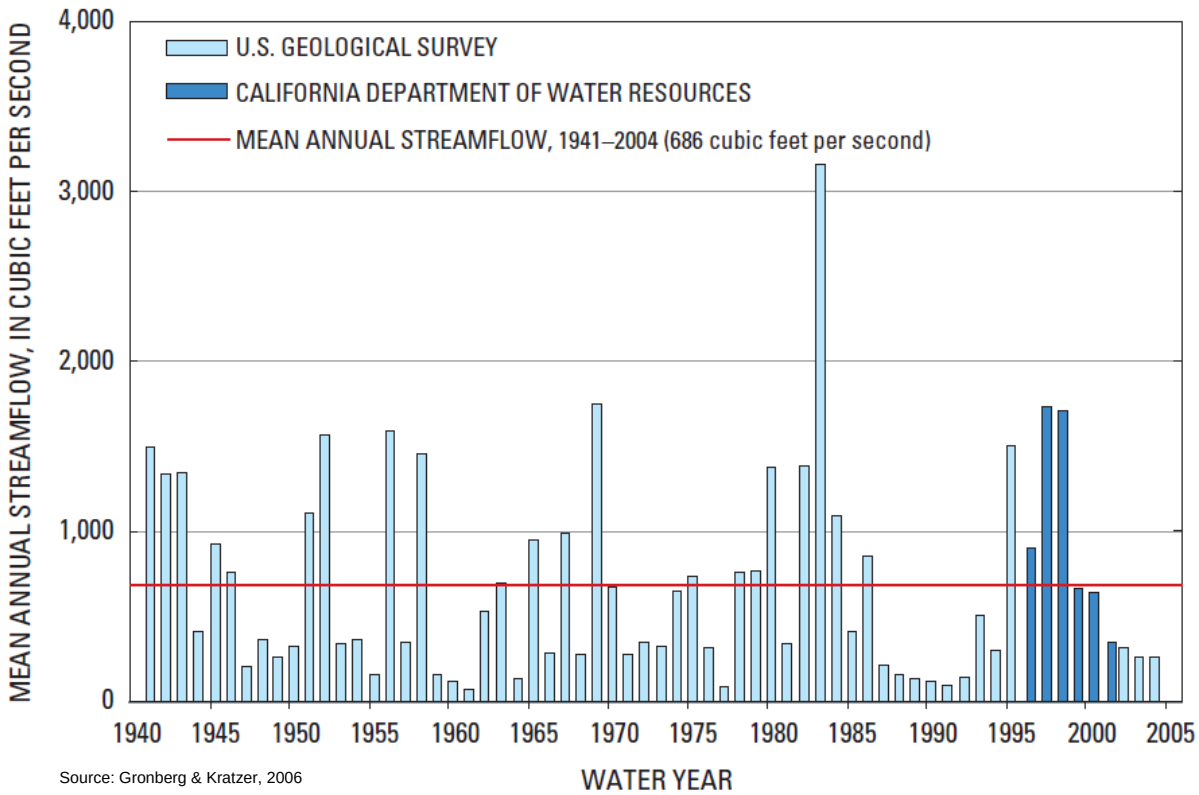
3.10 Surface Water Availability/Infrastructure

Potential surface water for recharge purposes may be supplied from the Merced River, smaller water courses, and local runoff. The Merced River is the principal surface water supply for the area. Figure 32 shows the mean annual streamflow for the Merced River near Stevinson. The figure shows the variability in streamflow due to hydrologic conditions. In the wettest year, an annual average of 3,000 cubic feet per second (cfs) was recorded flowing past the Stevinson Area in the Merced River, while in the driest years average annual streamflow was less than 100 cfs. Given the existing demands on the Merced River, it is the flows during the wetter periods that may be available for recharge.

MID diverts water from the Merced River into their distribution system through the Northside Canal from the Merced Falls Dam and through the Main Canal from the Crocker-Huffman Diversion Dam. The Northside Canal serves 10,000 acres of farmland north of the Merced River. Between 1994 and 2007, MID diversions have ranged between 430,600 – 571,000 acre-feet per year (afy) and averaged about 500,000 afy (Nolte, 2009). The Main Canal has a capacity of 2,000 cfs. MID operates 825 miles of water distribution facilities, of which 75% are earthen-lined canals, 14% are concrete lined channels, and 11% are pipelines (Merced Irrigation District, 2008)

Other surface water sources include permanent and ephemeral streams such as Bear Creek, Black Rascal Creek, Burns Creek, Canal Creek, Cottonwood Creek, Deadman Creek, Fahrens Creek, Little Dutchman Creek, Mariposa Creek, and Owens Creek. Gaging stations located on Burns Creek, Bear Creek, Mariposa Creek, and Owens Creek indicate that since 1993, annual outflow from the Region's creeks has ranged from 15,000 AFY to 238,700 AFY, with an average of approximately 94,000 AFY (AMEC Geomatrix, 2008). DWR estimates that approximately half of the inflow from surface water bodies (approximately 47,000 AFY) infiltrates and recharges the Merced Subbasin (AMEC Geomatrix, 2008).

Figure 32 Mean Annual Streamflow, Merced River near Stevinson, California



Source: Gronberg & Kratzer, 2006

3.11 Surface Water Quality

Water quality in the Merced River is generally unaffected by agricultural activities above New Exchequer Dam, (Gronberg & Kratzer, 2006) and declines as the water flows through the Merced Region. Water quality concerns in the lower Merced River include pesticides, notably DDT compounds and toxaphene, and trace elements (which could include includes arsenic, cadmium, chromium, copper, lead, mercury, nickel, or zinc) (Dubrovsky, Kratzer, Brown, Gronberg, & Burow, 1998).

3.12 Recharge Suitability Indices

A Geographic Information System (GIS) overlay method is used to analyze available spatial data and integrate the information to interpret physical conditions and produce index maps. The process involves multiple steps which include:

- Obtaining or creating GIS datasets that influence groundwater recharge;
- Applying ranking criteria and weights to each dataset;
- Overlaying and analyzing the data layers and conducting calculations to aggregate data to produce index maps showing preferred areas for groundwater recharge.

The digital data are used to evaluate the three recharge conditions presented in Table 2. Natural recharge is an estimate of where recharge was more focused prior to development. Anthropogenic recharge is an estimate of where recharge occurs, taking into account current land use and water use practices. The Facility Siting index is a measure of locations that may be better suited for new spreading basins. An index ranking system is developed and applied using GIS. The features for each dataset are ranked on a scale from 0 or 1 to 5 with 0 being least favorable conditions and 5 being most favorable conditions. Additionally, each dataset is weighted based on its importance in determining recharge. The ranking and weighting factors are shown in Table 3.

Table 2 Types of Data Used to Evaluate Recharge Conditions

	Natural	Anthropogenic	Facility Siting
Land use		√	√
Hydrologic soils group	√	√	√
Surface slope	√	√	√
Texture of subsurface materials, 0 -50 ft	√	√	√
Texture of subsurface materials, 50 -100 ft	√	√	√
Texture of subsurface materials, 100 -150 ft	√	√	√
Corcoran Clay thickness	√	√	√
Depth to groundwater	√	√	√
Groundwater flow direction			√

Table 3 Ranking Factors and Quantification Methods

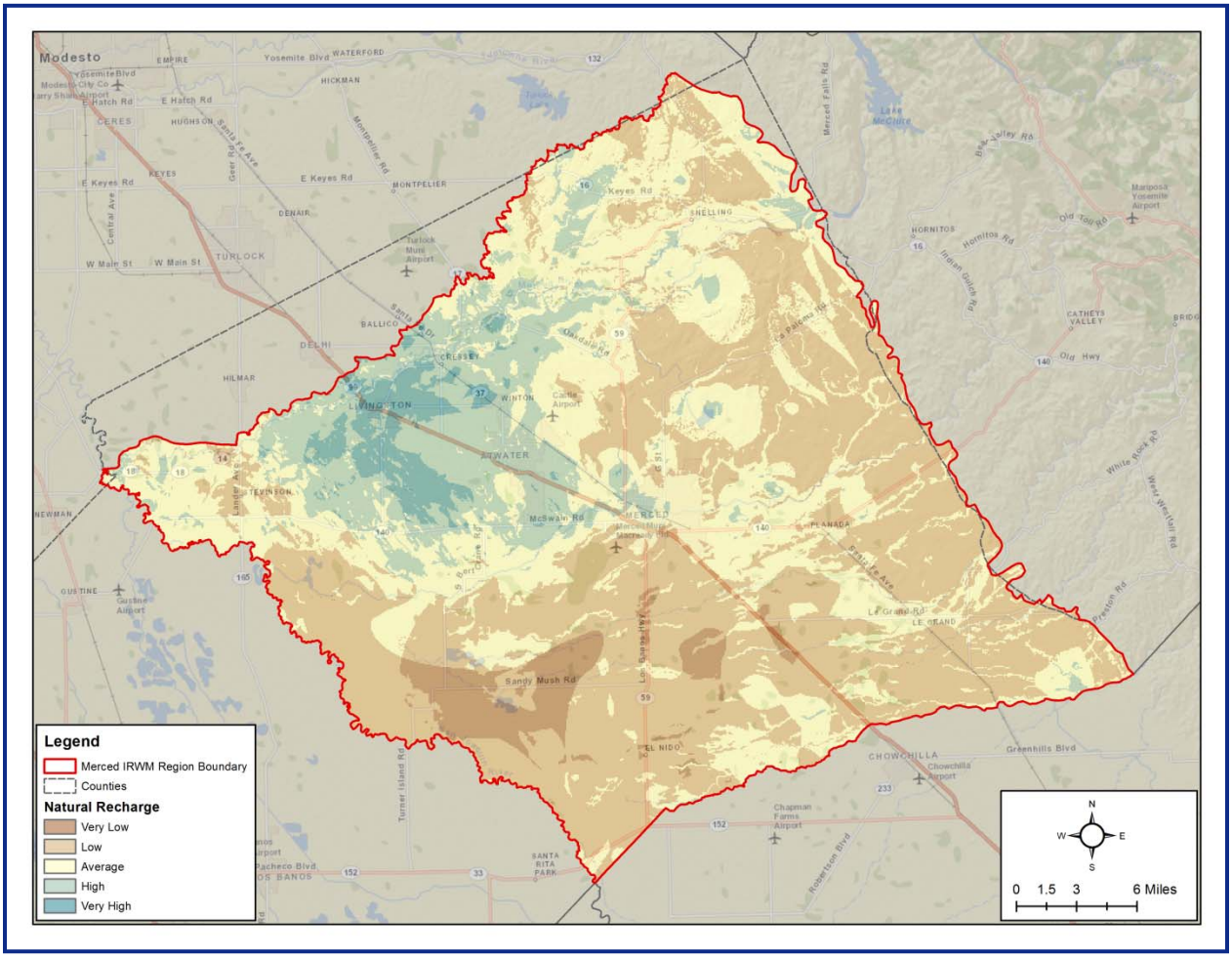
Factor	Quantification Method	Attribute	Natural Recharge		Anthropogenic Recharge		Facility Siting	
			Weight	Ranking	Weight	Ranking	Weight	Ranking
Appropriate land uses	Land use is quantified by land use maps	Land Use Idle Vacant Field Crops Pasture Other Crops Urban, Semi Ag Riparian, Water Native	N/A	N/A	5	3 3 5 5 5 1 5 3	3	5 4 3 3 2 1 0 0
Surface and Subsurface Conditions	Soil permeability is quantified using soils data from USDA-NRCS soil surveys in combination with slope and the depth to the Corcoran clay.	Hydrologic Soils Group Type A Type B Type C Type D Not Surveyed	5	5 3.75 2.5 1.25 2.5	5	5 3.75 2.5 1.25 2.5	4	5 3.75 2.5 1.25 2.5
		Slope (degrees) 0–2 3–5 6–8 9–15 16+	1	5 4 3 2 1	1	5 4 3 2 1	2	5 4 3 2 1
		Depth to Corcoran Clay Not present 0-20 ft 20-40 ft 40-60 ft >60 ft	1	5 4 1 2 3	1	5 4 1 2 3	2	5 4 1 2 3
Available storage	Available storage is quantified by soil texture and depth to water	Soil texture (0 to 50 ft) (% Coarse-Grained Materials) 80–100 60–80 40–60 20–40 0–20	5	5 4 3 2 1	5	5 4 3 2 1	5	5 4 3 2 1
		Soil texture (50 to 100 ft) (% Coarse-Grained Materials) 80–100 60–80 40–60 20–40 0–20	5	5 4 3 2 1	5	5 4 3 2 1	5	5 4 3 2 1
		Soil texture	5		5		5	

		(100 to 150 ft) (% Coarse-Grained Materials) 80–100 60–80 40–60 20–40 0–20		5 4 3 2 1		5 4 3 2 1		5 4 3 2 1
		Depth to Water (feet) >80 ft 60–80 ft 40–60 ft 20–40 ft 10–20 ft 0–10 ft	5	5 5 5 5 2.5 1	5	5 5 5 5 2.5 1	5	5 4 3 2 1 0
Flow Direction	Flow direction is based on groundwater elevation maps	Flow Direction Flow In Flow Out (low/ moderate slope) Flow Out (steep slope)	N/A	N/A	N/A	N/A	5	5 2.5 1

3.12.1 Natural Recharge

Figure 33 shows the results of the Natural Recharge Index. The results show that most natural recharge from rainfall and stream flow sources occurred in the areas centered along Highway 99 to the northwest of Merced and along the path of the Merced River. Areas with lower natural recharge are primarily along the northeasterly boundary and in the southern portions of the region.

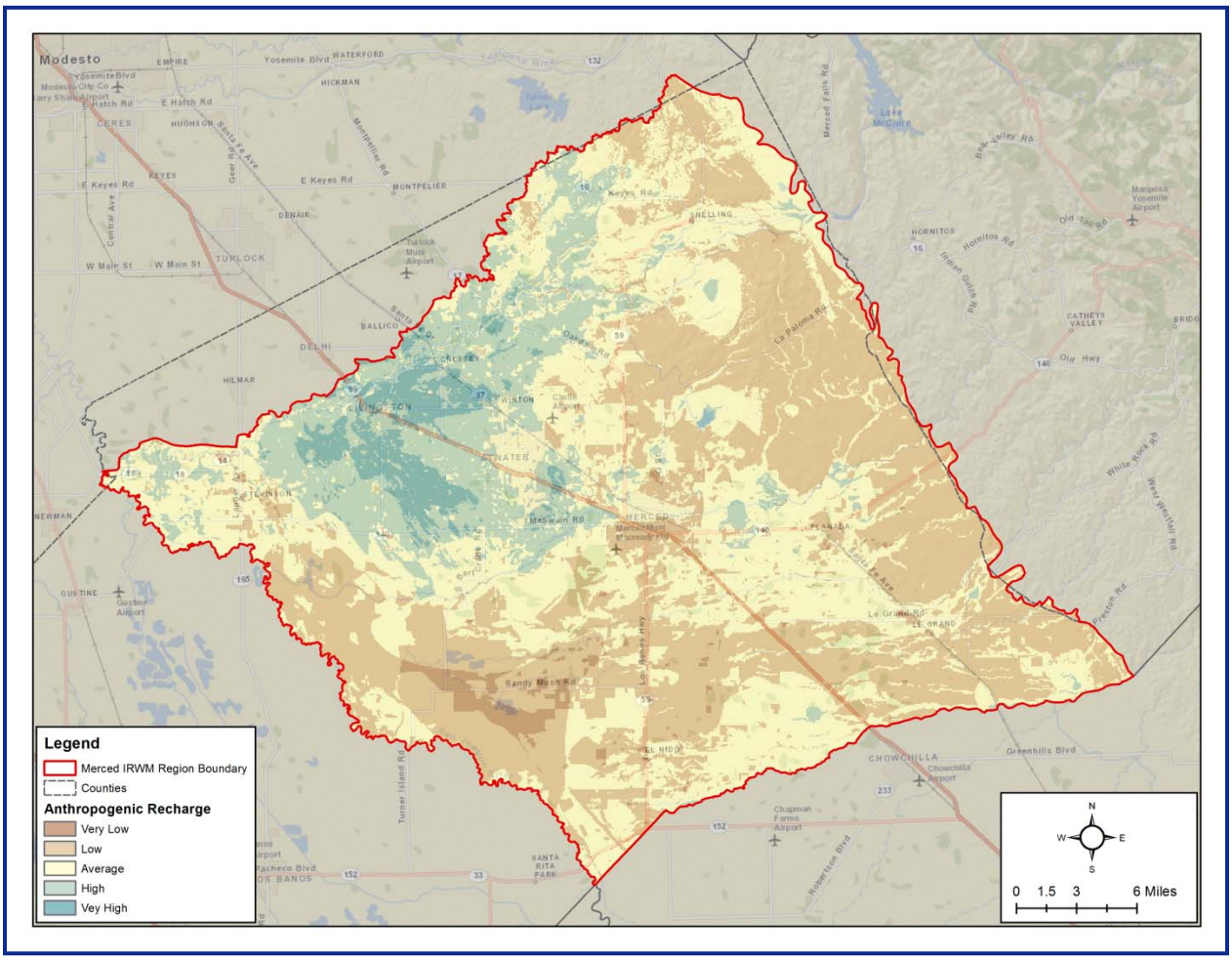
Figure 33: Index – Natural Recharge



3.12.2 Anthropogenic Recharge

Figure 34 show the results of the Anthropogenic Recharge Index. The results are somewhat similar to Figure 33 except that recharge is less in urbanized areas and higher on the surrounding irrigated agricultural lands.

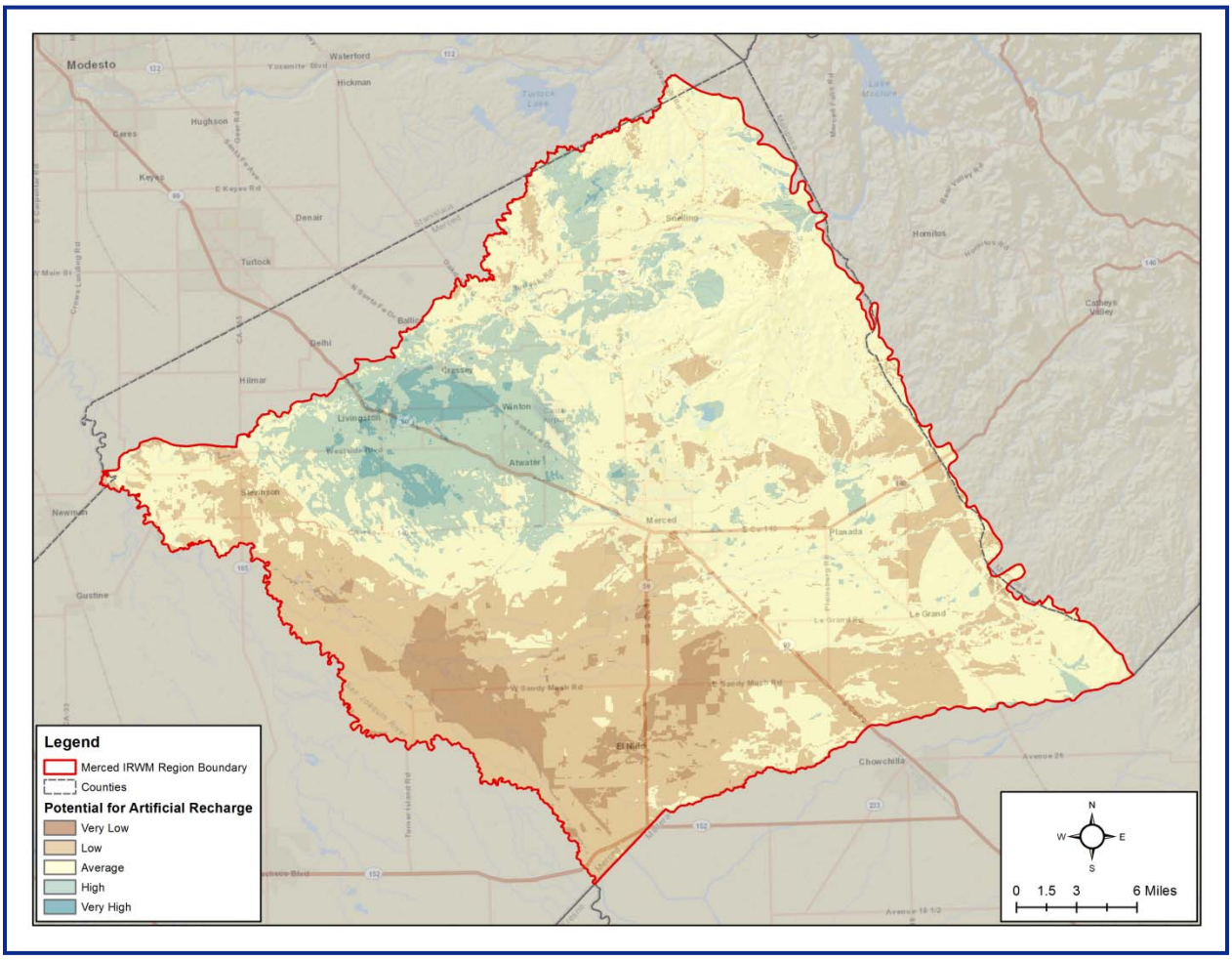
Figure 34: Index – Anthropogenic Recharge



3.12.3 Potential for Artificial Recharge

Figure 35 shows the results of the Facility Siting Index. The results show that the most promising locations for recharge facilities are generally along Highway 99 to the northwest of the City of Merced. More isolated areas that have higher potential for recharge exist in much of the basin to the north of a line extending from approximately Stevinson to the Merced Wastewater Plant to Le Grande.

Figure 35: Index –Recharge Facility Siting



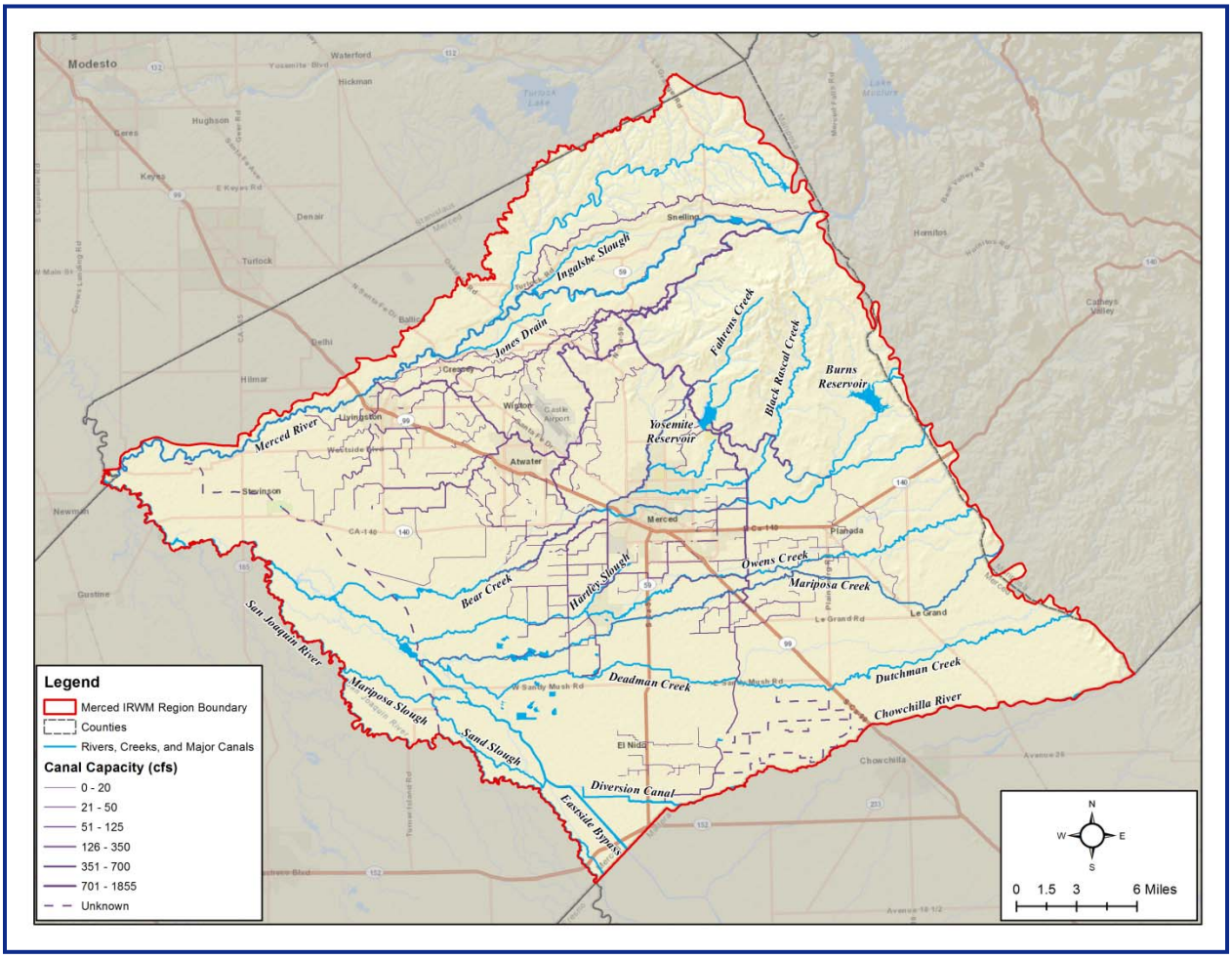
3.13 Data Gaps

Sufficient data was available to characterize recharge in the study area at a regional level. As with most studies, additional data could improve or expand the analysis. Data that would contribute the most toward improving the results are available canal capacities. Additionally, the elevation of parcels in relation to the elevation of the relevant conveyance would help identify where water could be cost-effectively delivered. Other items, such as sufficient water quality data, may not be cost effective for this type of regional analysis. The GIS analysis has been developed in a flexible form such that additional data can be incorporated into the analysis as it becomes available.

Canal available capacity was not readily available for the study area in a format suitable for inclusion in the GIS analysis. Figure 36 shows the location of canals and pipelines for MID, Chowchilla Water

District, Merquin County Water District, and Stevinson Water District; however, the dataset does not contain attributes to determine where the canals have excess capacity and when that excess capacity occurs. The availability of excess capacity is critical to move water to the recharge basins. Discussions with MID, Chowchilla Water District, and other surface water users will be needed to determine where and when water can be moved to potential basins and to identify where canal improvements may be warranted.

Figure 36: Surface Water Canals and Pipelines



3.14 Local Considerations

This analysis was performed at a regional scale. Local conditions can vary significantly and should be confirmed prior to moving forward with specific sites. For instance, local understanding of individual parcels of land that are known to be too sandy to effectively farm can often be very effective recharge sites, cost-effective for purchase, result in the sale of excavated materials, and can have water quality benefits from ceasing application of agrochemicals onto the sandy soil. Alternately, there are known locations of high groundwater in areas generally between the cities of Atwater and Livingston, south of Highway 99 and north of Highway 140 (AMEC Geomatrix, 2008). These areas will require special consideration to ensure that recharge activities could exist without exacerbating high water levels.

Additionally, local conditions can vary considerably from what can be shown in a regional analysis. For this reason, local studies should be performed to determine the suitability of a site prior to design and construction. These local studies should include collection of information on lithology, groundwater levels, presence of perched aquifers, groundwater quality, surface water availability and quality, and other locally relevant issues.

3.15 Conclusions

Understanding recharge is important for effective management of groundwater. This analysis characterized recharge in three ways: natural, anthropogenic, and for purposes of locating recharge facilities.

The analysis method selected is relatively straightforward, transparent, and repeatable. The details of the analysis, the ranking and weighting of the datasets, should help improve the awareness of the Merced Region stakeholders of the importance of the recharge areas to the overall management and operation of the groundwater basin. This awareness is intended to facilitate further discussion regarding how to best manage the local resources.

The results from the analysis presented herein show the relative capability for recharge or suitability for recharge projects. Based on these results, the location of historical and current recharge areas, the impacts of current and future land use changes, and where to concentrate efforts at determining feasibility for development of recharge facilities can be better understood and put to use for future groundwater management activities. The results of this effort are also suitable for compliance with new groundwater management plan requirements of AB359, which, among other requirements, requires inclusion of a recharge map in groundwater management plans.

The results of the study indicate that the best recharge areas are focused in a relatively small portion of the basin, near Livingston and Atwater. Many of these areas are near the Merced River and more detailed analysis is warranted for potential projects to estimate the volume of recharged water that could be lost to the surface water system. While benefits may be accrued from direct recharge projects, in-lieu recharge should be used extensively to provide recharge benefits across the Merced Region. In-lieu projects do not require permeable materials above the aquifer for success and thus can be widely implemented across the region, where available surface water can be delivered to substitute for groundwater pumping.

Recommendations for future work include identifying potential sites through stakeholder coordination, performing site specific analyses and field work, identifying source water and water rights, and confirming conveyance capacity. In-lieu projects can be advanced through identification of additional water supplies, water delivery infrastructure, and/or water users.

4 Codes and Regulations

There are numerous codes and regulations that are relevant to the development of an artificial recharge basin. The applicable codes and regulations and the related permits will vary depending on the specifics of the project. Table 4 provides a summary of relevant codes and regulations. Not all of these will be required for all projects, and additional needs may arise for other projects. Specifically, several of the items in Table 4 relate to alterations of streams, which will likely not be relevant to the majority of potential projects in the Merced Region.

The timing of the permits will depend on the permits required by the specific project. The initial step should be to define the project. The project description can then be used to determine the necessary permits. For example, many projects would not require a Section 404 Permit, Streambed Alteration Agreement, CVFPB Encroachment Permit, or a Mining Permit. However, a project may require additional unlisted permits. For example, a project recharging recycled water would require significantly more analysis and additional permits.

Table 4: Summary of Potentially Relevant Codes and Regulations

Item	Potential Permit or Other Needs	
Federal		
Section 404 of the Clean Water Act	Wetlands Delineation Section 404 Permit	
State		
California Environmental Quality Act (CEQA)[a]	Environmental Impact Report (EIR) Mitigation Monitoring and Reporting Plan Findings and Statement of Overriding Consideration	
California Endangered Species Act	Informal Consultation, Incidental Take Permit, or Consistency Determination	
California Fish and Game Code Section 1600 (Streambed Alteration)	Streambed Alteration Agreement	
Porter Cologne Water Quality Act	Section 401 Water Quality Certification Section 402 NPDES Permit	
	Storm Water Pollution Prevention Plan	
State Water Resources Control Board	Ensure appropriate water rights to source water	
Central Valley Flood Protection Board (CVFPB)	CVFPB Encroachment Permit	
Local		
San Joaquin Valley Air Pollution Control District	Dust Control Plan	
Merced County Surface Mining and Reclamation Act (SMARA)	Mining Permit Reclamation Plan	
Other Local Considerations		
Easements	Grading and Excavation Permits	Design Standards and Specifications
Right-of-Way Crossings	Building Permits	Well Permits
Encroachment Permits	Tree Removal Permits	

Footnotes:

a. CEQA incorporates numerous other state requirements, including the Native Plan Protection Act, California Fish and Game Code Sections 1800-1802, 3503, 3511, and 5050.

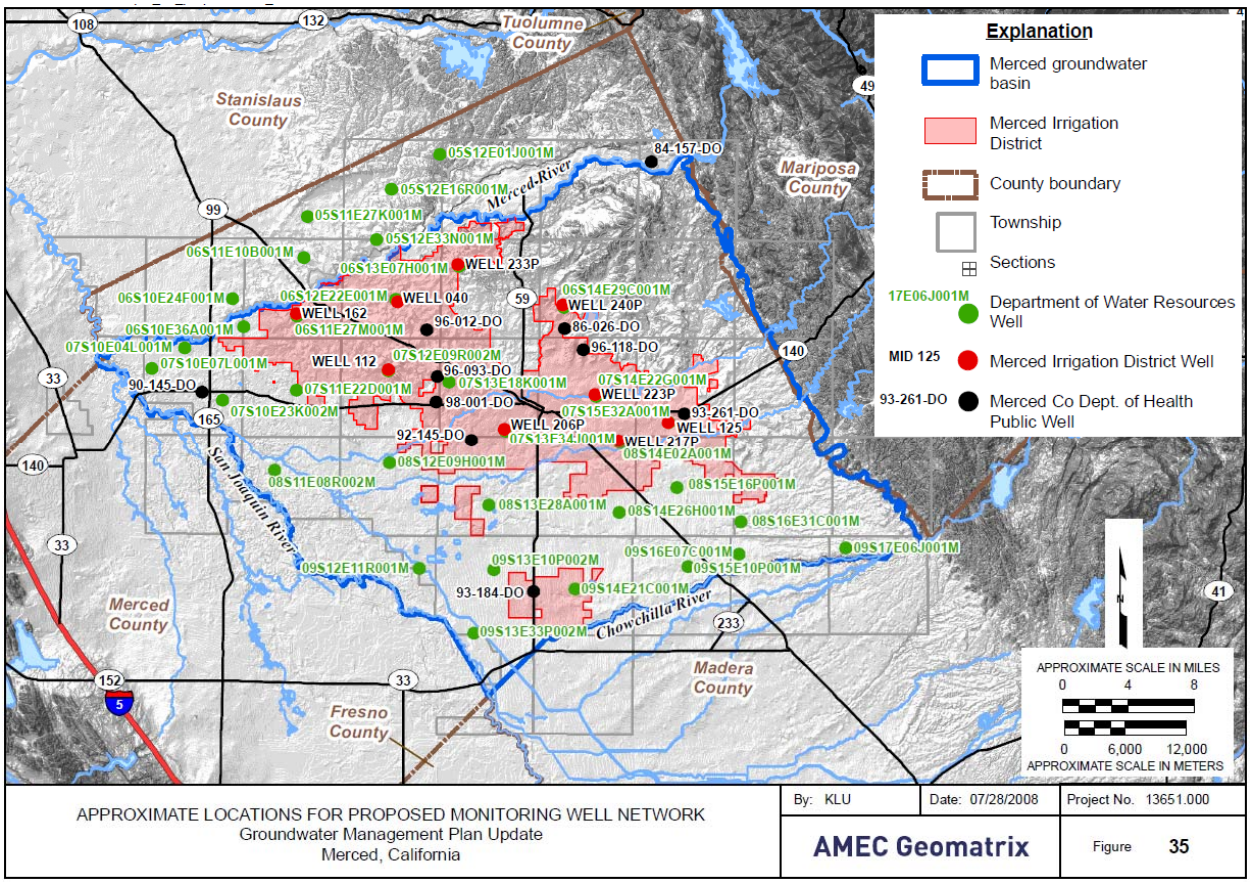
5 Monitoring Protocols

Monitoring is necessary to quantify progress towards meeting overall sustainability goals for the basin and to monitor for the effectiveness of the recharge basins. A portion of this need can be met through existing monitoring, although additional monitoring can improve the ability to quantify these items.

5.1 Existing Protocols

As described in the *Merced Groundwater Basin Groundwater Management Plan Update* (AMEC Geomatrix, 2008), groundwater levels have been measured by DWR, MID, and other entities since the 1950s. The GWMP developed a long-term network for monitoring overall groundwater conditions in the Merced Groundwater Basin, as shown in Figure 37.

Figure 37: Existing Groundwater Monitoring Well Network



Water quality is monitored in the basin for public supply wells and for domestic wells. The public supply wells in the area are monitored for water quality for compliance with California Code of Regulations Title 22. Additionally, Merced County Department of Environmental Health has monitored 18 domestic wells since 1988. The GWMP added 20 agricultural wells to the water quality monitoring efforts, analyzing water for general minerals, nitrate, and arsenic on a 5-year frequency.

Monitoring protocols for the area are presented in the GWMP, Appendix F. These protocols include details on purging and sampling of monitoring wells and supply wells; sample containers, labels, preservation, and handling; quality control samples; field measurements; equipment cleaning; and documentation.

5.2 Recommendations

Existing networks and protocols are designed to provide basin-level assessments of water levels and water quality. This existing network should be sufficient to track progress towards meeting basin sustainability goals. However, additional monitoring is needed for individual recharge basins. This monitoring will require site-specific information, but will need to address the following needs:

- Monitoring groundwater levels near the basin
    - To track water in the subsurface and its progress migrating towards aquifers where it can be extracted (monitor for project success). Monitoring would be through nested, multi-level groundwater wells.
    - To identify potential for harm due to waterlogging at adjacent properties. This need will depend on the presence of relatively shallow fine-grained layers or relatively high groundwater levels. Monitoring will be through shallow groundwater wells or piezometers.
- Monitoring groundwater quality near the basin
    - To identify at an early time if there are water quality problems, such as mobilization of arsenic, uranium, or nitrate. Monitoring may be performed through the same wells utilized for groundwater level monitoring if appropriately located.

The extent of monitoring should be based on a qualitative cost-benefit analysis. If the conditions near a recharge basin are well understood and there are few potential issues, there may not be substantial benefit from expensive monitoring. However, if there is the potential to harm adjacent property owners or if there is the potential that recharged water may not be recoverable, then the cost of monitoring may be justifiable.

6 Analytical Tools

6.1 Existing Tools

Existing analytical tools include groundwater models and monitoring databases.

6.1.1 Groundwater Models and Integrated Hydrologic Models

Previous groundwater models related to the Merced Basin were identified as part of this task. Following are the models that were identified in the Basin and/or in the vicinity of the project area.

- New Regional Integrated Water Resources Model
- California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM)
- Central Valley Hydrologic Model (CVHM)
- Castle Air Force Base Groundwater Model
- WESTSIM
- MercedSIM
- Land Use and Water Demand Model (LUWDM)
- Merced Area Groundwater Model (MAGM)

Summary information on the following three models are available and are presented below.

New Regional Integrated Water Resources Model

The Merced Area Groundwater Pool Interests (MAGPI) are embarking on the development of a new integrated water resources model that will serve as an analytical tool for the quantification of the regional

water budget, planning and analysis of conjunctive use management strategies, design and evaluation of specific water supply projects, evaluation of groundwater recharge and banking operations, evaluation of recycled water and storm water projects, evaluation of flood control studies, and development of financing mechanisms and cost sharing arrangements among MAGPI members. Development of the new model will improve the understanding of the surface water and groundwater flow system and response characteristics in the Basin, and aid in the evaluation of the state of the Merced Region in terms of rate and amount of potential overdrafts in the Basin, as well as rate and extent of regional water quality problems in the Basin. With regards to groundwater recharge, the model will be suitable for regional analysis of the impacts and benefits of groundwater recharge, including the net gain in groundwater storage and any potential to raise regional groundwater levels to unacceptable depths.

MAGPI has identified the following goals for development of the integrated water resources model:

- Develop the model in a participatory and transparent manner to facilitate outreach and build technical understanding among basin stakeholders.
- Document the model thoroughly to make it accessible to interested parties.
- Determine the level of model spatial and temporal resolution needed to satisfy basin water planning objectives.
- Establish the capability to evaluate alternative conjunctive water management strategies, including construction of recharge basins or injection wells, and implementation of initiatives to increase surface water sales (in lieu water programs).
- Establish the capability to identify beneficiaries of alternative conjunctive water management initiatives and support development and evaluation of alternative cost sharing formulae.
- Provide assistance to individual MAGPI member agencies in their planning efforts.
- Develop better understanding of basin operations by the public.
- Address specific issues, including:
    - Possible effects on the movement of contaminant sites at Castle Airport
    - Impacts of groundwater pumping in the vicinity of the Merced River on Merced River flows
    - Urban growth impacts
- Establish the ability to add water quality modeling capability to the model, or based on the model, in the future.

MAGPI has also identified the following specific objectives for the model to develop an analytical tool that can:

- Evaluate the natural recharge rates
- Simulate surface water systems operations and also dynamically compute the stream-aquifer interactions as well as unlined canal-aquifer interactions
- Simulate reservoir operations of Lake McClure
- Assists in better understanding the groundwater flow system characteristics and behavior in the Merced Groundwater Basin area, as well as within local sub-areas of interest
- Provide a measure of meeting the goals and objectives of the GWMP and the IRWMP
- Assist in quantifying the effects of use of storm water and recycled water
- Quantify the effects of groundwater storage and banking
- Simulate the groundwater and surface water system responses to different pumping and recharge programs in the model area

- Quantify the impacts of various land use and water supply strategies on groundwater and surface water resources in the Basin

The new model is anticipated to be completed in 2014.

California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM)

The California Department of Water Resources (DWR) developed the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) as a tool to aid in water management planning. C2VSIM simulates the response of the groundwater and surface water flow systems to surface and ground water stresses based on hydrologic data beginning in 1921 using a grid with more than 30,000 nodes. Simulation includes groundwater flow coupled with land surface, river, lake, unsaturated zone and small watershed processes. Water demands are also simulated based on land use, soil and climatic conditions, and agricultural management parameters. C2VSIM is developed using version 3.02 of DWR's Integrated Water Flow Model (IWFM).

Central Valley Hydrologic Model (CVHM)

The Central Valley Hydrologic Model (CVHM) was developed in 2009 by the USGS to model Central Valley water supply and water demand, and simulates surface water and groundwater flow. CVHM includes a geospatial database, a texture model, and is simulated using MODFLOW and the Farm Process. The model utilizes 20,000 uniform model cells with an area of 1 mi^2 each and divides the aquifer horizontally into 10 layers (U. S. Geological Survey - California Water Science Center, 2012).

Castle Air Force Base Groundwater Model

A model was developed in 1988 by Lizanne Avon titled "A contaminant transport model of trichloroethylene movement in groundwater at Castle Air Force Base, California" No additional data are currently available. Any localized model around the Castle Airport Aviation and Development Center would be focus on contaminants and would likely not cover areas that are well suited for recharge due to that contamination.

WESTSIM

WESTSIM is an IWFM-based groundwater and surface water simulation model of the west-side of the San Joaquin Valley. The model was developed in 2006 by the U.S Bureau of Reclamation largely to assist in addressing subsidence, climate change, streamflow, and TMDL issues.

MercedSIM

MercedSIM is a Lawrence Berkeley National Laboratory application that simulates the hydrology of east and west-side of Merced County. MercedSim incorporates WESTSIM and expands to the east, utilizing the same 7-layer structure as WESTSIM. Additional data from the east of the San Joaquin River was incorporated from DWR, MID, and Geomatrix to create a model with a 10-year simulation period of 1990-2000. The model is not currently available for use.

Land Use and Water Demand Model (LUWDM)

The Land Use and Water Demand Model (LUWDM) was used in 2001 to calculate monthly demand for Merced River diversions and water demand for agricultural and municipal use.

Merced Area Groundwater Model (MAGM)

The Merced Area Groundwater Model (MAGM) was used in in 2001 in conjunction with LUWDM and MRSIM to simulate groundwater levels and flow directions for the project area. It is not currently known what software or algorithms were used for this model.

6.1.2 Surface Water Models

Previous surface water models related to the Merced Basin were identified as part of this task. Following are the models that were identified in the Basin and/or in the vicinity of the project area.

- Merced River Simulation Model (MRSIM)
- CalSim II
- CalSim III

Summary information on the following three models are available and are presented below.

Merced River Simulation Model (MRSIM)

Merced River Simulation Model (MRSIM) is a mass balance sequential simulation model that operates Lake McClure on a monthly basis to satisfy irrigation needs within MID boundaries. MRSIM is written in FORTRAN and is designed specifically to simulate Lake McClure and the Merced River downstream to Cressey. The algorithms for this model are not currently known.

CalSim II

CalSim II is a planning model developed by the Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation). It simulates the State Water Project (SWP) and the Central Valley Project (CVP) and areas tributary to the Sacramento-San Joaquin Delta. CalSim II provides quantitative hydrologic-based information to those responsible for planning, managing and operating the SWP and the CVP. As the official model of those projects, CalSim II is typically the system model that is used for any interregional or statewide analysis in California. CalSim II uses described optimization techniques to route water through a CVP-SWP system network representation. The network includes over 300 nodes and over 900 arcs, representing 24 surface reservoirs and the interconnected flow system.

The model operates on a monthly time step from water year 1922 through 2003. Using historical rainfall and runoff data, which has been adjusted for changes in water and land use that have occurred or may occur in the future, the model simulates the operation of the water resources infrastructure in the Sacramento and San Joaquin river basins on a month-to-month basis during this 82-year period. In the model, the reservoirs and pumping facilities of the SWP and CVP are operated to assure the flow and water quality requirements for these systems are met. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over 82 years from 1922 to 2003, representing a fixed level of development (U.S. Bureau of Reclamation, 2008).

CalSIM III

CalSIM III is currently under development to address weaknesses identified in CalSim II. Goals for CalSim III development include:

- Improve accuracy of water supply estimates
- Create finer model spatial resolution
- Update agricultural demand calculations and water use efficiencies
- Associate agricultural demand with the correct water supply source
- Reconcile differences between C2VSIM and CalSim
- Improve the representation of groundwater (Yin & Arora, 2007)

CalSim III has not been publically released.

6.1.3 Data Management Tools

The Merced Groundwater Basin Groundwater Management Plan Update (AMEC Geomatrix, 2008) indicates that the member agencies upload data into a centralized repository for storage and analysis. As part of the IRWMP development, a data management tool, HydroDMS, will be developed and implemented. This will allow data to be available to member agencies and the public through an internet website.

6.2 Recommended Tools

The basic tools needs for developing and implementing a recharge program are the ability to estimate the benefits and impacts of recharge project and the ability to share information with stakeholders. Existing tools and tools under development meet the bulk of those needs. Recommendations for additional tools include:

- Water Availability Tool. A water availability tool would include information on streamflow, water rights, and available canal capacities. This could be based on historical data or could be a more dynamically driven model based on the datasets of the integrated hydrologic model. The purpose of the tool would be to indicate when and where there is the ability to move water through existing infrastructure and to identify where small cost-effective infrastructure changes can be made to increase the ability to recharge water.
- Water Accounting Tool. A water accounting tool would account for surface water and groundwater use throughout the region. The tool would allow for the analysis of net water use, taking into consideration the connectivity between the surface water system and the groundwater system.

7 Alternatives

Alternatives were developed to analyze the ability to meet basin sustainability goals through additional artificial recharge. This analysis was done at a conceptual, high-level analysis. Actual selection of recharge basins will be based on this and future site-specific, technical analysis as well as on the ability to identify willing sellers and other non-technical metrics.

As discussed in Section 2, the Merced Groundwater Basin is currently thought to be in a state of declining groundwater levels. Work performed for the Groundwater Management plan indicated that over the period of 1980 through 2007 there was an annual average loss of 26,000 AFY of groundwater from the Merced Groundwater Basin, which is similar to the Merced Region, but does not include the portion of the Merced Region north of the Merced River. Alternatives were developed based on measured infiltration rates from Cressey Basin (located on 19 acres north of Winton on the southwest corner of Mercedes Avenue and Jones Road) and from other basins throughout the state. Infiltration rates seen over a two-month period at Cressey Basin were approximately 12 ft/day, 14 ft/day, and 1 ft/day for Ponds 1, 2, and 3, respectively. Assuming 4 months of recharge per year occurring on 50% of all years, this results in an average recharge of 720, 840, and 60 ft/year for the three ponds, respectively. Elsewhere in California, ponds typically recharge at a rate of between 100 and 700 ft/year (see Table 5). These values are obviously dependent on water availability and local geologic conditions, but provide a starting point for a regional analysis of the amount of land required to address overdraft.

The footprint of recharge basins needed to address the 26,000 AFY of artificial recharge was developed based on an average annual recharge rate of 100 ft/yr, 400 ft/yr, and 700 ft/yr. Obtaining the 26,000 AFY recharge will require:

- at 100 ft/yr, approximately 260 acres
- at 300 ft/yr, approximately 90 acres
- at 600 ft/yr, approximately 40 acres

To provide a sense of scale, these sizes are shown on Figure 38 along with the rankings from the Recharge Facility Siting Index that are within ½ mile of a MID canal or pipeline. Delivery infrastructure for other entities is not shown due to a lack of available data.

Development of recharge facilities will require additional site-specific investigations and/or pilot projects. The appropriate number of recharge basins (i.e., whether to have one or two larger basins or several

smaller basins) will depend on identifying the balance between increased infrastructure costs of multiple locations with decreased mounding issues and potentially more uniform distribution of project benefits. The locations themselves will need to be identified based on the suitability presented in this technical memorandum as well as available canal capacity, water availability, land availability, and land cost.

At this stage, five opportunity areas have been identified based on the information presented in this effort, as shown in Figure 39. Further discussions based on these opportunity areas is recommended.

In implementation, the locations and the sizes of the location will differ from what is shown due to availability of land for purchase, canal capacity limitations, water availability, and other factors. Also, note that as basins become larger the recharge rates decline due to reduced ability for lateral movement of recharged water.

Table 5: Measured Recharge Rates from Existing Recharge Basins

Recharge Basin	Agency	Location	Recharge Rate (ft/yr)
Cressey Basin, Pond 1	Merced Irrigation District	Winton	720[a]
Cressey Basin, Pond 1	Merced Irrigation District	Winton	840[a]
Cressey Basin, Pond 1	Merced Irrigation District	Winton	60[a]
Rapid Infiltration Extraction (RIX)	Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority	Riverside	100[b]
LAC Recharge Area	Palmdale Water District (PWD)	Antelope Valley	30[b]
ULRC Recharge Area	Palmdale Water District (PWD)	Antelope Valley	13[b]
LLRC Recharge Area	Palmdale Water District (PWD)	Antelope Valley	30[b]
Sweetwater Recharge Facilities	City of Tucson	Tucson, AZ	380[b]
Turner Basins @ Chino Basin	Inland Empire Utilities Agency	Ontario	29[b]
Warner Basin	Orange County Water District	Orange County	110[b]
Anaheim Lake	Orange County Water District	Orange County	390[b]
Kraemer Basin	Orange County Water District	Orange County	670[b]
Miller Basin	Orange County Water District	Orange County	660[b]
Burris Basin	Orange County Water District	Orange County	78[b]
Santiago Basins	Orange County Water District	Orange County	210[b]

Footnotes:

a. Recharge rate based on rates measured for 2 months. Assumes 4 months of recharge occurring 50% of years.

b. Recharge rates based on average annual recharge divided by pond area.

Figure 38: Footprint of Recharge Basins Estimated as Needed to Address Overdraft and Recharge Facility Siting Index within 0.5 Miles of Canals and Pipelines

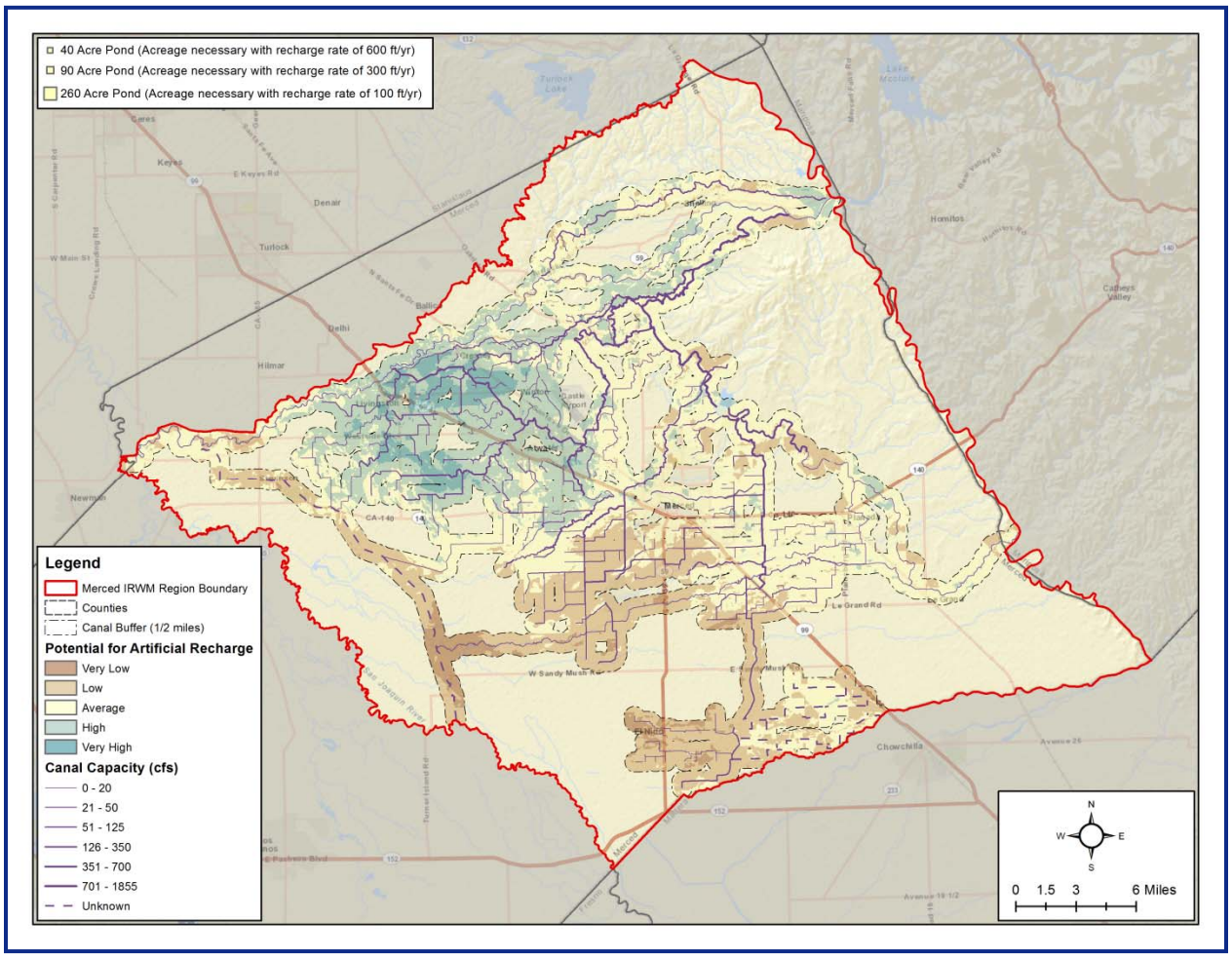
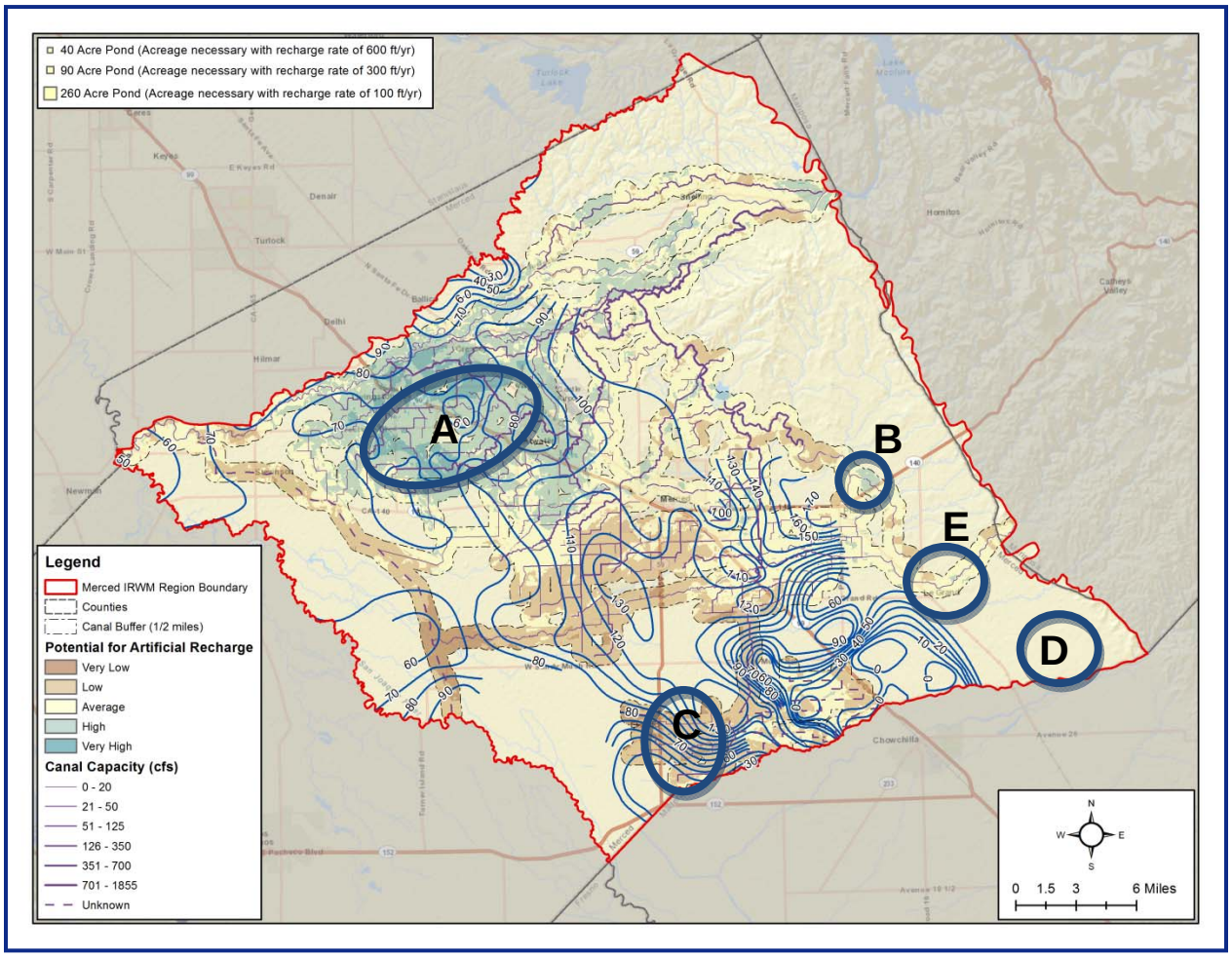


Figure 39: Opportunity Areas with Groundwater Elevations and Recharge Facility Siting Index



7.1 Opportunity Area A

Opportunity area A is located just south and east of Livingston. This area is noted as having "sugar sand" that is conducive to rapid recharge. It is also located in an area mapped with the highest potential for recharge and is located sufficiently away from the northeasterly boundary of the Merced Region to limit losses to the neighboring basin and/or the Merced River. However, with regards to groundwater levels, it should be noted that this area has been mentioned as having problems with high groundwater levels (see Figure 19), and localized groundwater level conditions will require analysis prior to implementing any project.

With regards to the datasets comprising the Recharge Facility Siting Index, Opportunity Area A is:

- Moderately rated for land use, with predominantly agricultural uses
- Highly rated for hydrologic soils group, with predominantly A and B soils
- Highly rated for slope, with predominantly less than 2% slopes
- Highly rated for texture at 0 – 50 ft below ground surface, with areas predominantly higher classifications

- Variably rated for texture at 50 – 100 ft below ground surface, with areas in all but the lowest classification
- Variably rated for texture at 100 – 150 ft below ground surface, with areas in all classifications
- Highly rated for thickness of Corcoran Clay, with 0 – 20 feet of Corcoran Clay
- Moderately rated for depth to groundwater, with areas in the middle classifications
- Highly rated for flow direction, with predominantly flow inward toward pumping depressions
- While not included in the index, the area is away from subsidence indicated in previous studies and would not have a significant benefit in reducing subsidence
- While not included in the index water quality is generally good, with TDS, chloride, nitrate, and arsenic below regulatory limits.

7.2 Opportunity Area B

Opportunity Area B is located north of Planada. This area has been noted as having existing local analysis that could provide local data necessary for recharge siting, the *Southeast Quadrant Well Field Feasibility Study*. It is also located in an area mapped as having average to high potential for recharge and is located along major water delivery infrastructure.

With regards to the datasets comprising the Recharge Facility Siting Index, Opportunity Area B is:

- Highly rated for land use, with predominantly agricultural uses.
- Moderately to poorly rated for hydrologic soils group, with predominantly B and C soils
- Variably rated for slope, with generally less than 2% slopes
- Variably rated for texture at 0 – 50 ft below ground surface, with areas in all classifications
- Variably rated for texture at 50 – 100 ft below ground surface, with areas in all classifications
- Poorly rated for texture at 100 – 150 ft below ground surface, with areas in the lower classifications
- Highly rated for thickness of Corcoran Clay, no Corcoran Clay present
- Highly to moderately rated for depth to groundwater, with areas in the top three classification
- Highly rated for flow direction, with predominantly flow toward the middle of the basin
- While not included in the index, the area is away from subsidence indicated in previous studies and would not have a significant benefit in reducing subsidence
- While not included in the index water quality is generally good, with TDS, chloride, nitrate, and arsenic below regulatory limits.

7.3 Opportunity Area C

Opportunity Area C is located in the southern corner of the Merced Region, near El Nido. While the area as mapped as having a low potential for recharge, the proximity to major water delivery infrastructure and the need for equitable distribution of recharge benefits makes this location an opportunity area.

With regards to the datasets comprising the Recharge Facility Siting Index, Opportunity Area C is:

- Highly rated for land use, with predominantly agricultural uses.
- Variably rated for hydrologic soils group, with all soil types

- Highly rated for slope, with less than 2% slopes
- Poorly rated for texture at 0 – 50 ft below ground surface, with areas in the lowest two classifications
- Moderately to poorly rated for texture at 50 – 100 ft below ground surface, with areas in the lower three classifications
- Poorly rated for texture at 100 – 150 ft below ground surface, with areas predominantly in the lowest classification
- Variably rated for thickness of Corcoran Clay, with all classification present
- Highly rated for depth to groundwater, with areas in the top three classifications
- Moderately to poorly rated for flow direction, with predominantly flow toward the basin boundary to the south.
- While not included in the index, the area is the most impacted by historical subsidence and additional recharge could reduce the risk of future subsidence.
- While not included in the index water quality is generally good, with TDS, chloride, nitrate, and arsenic below regulatory limits.

7.4 Opportunity Area D

Opportunity Area D is located in the eastern corner of the Merced Region, east-northeast of Chowchilla. While away from MID delivery infrastructure, this area may represent an opportunity to work with Chowchilla Water District to implement a project to improve groundwater conditions in both the Merced and Chowchilla Subbasins. It is located in an area mapped as having average to high potential for recharge and is located along the Chowchilla River.

With regards to the datasets comprising the Recharge Facility Siting Index, Opportunity Area D is:

- Variably rated for land use, with a mix of agricultural uses and native vegetation.
- Variably rated for hydrologic soils group, with B, C, and D soils
- Variably rated for slope, with generally less than 2% slopes
- Variably rated for texture at 0 – 50 ft below ground surface, with areas in all classifications
- Moderately to poorly rated for texture at 50 – 100 ft below ground surface, with areas in the lower three classifications
- Variably rated for texture at 100 – 150 ft below ground surface, with areas in all classifications
- Highly rated for thickness of Corcoran Clay, no Corcoran Clay present
- Highly rated for depth to groundwater, in the top classification
- Highly rated for flow direction, with predominantly flow along the basin boundary (noting that this project will require collaboration with Chowchilla Water District and any potential losses to Chowchilla Subbasin would thus be a benefit to the project partner)
- While not included in the index, the area is away from subsidence indicated in previous studies and would not have a significant benefit in reducing subsidence
- While not included in the index water quality is generally good, with TDS, chloride, nitrate, and arsenic below regulatory limits.

7.5 Opportunity Area E

Opportunity Area E is located in the eastern portion of the Merced Region, near Le Grand. It is located in an area with relatively fewer recharge opportunities, with the bulk of the most suitable land located in and around Opportunity Area A.

With regards to the datasets comprising the Recharge Facility Siting Index, Opportunity Area E is:

- Variably rated for land use, with a mix of uses.
- Highly rated for hydrologic soils group, with B, C, and D soils
- Highly rated for slope, with generally less than 2% slopes
- Moderately to poorly rated for texture at 0 – 50 ft below ground surface, with areas in the lower three classifications
- Poorly rated for texture at 50 – 100 ft below ground surface, with areas in the lower two classifications
- Poorly rated for texture at 100 – 150 ft below ground surface, with areas in the lower two classifications
- Highly rated for thickness of Corcoran Clay, no Corcoran Clay present
- Highly rated for depth to groundwater, in the top classification
- Highly to moderately rated for flow direction, with some groundwater flow towards the southeastern boundary or internal sinks near that boundary. Note that some losses here could be a benefit to Chowchilla Water District and maybe an opportunity for partnering on this effort.
- While not included in the index, the area on the edge subsidence indicated in previous studies and could potentially have a small significant benefit in reducing subsidence
- Regional analysis shows that arsenic concentrations in the area may be elevated. This warrants additional study, particularly if the water is intended for drinking water purposes.

8 Implementation

Implementation of recharge activities requires:

- Identification of the role recharge is expected to play in meeting the overall sustainability goal of the basin, as opposed to other options such as conservation.
- Identification of non-basin infrastructure needs, such as canal improvements.
- Identification of potential regional partnerships, such as with Chowchilla Water District
- Identification of parcels for projects, which should include
  - Owner willing to sell at no more than market price
  - Adequate size for a feasible project
  - High score on the Recharge Facility Siting Index
  - Close proximity to a canal with available capacity and the ability to deliver water via gravity or low-head booster pumps.
  - Sufficiently far from point source contaminants
  - Above aquifer with suitable quality for beneficial use of extracted water

- Ability to extract water for beneficial use, through new or existing facilities
- Identification of benefits and impacts through use of modeling tools.
- Identification of funding for development of the projects as well as operation and maintenance
- Development of permits and other items required by regulation
- Construction
- Monitoring
- Operation and Maintenance

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Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-6

MID/FERC/USFWS Agreements

Form L-2
(Revised February 1, 1964)

FEDERAL POWER COMMISSION

TERMS AND CONDITIONS OF LICENSE
FOR UNCONSTRUCTED MAJOR PROJECT
AFFECTING LANDS OF THE UNITED STATES

Article 1. The entire project, as described in the order of the Commission, shall be subject to all the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, that if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval amended, supplemental, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. Said project works shall be constructed in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or

property, no substantial alteration or addition not in conformity with the approved plans shall be made to any dam or other project works under the license without the prior approval of the Commission; and any emergency alteration or addition so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in the project works or divergence from such approved exhibits may be made if such changes will not result in decrease in efficiency, in material increase in cost, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may from time to time prescribe for the protection of life, health, or property.

Article 4. The construction, operation, and maintenance of the project and any work incident to additions or alterations shall be subject to the inspection and supervision of the Regional Engineer, Federal Power Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction

of the project. Construction of the project works or any feature thereof shall not be initiated until the program of inspection for the project works or any such feature thereof has been approved by said representative. The Licensee shall also furnish to said representative such further information as he may require concerning the construction, operation, and maintenance of the project, and of any alteration thereof, and shall notify him of the date upon which work will begin, and as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall allow him and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties.

Article 5. The operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes; and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period

of time, as the Commission may prescribe for the purposes hereinbefore mentioned.

Article 6. The actual legitimate original cost of the original project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Act and the Commission's rules and regulations thereunder.

Article 7. After the first twenty (20) years of operation of the project under the license, six (6) percent per annum shall be the specified rate of return on the net investment in the project for determining surplus earnings of the project for the establishment and maintenance of amortization reserves, pursuant to Section 10 (d) of the Act; one-half of the project surplus earnings, if any, accumulated after the first twenty years of operation under the license, in excess of six (6) percent per annum on the net investment, shall be set aside in a project amortization reserve account as of the end of each fiscal year, provided that, if and to the extent that there is a deficiency of project earnings below six (6) percent per annum for any fiscal year or years after the first twenty years of operation under the license, the amount of such deficiency shall be deducted from the amount of any surplus earnings accumulated thereafter until absorbed, and one-half of the remaining surplus earnings, if any, thus cumulatively computed, shall be set aside in the project amortization reserve account; and the amounts thus established in the project amortization reserve account shall be maintained therein until further order of the Commission.

Article 8. The Licensee shall install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so, after notice and opportunity for hearing.

Article 9. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other power systems and in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 10. The Licensee shall, for the conservation, and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance and operation of such facilities and comply with such reasonable modifications of the project structures and operation as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing and upon findings based on substantial evidence that such facilities and modifications are necessary and desirable, reasonably consistent with the primary purpose of the project, and consistent with the provisions of the Act.

Article 11. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of Licensee's lands and interest in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be prescribed by the Commission, reasonably consistent with the primary purpose of the project, in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 12. The Licensee shall construct, maintain and operate or shall arrange for the construction, maintenance and operation of such recreational facilities including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities and utilities, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior

or other interested Federal and State agencies, after notice and opportunity for hearing and upon findings based upon substantial evidence that such facilities are necessary and desirable, and reasonably consistent with the primary purpose of the project.

Article 13. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and recreational purposes, including fishing and hunting, and shall allow to a reasonable extent for such purposes the construction of access roads, wharves, landings, and other facilities on its lands the occupancy of which may in appropriate circumstances be subject to payment of rent to the Licensee in a reasonable amount: Provided, that the Licensee may reserve from public access, such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property and Provided further, that the Licensee's consent to the construction of access roads, wharves, landings, and other facilities shall not, without its express agreement, place upon the Licensee any obligation to construct or maintain such facilities. These facilities are in addition to the facilities that the Licensee may construct and maintain as required by the license.

Article 14. The Licensee shall be responsible for and shall minimize soil erosion and siltation on lands adjacent to the stream resulting from construction and operation of the project. The Commission upon request, or upon its own motion, may order the Licensee to construct and maintain such preventive works to accomplish this purpose and to revegetate exposed soil surface as the Commission may find to be necessary after notice and opportunity for hearing.

Article 15. No lease of the project or any part thereof whereby the lessee is granted the occupancy, possession, or use of the project, or any part thereof, shall be made without prior written approval of the Commission; and the Commission may, if in its judgment the situation warrants, require that all the conditions of the license, of the Act, and of the rules and regulations of the Commission shall be applicable to such property so leased to the same extent as if the lessee were the Licensee: Provided, that the provisions of this article shall not apply to leases of land or buildings or other property while not required to achieve the purposes of the license.

Article 16. Upon the completion of the project, or at such other time as the Commission may direct, the Licensee shall submit to the Commission for approval revised maps, plans, specifications, and statements insofar as necessary to show any divergence from or variations in the project area and project boundary as finally located or in the project works as actually constructed when compared with the area and boundary shown and the works described in the license or in the maps, plans, specifications, and statements approved by the Commission, together with a statement in writing setting forth the reasons which in the opinion of the Licensee necessitated or justified variations in or divergence from the approved

maps, plans, specifications, and statements. Such revised maps, plans, specifications, and statement shall, if and when approved by the Commission, be made a part of the license under the provisions of Article 2 hereof.

Article 17. In the construction and maintenance of the project, the location and standards of roads and trails, and other land uses, including the location and condition of quarries, borrow pits, spoil disposal areas, and sanitary facilities, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Article 18. In the construction and maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines, and telegraph, telephone, and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling and obstructing traffic and endangering life on highways, streets, or railroads. None of the provisions of this article is intended to relieve the Licensee from any responsibility or requirement which may be imposed by other lawful authority for avoiding or eliminating inductive interference.

Article 19. The Licensee shall make provision, or shall bear the reasonable cost, as determined by the agency of the United States affected, of making provision for avoiding inductive interference between any project transmission line or other project facility constructed, operated, or maintained under the license, and any radio installation, telephone line, or other communication facility installed or constructed before or after construction of such project transmission line or other project facility and owned, operated, or used by such agency of the United States in administering the lands under its jurisdiction.

Article 20. The Licensee shall clear such portions of transmission line rights-of-way across lands of the United States as are designated by the officer of the United States in charge of the lands; shall keep the areas so designated clear of new growth, all refuse, and inflammable material to the satisfaction of such officer; shall trim all branches of trees in contact with or liable to contact the transmission line; shall cut and remove all dead or leaning trees which might fall in contact with the transmission line; and shall take such other precautions against fire as may be required by such officer. No fires for the burning of waste material shall be set except with the prior written consent of the officer of the United States in charge of the lands as to time and place.

Article 21. Timber on lands of the United States cut, used, or destroyed in the construction and maintenance of the project works or in the clearing of said lands shall be paid for in accordance with the requirements of and at the current stumpage rates applicable to the sale of similar timber by the agency of the United States having jurisdiction over said lands; and all slash and debris resulting from the cutting or destruction of such timber shall be disposed of as the officer of such agency may direct.

Article 22. The Licensee shall do everything reasonably within its power and shall require its employees, contractors, and employees of contractors to do everything reasonably within their power, both independently and upon request of officers of the agency of the United States concerned, to prevent, make advanced preparations for suppression, and suppress fires on lands occupied under the license.

Article 23. The Licensee shall interpose no objection to, and shall in no way prevent, the use by the agency of the United States having jurisdiction over the lands of the United States affected, or by persons or corporations occupying lands of the United States under permit, of water for fire suppression from any stream, conduit or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license, or to the use by said parties of water for sanitary and domestic purposes from any stream or body of water, natural or artificial, used by the Licensee

in the operation of the project works covered by the license.

Article 24. The Licensee shall be liable for injury to, or destruction of, any buildings, bridges, roads, trails, lands, or other property of the United States, occasioned by the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto under the license. Arrangements to meet such liability, either by compensation for such injury or destruction, or by reconstruction or repair of damaged property, or otherwise, shall be made with the appropriate department or agency of the United States.

Article 25. The Licensee shall allow any agency of the United States, without charge, to construct or permit to be constructed on, through, and across the project lands, conduits, chutes, ditches, railroads, roads, trails, telephone and power lines, and other means of transportation and communication not inconsistent with the enjoyment of said lands by the Licensee for the purposes stated in the license. This article shall not be construed as conferring upon the Licensee any right of use, occupancy, or enjoyment of the lands of the United States other than for the construction, operation, and maintenance of the project as stated in the license.

Article 26. There is reserved to the appropriate department or agency of the United States, or of the State or county involved, the right to take over, maintain, and supervise the use of any project road as a public road after construction of the project works is completed.

Article 27. The Licensee, its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such properties necessary or useful to the project and to the development, transmission, and distribution of power therefrom will be voluntarily sold, transferred, abandoned, or otherwise disposed of without the approval of the Commission: Provided, that a mortgage or trust deed or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article. In the event the project is taken over by the United States upon the termination of the license, as provided in Section 14 of the Act, or is transferred to a new licensee under the provisions of Section 15 of the Act, the Licensee, its successors and assigns will be responsible for and will make good any defect of title to or of right of user in any of such project property which is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and will pay and discharge, or will assume responsibility for payment and discharge, of all liens or incumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, that the provisions of this article are not intended to prevent the abandonment or the

retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear, or to require the Licensee, for the purpose of transferring the project to the United States or to a new Licensee, to acquire any different title to or right of user in any of such project property than was necessary to acquire for its own purposes as Licensee.

Article 28. For the purpose of determining the stage and flow of the stream or streams from which water is diverted for the operation of the project works, the amount of water held in and withdrawn from storage, and the effective head on the turbines, the Licensee shall install and thereafter maintain such gages and stream-gaging stations as the Commission may deem necessary and best adapted to the requirements; and shall provide for the required readings of such gages and for the adequate rating of such stations. The Licensee shall also install and maintain standard meters adequate for the determination of the amount of electric energy generated by said project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission and may be altered from time to time if necessary to secure adequate determinations, but such alteration shall not be made except with the approval of the Commission or upon the specific direction of the Commission. The installation of gages,

the ratings of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of said project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient record of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 29. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without replacement, or shall abandon or discontinue good faith operation of the project for a period of three years, or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address to the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license, and not less than 90 days after public notice may in its discretion terminate the license.

Article 30. Whenever the Licensee is directly benefited by the construction work of another Licensee, a permittee, or of the United States of a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for

such part of the annual charges for interest, maintenance, and depreciation thereon as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United States the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the costs of making the determinations pursuant to the then current Commission Regulations under the Federal Power Act within 60 days from the date of rendition of a bill therefor and, upon failure to do so, shall thereafter be subject to the payment of the penalties specified in the then current Regulations. The Licensee shall have the right to pay such amounts under protest within the 60-day period and to reconsideration of the amounts billed or a hearing as provided by the then current Regulations under the Act.

Article 31. Upon abandonment of the project the Licensee shall remove all buildings, equipment and power lines from lands of the United States and restore said lands to a condition satisfactory to agency having jurisdiction over the lands and shall fulfill such other obligations under the license as the Commission may prescribe.

Article 32. The right of the Licensee and of its transferees and successors to use or occupy lands of the United States under the

license for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless a new license is issued pursuant to the then existing laws and regulations.

Article 33. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Joseph C. Swidler, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Carol A. Howard, and David S. Black

Merced Irrigation District) Project No. 2179

ORDER ISSUING LICENSE (MAJOR)

(Issued April 8, 1964)

Application was filed on August 4, 1958, and amended on February 21, 1963, by Merced Irrigation District (Applicant) of Merced, California, for a license under Section 4(e) of the Federal Power Act (Act) for proposed Project No. 2179, to be known as the Exchequer Hydro-Electric Development, to be located on Merced River, County of Mariposa, California, and affecting public lands of the United States.

The proposed project, which would consist of an enlargement of Applicant's existing licensed Exchequer Project No. 88 and the Exchequer Afterbay Development, is to be used primarily for irrigation flood control and power. Applicant proposes to finance Project No. 2179 with a contribution from the United States for flood control benefits to be provided and the issuance of revenue bonds based upon a proposed long-term power sales contract with Pacific Gas and Electric Company (Pacific) which has expressed its willingness to negotiate such a contract. Pacific is currently purchasing the power output from Applicant's Project No. 88.

As proposed in the amended application for license, the existing Exchequer concrete gravity arch dam will be raised 195 feet to a total height of 480 feet by placement of a rolled rock fill with a reinforced concrete facing abutting the downstream side of the existing dam. The total reservoir storage would be increased from 281,200 acre feet to 1,[illegible]10,000 acre feet and the reservoir area would be increased from 2,600 acres to 6,900 acre feet at elevation 865 feet. A middle dyke and a gated spillway will be located on the right abutment about 0.7 miles from the dam. An 18-foot diversion and power tunnel about 1,200 feet long will be in the right abutment. The existing powerhouse of Project No. 88 with a capacity of

25,000 kilowatts will be abandoned and a new powerhouse will be constructed just downstream from the toe of the enlarged dam containing two generating units, each with a turbine capacity of 63,100 horsepower connected to a generator rated at 44,500 kva. The installed capacity will be 80,000 kilowatts. Provision is being made in the powerhouse for a third future unit.

The afterbay development, which will be located about 6 miles downstream from the Exchequer dam, will consist of a dam comprised of a 76-foot high concrete gravity gated spillway section, a power intake section and two rock-fill abutment sections; a reservoir with a storage capacity of 8,750 acre feet at normal maximum water surface elevation 400 feet; and a powerhouse integral with the dam containing one generating unit with a turbine capacity of 11,050 horsepower connected to a generator rated at 7,800 kva at 0.9 power factor. The installed capacity will be 7,000 kilowatts.

The annual value of power from the project, both at-site and downstream at Pacific's Project No. 1355, is estimated by Commission staff at $2,400,000 based on alternate steam with private financing. The annual cost of the project is estimated by the staff at $1,953,000 based on 4 percent cost of money to Applicant.

The original plan of development presented by Applicant in its application for license provided for the construction of Begby development upstream from the Exchequer development the enlargement of the Exchequer development, and the construction of the Snelling development downstream from the Exchequer development. However, as recited above, Applicant now proposes an initial development to comprise the enlargement of the existing Exchequer development and an afterbay development as a temporary substitute for the Snelling development. Applicant advises that its estimate of power value and power output from Bagby and Snelling indicates that income from such power output would not presently support the required expenditure for that ultimate development. We are herein providing that at such time as a more complete development becomes economically feasible, the afterbay development would not preclude a more comprehensive development of the reach of river involved.

The Secretary of the Army and the Chief of Engineers, in reporting on the application, have recommended for inclusion in any license for the project, a special condition in the interest of flood control.

The Department of the Interior, in reporting on the application, has recommended for inclusion in any license for the project certain conditions in the interests of the Department.

The Department of Fish and Game, State of California, in reporting on the application, advised it had entered into an agreement with Applicant for the protection of fish and wildlife.

The Commission finds:

(1) Applicant is a "municipality" as defined in the Federal Power Act, and has submitted satisfactory evidence of its compliance with the requirements of all applicable State laws insofar as necessary to effect the purposes of a license for the project.

(2) The proposed project will affect lands of the United States.

(3) Public notice of the filing of the application has been given as required by the Act. There are no protests or conflicting applications before the Commission.

(4) The proposed project will not affect a Government dam.

(5) The issuance of a license for the project will not interfere or be inconsistent with the purposes for which any reservation was created or acquired.

(6) The project is best adapted to a comprehensive plan for improving and developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, and for other beneficial public uses, including recreational purposes, upon compliance with the terms and conditions hereinafter imposed.

(7) The issuance of a license for the project will not affect the development of any water resources for public purposes which should be undertaken by the United States.

(8) The installed horsepower capacity of the proposed project for the purpose of computing the capacity component of the administrative annual charge is 116,000 horsepower, and the amount of annual charges, based on such capacity, to be paid under the license for the project, for the costs of administration of Part I of the Act is reasonable as hereinafter fixed and specified.

(9) The amount of annual charges to be paid under the license for the use, occupancy and enjoyment of lands of the United States by the project shall be determined at a later date as hereinafter provided.

(10) The electrical facilities referred to in paragraph (B) below, which were included in the application for license, are parts of the project within the meaning of Section 3 (11) of the Act and should be included in the license for the project.

(11) The exhibits designated and described in paragraph (B) below, which were filed as part of the application for license, conform to the Commission's rules and regulations, and should be approved as part of the license for the project.

The Commission orders:

(A) This license is hereby issued to Merced Irrigation District (Licensee) of Merced, California, under Section 4(e) of the Act for a period of 50 years, effective as of March 1, 1964, for the construction, operation and maintenance of Project No. 2179 on the Merced River, California, and affecting lands of the United States; subject to the terms and conditions of the Act which is incorporated by reference as a part of this license, and subject to such rules and regulations as the Commission has issued or prescribed under the provisions of the Act; provided, however, that the Licensee shall surrender its license for Project No. 80 within 30 days after such project becomes inoperative during the construction of Project No. 2179.

(B) Project No. 2179 consists of:

(i) All lands constituting the project area and enclosed by the project boundary or the limits of which are otherwise defined and/or interst in such lands necessary or appropriate for the purpose of the project, whether such lands or interest therein are owned or held by the applicant or by the United States; such project area and project boundary being more specifically shown and described by certain exhibits which formed part of the amended application for license, and which are designated and described as follows:

Exhibit	FPC No.	Showing
J	2179-24	General Map
K	2179-25	Project Area
	2179-26	" "
	2179-27	" "
	2179-28	" "
	2179-29	" "
	2179-30	" "

(ii) All project works consisting principally of:

Exchequer Development, an enlargement of applicant's existing Exchequer development (FPC Project No. 88) would consist of: a 480 foot high rock fill dam with reinforced concrete facing abutting the downstream side of the existing concrete dam, with a crest length of 1,200 feet; an auxiliary rock fill dike with crest length of 1,200 feet at elevation 881 feet varying in height to 56 feet about ½ mile north of the dam; a gated spillway about 4,500 feet northwest of the right abutment; a reservoir with storage of 1,010,000 acre-feet and area of 6,900 acres at maximum water surface elevation 855 feet; two 10-foot steel penstocks leading to a powerhouse containing two 63,100-horsepower turbines connected to two 40,000-kilowatt generators with minimum provisions for a future unit; substation; and appurtenant mechanical facilities;

Exchequer Afterbay Development, would be approximately 6 miles downstream from Exchequer, near the headwaters of Merced Falls reservoir owned by Pacific Gas and Electric Company (FPC Project No. 1335) and would be created by a 76 foot high concrete gravity dam with rock fill wing dams at each end; a gated spillway would be located in the concrete gravity section; a reservoir with storage of 8,750 acre-feet at maximum water surface elevation 400 feet; one 22-foot steel penstock leading to a powerhouse containing one 11,050-horsepower turbine connected

to a 7,000-kilowatt generator; substation; and appurtenant mechanical and electrical facilities; the location, nature and character of which are more specifically shown and described by the exhibits hereinbefore cited and by certain other exhibits which also formed part of the amended application and which are designated and described as follows:

Exhibit	FPC No.	Showing
L	2179-31	"General Plan, Exchequer Development"
	2179-32	"Typical Details Exchequer Development"
	2179-37	"Dike & Spillway Exchequer Development"
	2179-33	"General Plan, Afterbay Dam"
	2179-34	"Typical Details Afterbay Dam"

Exhibit M: Comprised of two (2) pages, signed January 29, 1963, describing mechanical and electrical equipment for: "Works Covered by this Amended Application" and "Proposed Ultimate Development on Merced River".

(iii) All other structures, fixtures, equipment or facilities used or useful in the maintenance and operation of the project and located on the project area, including such portable property as may be used or useful in connection with the project or any part thereof, whether located on or off the project area, if and to the extent that the inclusion of such property as part of the project is approved or acquiesced in by the Commission; also, all riparian or other rights, the use or possession of which is necessary or appropriate in the maintenance or operation of the project.

(C) This license is also subject to the terms and conditions set forth in Form L-2 (Revised February 1, 1964) entitled "Terms and Conditions for Unconstructed Major Project A fecting Lands of the United States" (30 FPC), which terms and conditions, designated as Articles 1 through 33, are attached hereto and made a part hereof except for Articles 6, 7, 18, 19 and 20 thereof, and subject to the following special conditions set forth herein as additional articles:

Article 34. The Licensee shall commence construction of the project works within two years after the effective date of the license and shall thereafter in good faith and with due dilligence prosecute such construction and shall complete construction of such works within three years thereafter.

Article 35. The Licensee shall, within one year following completion of the construction of the project file with the Commission revised Exhibits F and K showing final project boundary prepared in accordance with the Commission's rules and regulations.

Article 36. The Licensee shall submit in accordance with the Commission's rules and regulations, revised Exhibit L drawings for the project structures and Licensee shall not begin construction of the project works until the Commission approves the Exhibits.

Article 37. The right, power, and authority is reserved to the United States to construct or to the Commission to issue a license authorizing the construction, operation and maintenance of a hydroelectric project which will more completely utilize the water resources of the reach of the Merced River in which the afterbay development of Project No. 2179 is located.

Article 38. The acceptance of this license by the Licensee shall constitute its stipulation, consent and agreement made upon its own behalf and upon the behalf of its successors and assigns for the benefit of the United States, or the person or persons hereinafter constructing, operating and maintaining such more complete development or his or their successors and assigns that said Licensee, its successors or assigns shall amend its license to eliminate the afterbay development of Project No. 2179 at such time as the afterbay development becomes inoperative by reason of inundation by such more complete development, that said Licensee, its successors or assigns shall not be entitled to any compensation for damages sustained by reason of inundation or destruction of the afterbay

development; provided said Licensee, its successors or assigns shall be entitled to receive from said more complete development for the unexpired term of the license for Project No. 2179, an amount of electric capacity and energy equal to that generated by the afterbay development with compensation to the downstream developer in an amount equal to the cost to the licensee if the capacity and energy had been received from the afterbay development. In the event the licensee for Project No. 2179 and the owner of such more complete development should be unable to agree, the amount of capacity and energy which the licensee is entitled to receive, and the amount equal to the cost if it had been generated at the afterbay development, shall be determined by the Commission.

Article 39. The Licensee shall enter into an agreement with the Department of the Army providing for the operation of the project for flood control in accordance with rules and regulations prescribed by the Secretary of the Army. A conformed copy of the agreement shall be filed with the Commission for its information and records prior to commencement of construction of project works.

Article 40. The Licensee shall provide minimum streamflow in the Merced River downstream from the project reservoirs in accordance with the following schedule:

(a) Downstream from Exchequer Dam, a minimum flow of 25 cubic feet per second at all times.

(b) At Shaffer Bridge downstream from Exchequer Afterbay Dam, a minimum streamflow shall be maintained as follows:

Period	Normal Year (c.f.s.)	Dry Year 2/
June 1 through Oct. 15	25	15
Oct. 16 through Oct. 31	75	60
Nov. 1 through Dec. 31 1/	100	75
Jan. 1 through May 31	75	60

1/ If the average streamflow maintained at Shaffer Bridge from November 1 through December 31 is greater than 150 cubic feet per second exclusive of flood spills and emergency releases, then the streamflows from January 1 through March 31 shall be maintained at 100 cubic feet per second or more.

(Footnotes continued on next page).

Article 41. The Licensee shall, insofar as possible during the period November 1 through December 31, regulate the Merced River streamflow downstream from the Exchequer afterbay development between [illegible] and 200 cubic-feet per second except during dry years when the streamflow shall be maintained between 75 and 150 cubic feet per second. Streamflow shall be measured at Shaffer Bridge.

Article 42. The Licensee shall operate the power plants so as to avoid rapid fluctation of the Merced River. At Crocker-Huffman diversion, the Licensee shall, insofar as possible, restrict the rate of change of release during any one-hour period to not more than double nor less than one-half the amount of release at the start of the change. The Licensee shall, during emergency periods, endeavor to make releases in a manner which will not be detrimental to fish.

Article 43. The Licensee shall make all releases at Exchequer Dam during the period, October 16 through December 31, from the outlets at or below elevation 485 feet insofar as physically possible.

Article 44. The Licensee shall maintain the water surface elevation of Exchequer Reservoir as high as possible from April through October and maintain a minimum pool of not less than 115,000 acre-feet in Exchequer Reservoir except for a drawdown as necessary to maintain previously recommended minimum streamflow.

Article 45. The Licensee shall cooperate with the Bureau of Sport Fisheries and Wildlife of the U.S. Fish and Wildlife Service to determine means of providing up to 15,000 acre-feet of project water and return flow waters to the Merced National Wildlife Refuge.

(Footnotes continued from previous page)

1/ (An emergency is defined as an occurrence usually of short duration, such as flood, mechanical, or operational failure which is beyond the control of the Licensee, and during which the Licensee shall not be required to observe the release schedules contained in the license stipulations).

2/ A dry year is defined as a year when the forecasted April 1 through July 31 unimpaired runoff, as published in the May 1 bulletin of the California Department of Water Resources for the station, "inflow to Exchequer" is less than 450,000 acre-feet.

Article 46. The Licensee shall, prior to impounding water, dispose of all temporary structures, unused timber, brush, refuse, or other inflammable material resulting from the clearing of the land or from the construction and maintenance of the project works, and shall clear all lands in the reservoir areas up to normal water levels; except that all lands in the reservoir areas shall be cleared according to a plan to be prescribed by the Commission upon the recommendation of the California Department of Fish and Game and the Bureau of Sport Fisheries and Wildlife. The clearing of the lands and the disposal of the material shall be done with due diligence by Licensee and to the satisfaction of the authorized representative of the Commission.

Article 47. The Licensee shall, within one year from the effective date of this license, file with the Commission for approval its proposed recreational use plan for the project. The plan shall be prepared after consultation with appropriate Federal, State and local agencies, and shall include recreational improvements which may be provided by others in addition to the improvements the Licensee plans to provide.

Article 48. The Licensee shall cooperate with the Central California Archeological Foundation, P.O. Box 5595, Sacramento, California, in the possible archeological survey and salvage and shall compensate for the expenses incurred but not to exceed a total of $6,000.

Article 49. The Licensee shall pay to the United States the following annual charges:

(i) For the purpose of reimbursing the United States for the cost of administration of Part I of the Act, a reasonable annual charge in accordance with the provisions of Part of the Commission's regulations, in effect from time to time. The authorized installed capacity for such purposes is 116,000 horsepower.

(ii) For the purpose of recompensing the United States for the use, occupancy, and enjoyment of its lands, an amount to be determined hereafter by the Commission.

(D) The exhibits designated and described in paragraph (E) above are hereby approved as part of the license for the project.

(E) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313 (a) of the Act, and failure to file such an application shall constitute acceptance of this license. In acknowledgment of the acceptance of this license, it shall be signed for the licensee and returned to the Commission within 60 days from the date of issuance of this order.

By the Commission.

Joseph H. Gutride,
Secretary.

IN TESTIMONY of its acknowledgment of acceptance of all of the provisions, terms and conditions of this license, Merced Irrigation District, this 23rd day of June, 1964, has caused its corporate name to be signed hereto by N. G. SHEESLEY its _____ President, and its corporate seal to be affixed hereto and attested by CARL T. CHRISTIANSON its _____ Secretary, pursuant to a resolution of its Board of Directors duly adopted on the 23rd day of June, 1964, a certified copy of the record of which is attached hereto.

MERCED IRRIGATION DISTRICT

/S/ N. G. SHEESLEY
President

Attest:

/S/ CARL T. CHRISTIANSON
Secretary

(Executed in quadruplicate)

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Merced Irrigation District Project No. 2179-000

NOTICE OF AUTHORIZATION FOR CONTINUED PROJECT OPERATION

(March 5, 2014)

On February 27, 2012, the Merced Irrigation District, licensee for the Merced River Hydroelectric Project, filed an Application for a New License pursuant to the Federal Power Act (FPA) and the Commission's regulations thereunder. The Merced River Hydroelectric Project is located on the Merced River in Merced and Mariposa counties, California.

The license for Project No. 2179 was issued for a period ending February 28, 2014. Section 15(a)(1) of the FPA, 16 USC 808(a)(1), requires the Commission, at the expiration of a license term, to issue from year-to-year an annual license to the then licensee under the terms and conditions of the prior license until a new license is issued, or the project is otherwise disposed of as provided in section 15 or any other applicable section of the FPA. If the project's prior license waived the applicability of section 15 of the FPA, then, based on section 9(b) of the Administrative Procedure Act, 5 USC 558(c), and as set forth at 18 CFR 16.21(a), if the licensee of such project has filed an application for a subsequent license, the licensee may continue to operate the project in accordance with the terms and conditions of the license after the minor or minor part license expires, until the Commission acts on its application. If the licensee of such a project has not filed an application for a subsequent license, then it may be required, pursuant to 18 CFR 16.21(b), to continue project operations until the Commission issues someone else a license for the project or otherwise orders disposition of the project.

If the project is subject to section 15 of the FPA, notice is hereby given that an annual license for Project No. 2179 is issued to the licensee for a period effective March 1, 2014 through February 28, 2015 or until the issuance of a new license for the project or other disposition under the FPA, whichever comes first.

20140305-3063 FERC PDF (Unofficial) 03/05/2014

If issuance of a new license (or other disposition) does not take place on or before February 28, 2015, notice is hereby given that, pursuant to 18 CFR 16.18(c), an annual license under section 15(a)(1) of the FPA is renewed automatically without further order or notice by the Commission, unless the Commission orders otherwise. If the project is not subject to section 15 of the FPA, notice is hereby given that the licensee, Merced Irrigation District, is authorized to continue operation of the Merced River Hydroelectric Project, until such time as the Commission acts on its application for a subsequent license.

Kimberly D. Bose,
Secretary.

Document Content(s)

P-2179-000Notice.DOC.....1-2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Luis National Wildlife Refuge Complex
P.O. Box 2176
Los Banos, CA 93635
(209) 826-3508 ~ Fax (209) 826-1445

February 11, 2013

Mr. Hicham Eltal
Assistant General Manager, Water Resources
Merced Irrigation District
Merced, CA 95344-0288

Dear Mr. Eltal,

In accordance with the FERC settlement, I am providing a preliminary schedule for delivery of water in 2013 to the Merced National Wildlife Refuge.

Month	Rate (in CFS)	Acre-feet
March	20	1200
April	20	1200
May	35	2100
June	35	2100
July	30	1800
August	30	1800
September	35	2100
October	45	2700

Grand total estimated use for 2012 = 15,000 acre-feet. The volume estimated for March assumes that we will begin receiving delivered water on March 15.

Sincerely,

R.W. Parris
Deputy Refuge Manager

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-7

MID Production Wells Rendered Inoperable during the 2014 Irrigation Season Due to Drought

MID Production Wells Rendered Inoperable During the 2014 Irrigation Season due to the Drought

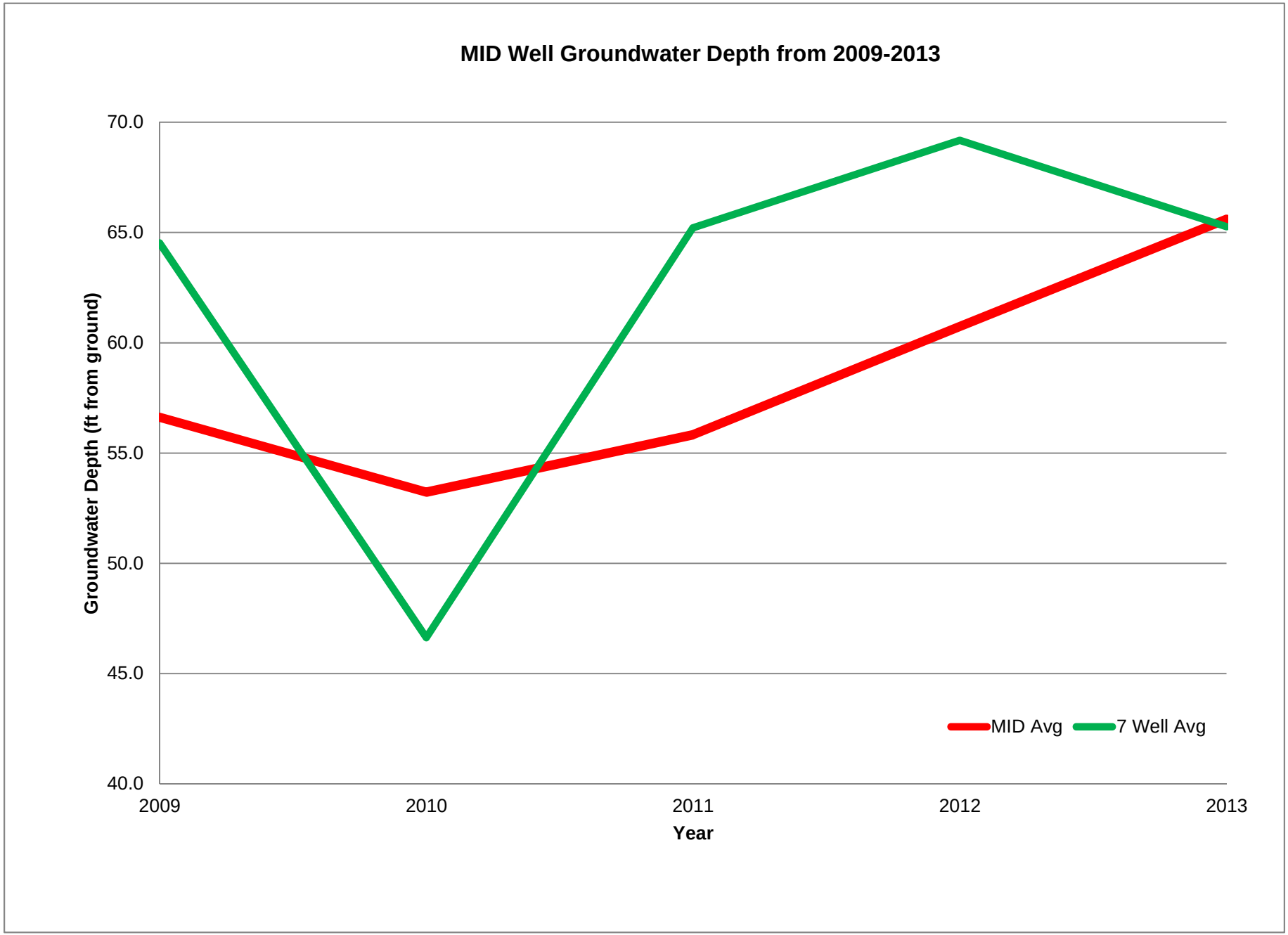
PUMP #	SIDE	HP	WELL CASE DEPTH	Well Depth	PUMP SET	DIAMETER	PUMP TEST	BOWLS	ACTION	COSTS	THIS YEAR	Priority	Tail End
241	**Livingston C Side**	40	204'	237	100'?	16	1.62	2 ST 12MB	LOW	$12,000	Y	1 done	
242	**Livingston C Side**	40	220'	240	120'	16	2.08	3 ST	LOW	$12,000	Y	2 later	
213	**Fairfield B Side**	60	172'	315	95'	16	2.52	1 ST 14HMO	LOW	$12,000	N	3 later	T
215	**Fairfield B Side**	60	244'	286	105'?	16	1.51	2 ST 14DHL	LOW	$12,000	Y	4 done	NT
176	**Livingston A Side**	75	192'	202	120'?	16	3.69	2 ST 14"3RLC-BJ	LOW	$12,000	Y	5	NT
30	**Fairfield B Side**	40	224	258	80'	16	2.19	1 ST 14JHO	LOW	$12,000	Y	6	NT
116	**Fairfield C Side**	40	380	765	120'?	16	1.21	?	LOW	$12,000	Y	7	NT
173	**Livingston A Side**	60	168'	181	100'	16	2.67	1 ST 14"CGHC-BJ	LOW	$12,000	Y	8	NT
140	**Fairfield C Side**	40	245'	265	145'	16	0.81	2 ST 12MB	LOW	$12,000	Y	9	NT
200	**Fairfield C Side**	60	336	590	145'	16	0.75	2 ST 14JMO-US	LOW	$12,000	Y	10	NT
192	**Livingston B Side**	50	168'	186	90'	16	2.36	1 ST 14"CGHC-BJ	LOW	$12,000	Y	11	NT
186	**Escaladian B Side**	60	168'	183	100'	16	2.34	2 ST 14HH-WOR.	LOW	$12,000	Y	12	NT
168	**Livingston A Side**	75	188'	204	128'	16	2.4	2 ST 14"3RLC-BJ	LOW	$12,000	Y	13	NT
236	**Escaladian A Side**	60	360'	574	155'	16	1.5	2 ST 14DHL	LOW	$12,000	Y	14	NT
184	**Livingston A Side**	50	200'	243	90'	16	1.5	1 ST 14"CGHC-BJ	LOW	$12,000	Y	15	NT
67	**Le Grand B Side**	15	112	285	50'	14	0.72	1 ST 12"MC	LOW	$12,000	Y	16	NT
3B	**Livingston A Side**	40	116	180	120'	16	0.95	2 ST	RE	$36,800	Y		NT
125	**Le Grand B Side**	25	84	163	140	18	1.4	2 ST 11CMC	RE	$83,200	Y		NT
194	**Livingston B Side**	60	120	137	100'	16	1.06	1 ST 14"CGHC-BJ	RE	$36,000	Y		NT
223	**Fairfield B Side**	60	128	195	100'	16	3.35	2 ST 14DHL	RE	$94,400	Y		NT
							36.63		**Total**	**$442,400**			
									LOW	**$192,000**			
									RE	**$250,400**			

181	Livingston B side	60	136	156	100'	16	2.19	1 ST 14"CGHC
182	Livingston B side	50	148	160	90'?	16	2.08	2 ST 14HH
26	Livingston B side	50	184	illed to 17(	140'	16	2.5	2ST 12MB
41	Livingston B side	25	90	105	42'	12"-16" ?	2.35	
52	Livingston B side	30	**252**	**252**	**110'**	14	2.61	**2ST 12HXB**
103	Livingston B side	25	**42**	**63**	**40'**	18"	2.1	**2ST POMONA**
188	Escaladian B Side	60	**220**	**247**	**100'**	16	1.84	**14"CGHC-BJ**

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-8

MID and El Nido Groundwater Level Data


MID Well Groundwater Depth from 2009-2013
70.0
65.0
60.0
55.0
50.0
45.0
40.0
Groundwater Depth (ft from ground)
2009
2010
2011
2012
2013
Year
MID Avg
7 Well Avg

Summary of MID Wells that have Data for all years (2009-2013)

Page 2 to 5

Well ID	2009	2010	2011	2012	2013
1	73.1	73.1	76.1	76.1	77.6
2B	84.5	80.5	80.3	81.1	83.8
3B	83.7	83.9	84.7	85.9	94.5
7B	75.5	73.6	75.9	79.4	82.5
8	70.9	67.0	69.7	73.3	112.3
9	69.2	66.9	70.0	71.2	78.7
12B	72.0	72.2	73.4	75.4	84.5
12	81.6	81.6	87.1	88.6	81.5
13	58.8	64.0	65.8	67.3	75.5
18A	53.5	52.2	52.9	58.0	61.3
20A	52.9	50.4	50.3	53.2	58.0
22	53.1	50.4	53.4	54.8	63.5
23	51.2	50.0	55.3	57.9	60.2
24A	43.1	42.3	45.0	63.0	47.9
26A	58.0	57.8	54.9	55.5	69.7
26	51.8	53.1	53.4	51.0	63.4
27A	36.6	35.9	36.1	37.0	46.9
30	30.6	24.4	50.9	63.1	41.9
31	39.6	41.6	43.6	41.1	49.7
32	76.4	78.3	72.6	74.9	77.2
33	57.5	57.3	60.5	59.0	70.3
38	37.9	34.9	32.9	37.5	42.1
40A	91.9	92.3	80.1	82.5	95.6
41	38.1	40.0	39.9	42.6	42.0
42A	47.5	49.1	48.0	52.5	59.3
43	44.5	35.0	47.5	48.3	44.9
45	59.5	58.9	61.9	64.7	74.1
46	32.5	31.8	32.1	34.2	39.4
48	73.3	66.7	68.4	70.7	73.7
49	37.5	34.4	33.4	33.6	37.8
50	39.5	36.3	35.9	37.7	44.1
51	33.4	28.5	29.5	35.3	33.9
52	41.5	37.5	39.0	44.0	53.5
57B	42.9	40.6	45.2	45.5	60.5
58	64.0	62.8	64.9	65.9	66.0
59B	59.3	57.7	59.3	62.2	64.6
60	39.3	40.1	40.7	41.9	49.6
61	52.8	51.9	53.8	56.2	58.5
64	45.0	42.9	41.3	49.8	47.5
65	30.1	30.3	31.7	37.1	39.8
69	40.2	40.8	41.5	45.0	59.9
72	59.3	58.5	62.1	61.8	67.0
73A	64.9	64.7	62.8	69.7	73.9
74	44.3	43.2	43.3	45.4	49.3
78	61.6	59.0	62.8	64.5	70.3
80	93.5	87.7	84.4	84.3	89.8
82	50.0	41.1	43.7	45.2	51.0
83A	46.5	46.7	37.2	54.9	51.5
84	41.6	45.1	43.1	44.0	47.0
87A	72.0	69.6	69.2	71.7	8.9
90	65.5	55.8	64.0	70.5	82.2
97A	43.9	40.7	43.8	64.6	61.3

98A	51.9	49.0	45.3	49.5	64.6
102	27.4	26.5	25.0	24.8	31.2
105	62.0	65.0	65.3	68.3	70.5
106	60.4	48.4	57.3	58.5	70.4
107	45.2	56.3	54.8	64.6	69.6
108	48.0	50.8	50.3	50.0	59.1
109	51.9	51.9	52.4	50.6	57.6
114	47.6	47.7	50.4	51.7	59.1
115	31.6	29.8	29.0	31.3	36.2
116	78.0	63.0	52.2	71.1	82.7
120A	47.3	45.8	49.4	49.2	55.3
121A	86.7	90.2	90.8	93.6	112.4
123	45.3	47.2	45.0	45.7	56.1
124	58.0	54.0	57.0	57.1	57.4
125	80.2	41.0	38.5	37.9	44.1
127	58.0	56.7	56.8	61.4	66.6
128	54.7	51.7	54.6	56.9	60.9
129	72.0	71.8	64.7	74.3	79.3
132	70.9	69.9	73.5	73.6	79.9
133	54.4	53.2	50.3	50.5	56.6
134A	54.4	53.2	50.3	50.5	56.6
136	37.5	34.3	32.0	46.0	44.1
137	62.1	59.3	55.5	59.9	66.3
138	61.0	61.0	58.0	64.7	75.9
140	47.0	46.7	47.0	62.2	97.0
144	61.0	61.0	63.2	69.5	72.4
145	38.9	45.8	43.2	44.3	50.3
148	51.7	50.1	52.8	54.9	60.6
149	77.5	65.8	81.0	90.0	101.1
151	58.1	57.5	53.5	56.1	57.9
153	81.5	81.1	82.1	85.5	96.5
156A	52.5	49.5	49.6	51.4	61.4
159	53.8	50.9	50.5	55.9	50.2
160	52.9	50.7	48.5	65.7	63.5
161	50.5	52.0	46.5	53.8	62.0
162	56.8	56.3	50.3	54.6	65.0
163	58.0	61.0	64.7	70.0	78.7
164	77.2	64.5	55.5	62.4	61.7
165	81.1	102.1	108.0	76.7	124.8
166	72.2	74.9	75.6	79.3	86.0
167	68.6	65.6	69.0	78.9	89.7
168	70.6	74.2	73.8	80.0	82.2
169	76.7	75.8	76.1	75.4	85.9
170	69.5	64.7	75.1	83.7	88.3
171	90.7	77.5	78.5	76.3	79.7
172	68.6	71.0	72.6	73.3	73.0
173	74.5	75.8	74.9	83.7	91.0
174	80.9	80.1	79.0	81.0	91.5
175	87.2	79.9	79.9	82.8	88.5
176	75.3	75.1	74.1	82.5	87.7
177	76.0	74.9	74.6	78.3	80.0
178	84.1	80.0	83.7	87.0	92.0
179	82.8	78.2	87.7	86.8	94.2
180	78.0	77.1	76.9	81.5	84.3
181	82.2	81.5	81.3	83.7	89.7

182	83.8	80.8	82.9	85.5	88.3
184	83.1	80.3	83.6	84.6	87.4
185	85.3	77.1	76.1	78.9	85.9
186	94.8	88.0	89.0	90.7	98.8
187	93.3	87.8	84.8	88.1	91.2
188	77.2	81.6	79.4	81.0	92.6
189	75.4	74.7	75.4	77.4	84.8
191	87.0	86.2	86.6	87.5	98.7
192	67.2	67.7	69.1	71.7	78.3
193	68.8	71.2	71.1	71.6	78.8
194	61.4	65.4	66.7	65.5	75.3
195	102.0	93.9	89.2	115.1	94.0
196	52.2	49.5	48.8	53.2	64.3
197	53.5	52.5	52.1	56.5	61.5
198	36.0	40.9	35.2	42.0	47.4
200	83.8	85.2	84.7	94.1	116.4
201	44.1	41.9	39.8	37.7	44.1
202	52.0	51.7	44.5	38.9	52.0
203	39.6	38.5	40.2	41.6	49.4
204	30.9	31.4	31.8	32.8	41.0
205	50.1	48.5	46.3	46.4	64.9
206	38.1	37.2	44.3	42.9	51.2
207	42.7	41.5	40.2	40.9	47.6
208	61.1	61.0	60.9	52.9	56.5
209	57.2	55.8	56.0	48.9	69.8
211	60.0	49.2	57.6	55.5	71.2
213	62.3	54.2	62.5	73.9	86.4
214	78.8	66.0	76.0	88.9	100.3
215	73.8	66.8	71.5	76.0	73.4
216	76.2	74.3	64.4	70.8	90.8
217	68.5	69.8	68.1	71.8	83.6
218	82.5	61.5	62.5	65.5	77.2
219	65.0	62.5	60.6	64.6	77.0
220	75.0	66.8	64.7	66.5	79.2
221	65.5	62.1	57.9	59.8	64.3
222	59.7	58.0	56.0	60.1	65.8
223	67.3	67.2	63.0	65.0	80.6
224	70.1	71.6	57.1	83.7	77.2
225	77.8	77.1	83.3	83.2	90.0
226	76.0	75.0	80.1	79.0	82.7
227	76.0	74.0	75.4	77.0	84.5
228	79.6	75.9	78.8	81.3	85.3
229	99.6	85.7	104.3	114.7	115.8
230	107.5	106.8	111.8	114.2	121.0
231	110.8	102.6	111.9	106.6	121.9
232	116.2	109.7	117.9	113.9	138.5
233	119.1	116.2	129.0	129.7	137.0
234	99.9	96.4	98.5	137.7	108.0
236	123.8	111.9	131.2	128.6	140.7
237	100.0	97.0	108.4	130.8	124.0
238	119.1	108.1	103.0	121.0	139.5
239	125.2	119.9	129.4	132.4	137.3
240	100.0	96.8	96.4	105.1	105.8
241	72.9	71.6	74.0	81.2	92.2
242	73.0	70.9	71.9	75.0	79.5

MID Avg	**65.1**	**62.8**	**63.9**	**67.6**	**73.9**
7 Well Avg	**64.5**	**63.3**	**65.2**	**69.1**	**74.3**

MID Wells Groundwater Distance from Ground Level Record Data

Page 6 to 11

*Depth from grou

Well Numl	Well S	2009 Average	2010 Average	2011 Average	2012 Average	2013 Average
		2009 Average	2010 Average	2011 Average	2012 Average	2013 Average
1		73.05	73.10	76.10	76.13	77.55
2	B	84.50	80.50	80.30	81.10	83.83
3	B	83.70	83.93	84.07	85.87	94.50
4	A	61.90	69.00	62.60	62.30	
5						
5	A					
6		85.50		78.00	83.80	92.63
7	B	75.50	73.60	75.93	79.43	82.50
7						
8		70.90	67.03	69.73	73.30	112.25
9		69.15	66.90	70.03	71.23	78.70
10						
11					79.47	74.50
11	A				73.75	79.67
12		81.60	81.60	87.13	88.60	81.50
12	B	71.95	72.23	73.43	75.37	84.50
13		58.75	64.00	65.80	67.03	75.50
14				62.40	56.00	
15	A					
16						
17		53.65	47.40	52.97	62.20	
18	A	53.45	52.17	52.85	58.03	61.25
19						
20	A	52.85	50.43	50.33	53.23	57.97
22		53.10	50.37	53.37	54.77	63.53
23		51.20	50.00	55.30	57.93	60.17
24	A	43.10	42.27	45.00	63.00	47.87
24		43.95		50.60	50.45	54.40
25			46.90	43.70	48.80	47.47
26	A	58.00	57.80	54.93	55.50	69.67
26		51.80	53.07	53.43	51.03	63.40
27	A	36.55	35.87	36.07	37.00	46.87
28	A					
29	A					
29						
30		30.60	24.37	50.90	63.10	41.90
31		39.60	41.60	43.60	41.07	49.67
32		76.35	78.33	72.63	74.87	77.15
33		57.45	57.27	60.53	59.00	70.33

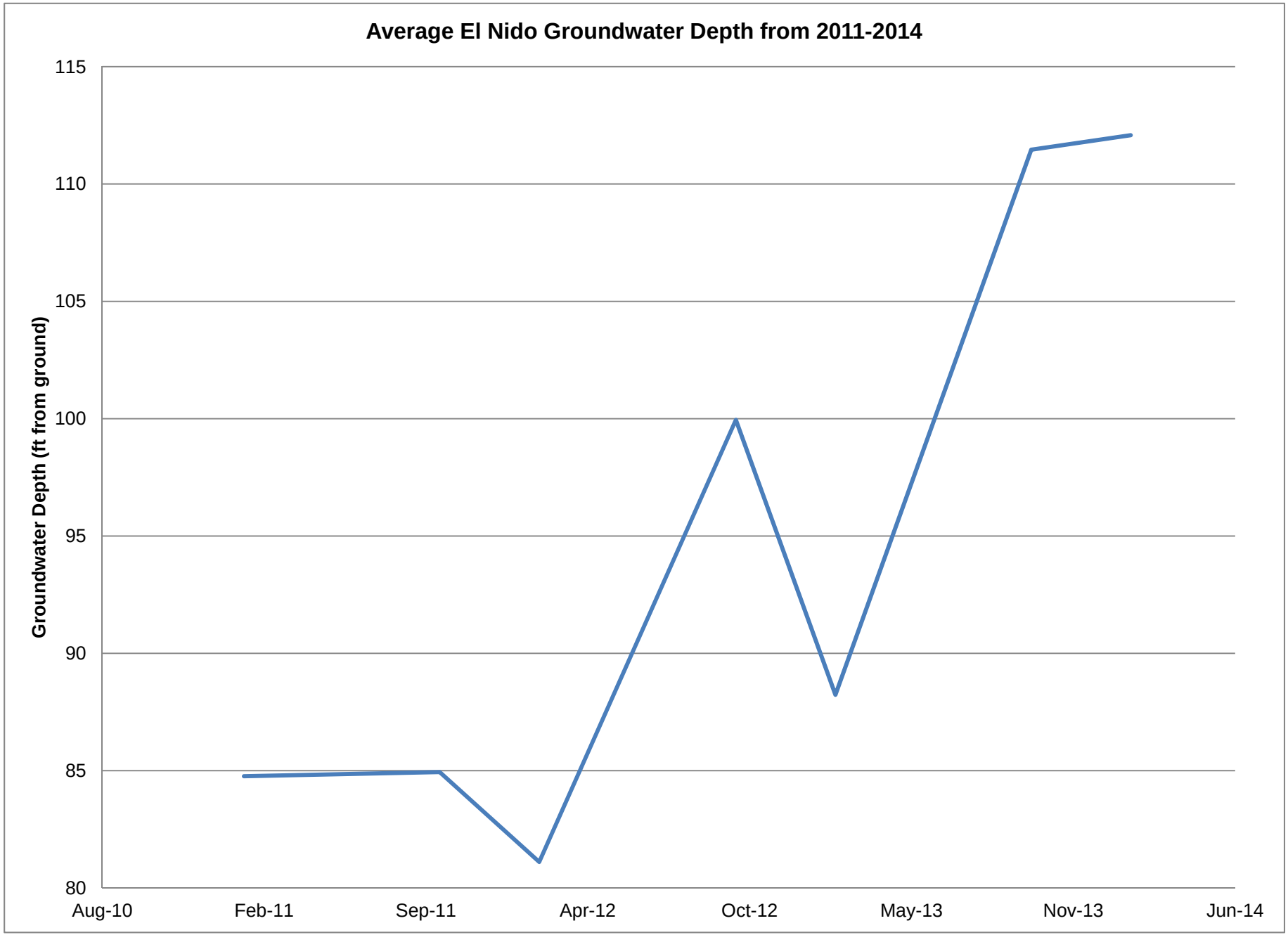
34					
34 A					
35					
38	37.90	34.90	32.90	37.50	42.10
39	55.50			70.80	60.50
40 A	91.85	92.33	80.07	82.50	95.60
41	38.05	40.00	39.90	42.63	42.00
42 A	47.50	49.13	47.97	52.50	59.33
43 A	44.05		43.50	44.60	57.03
43	44.50	34.97	47.50	48.30	44.90
45	59.50	58.93	61.90	64.67	74.13
46	32.50	31.80	32.13	34.20	39.43
47 B		21.33	18.25	22.30	26.47
48	73.25	66.67	68.37	70.73	73.73
49	37.50	34.40	33.40	33.60	37.80
50	39.50	36.27	35.90	37.65	44.10
51	33.40	28.53	29.53	35.33	33.87
52	41.50	37.50	39.03	44.00	53.47
53		37.37	36.30	39.17	44.40
54 A	59.80	61.33	67.10	67.00	
54					71.00
55	91.10			84.77	105.00
55 B	64.10			76.07	68.70
56			38.00	47.00	65.03
57 A					
57 B	42.90	40.57	45.17	45.50	60.50
58	64.00	62.77	64.90	65.90	66.00
59 B	59.25	57.73	59.33	62.23	64.60
60	39.30	40.07	40.73	41.85	49.63
61	52.80	51.90	53.77	56.20	58.47
62 A					
64	45.00	42.87	41.27	49.80	47.47
65	30.10	30.27	31.73	37.13	39.83
66					
67	63.00		50.00	54.10	63.23
68				62.35	
69	40.20	40.83	41.50	45.00	59.90
70					
72	59.25	58.53	62.10	61.80	67.00
73 A	64.85	64.67	62.83	69.70	73.93
74	44.25	43.17	43.25	45.37	49.33
78	61.55	59.00	62.75	64.47	70.27
79					
80	93.50	87.07	84.43	84.30	89.77
81	105.00		116.20	111.30	136.35
82	50.00	41.10	43.70	45.23	50.97
83 A	46.05	46.67	37.23	54.93	51.50

84	41.55	45.13	43.10	43.97	46.97
85 B			78.30	79.20	
85					
86				69.80	76.70
87			32.00	37.20	65.00
87 A	72.00	69.63	69.17	71.07	80.90
88					
89					
90	65.45	55.83	63.97	70.50	82.20
91					
94 A				61.90	63.93
95					
96 A				55.60	54.10
97 A	43.90	40.67	43.83	64.60	61.27
98 A	51.90	49.00	45.27	49.53	64.57
100					
101	63.90	63.40		66.10	78.00
102	27.40	26.50	25.00	24.77	31.20
103			29.30	40.53	34.10
105	62.00	65.00	65.27	68.27	70.50
106	60.40	48.43	57.30	58.47	70.35
107	45.20	56.33	54.80	64.57	69.63
107 B					
108	48.00	50.83	50.27	50.00	59.13
109	51.90	51.90	52.43	50.60	57.57
112					
113		35.73	35.85	35.57	37.60
114	47.60	47.67	50.40	51.70	59.13
115	31.55	29.80	28.97	31.27	36.15
116	78.00	63.00	52.17	71.10	82.73
118				90.70	97.35
119				58.10	63.30
120 A	47.25	45.83	49.40	49.17	55.27
121 A	86.65	90.17	90.83	93.63	112.43
122					
123	45.30	47.17	45.03	45.67	56.07
124	58.00	54.00	57.03	57.05	57.37
125	80.20	41.00	38.50	37.87	44.07
126 A	79.90		79.25	81.45	98.47
127	58.00	56.67	56.80	61.40	66.63
128	54.65	51.73	54.63	56.93	60.93
129	72.00	71.83	64.67	74.30	79.25
130					
132	70.90	69.87	73.50	73.57	79.87
133	54.35	53.17	50.33	50.53	56.57
134 A	43.25	44.87	43.73	43.43	46.43
136	37.50	34.33	32.00	46.00	44.10

137	62.10	59.27	55.53	59.90	66.25
138	60.95	61.03	58.00	64.70	75.85
139	63.00	61.63	60.00	60.40	
140	47.00	46.70	47.00	62.17	96.97
141				37.00	53.00
142					
144	61.00	60.97	63.23	69.50	72.43
145	38.90	45.83	43.23	44.30	50.27
147				12.80	17.60
148	51.70	50.13	52.80	54.93	60.60
149	77.50	65.80	81.00	90.03	101.13
150					
151	58.10	57.50	53.50	56.10	57.85
152				72.50	
153	81.50	81.07	82.07	85.50	96.50
154 A			54.50	58.00	68.00
155	90.10			93.05	95.07
156 A	52.50	49.47	49.60	51.35	61.40
157			70.10	72.23	77.00
159	53.80	50.90	50.50	55.93	50.20
160	52.90	50.67	48.50	65.70	63.50
161	50.45	52.00	46.50	53.83	62.00
162	56.75	56.30	50.27	54.63	64.97
163	58.00	60.97	64.67	70.03	78.73
164	77.20	64.47	55.53	62.37	61.70
165	81.05	102.10	108.00	76.67	124.77
166	72.20	74.93	75.63	79.27	86.00
167	68.55	65.57	69.00	78.93	89.67
168	70.55	74.23	73.77	79.97	82.23
169	76.65	75.83	76.13	75.40	85.93
170	69.45	64.67	75.07	83.67	88.33
171	90.70	77.50	78.50	76.27	79.67
172	68.55	71.00	72.60	73.30	72.97
173	74.45	75.77	74.87	83.70	91.00
174	80.85	80.07	79.00	81.03	91.50
175	87.15	79.90	79.90	82.77	88.50
176	75.30	75.07	74.10	82.47	87.73
177	76.00	74.93	74.60	78.33	79.95
178	84.05	79.97	83.67	87.00	92.00
179	82.80	78.17	87.67	86.83	94.23
180	77.95	77.13	76.93	81.47	84.33
181	82.20	81.47	81.27	83.67	89.70
182	83.80	80.77	82.93	85.50	88.25
183			88.15	97.37	95.85
184	83.10	80.33	83.60	84.63	87.43
185	85.25	77.13	76.13	78.93	85.90
186	94.80	88.00	89.03	90.73	98.75

187	93.30	87.80	84.83	88.10	91.17
188	77.20	81.57	79.43	80.97	92.60
189	75.40	74.73	75.40	77.43	84.80
190		71.87	75.47	76.97	87.20
191	87.00	86.17	86.63	87.50	98.73
192	67.20	67.73	69.07	71.73	78.33
193	68.75	71.17	71.07	71.60	78.75
194	61.40	65.43	66.70	65.53	75.33
195	102.00	93.93	89.15	115.10	94.00
196	52.20	49.50	48.83	53.23	64.30
197	53.45	52.50	52.13	56.53	61.50
198	36.00	40.87	35.17	42.00	47.37
199				45.77	60.33
200	83.80	85.17	84.67	94.13	116.43
201	44.10	41.90	39.83	37.67	44.10
202	52.00	51.67	44.50	38.87	52.00
203	39.60	38.50	40.23	41.60	49.40
204	30.90	31.43	31.83	32.77	41.00
205	50.10	48.47	46.33	46.40	64.87
206	38.10	37.23	44.33	42.93	51.20
207	42.70	41.50	40.17	40.93	47.60
208	61.10	61.00	60.93	52.93	56.50
209	57.20	55.83	56.00	48.90	69.75
210					
211	60.00	49.20	57.57	55.50	71.20
212	54.50		343.00	69.53	81.30
213	62.25	54.17	62.53	73.90	86.40
214	78.75	66.00	76.00	88.85	100.25
215	73.75	66.80	71.50	75.97	73.40
216	76.15	74.33	64.37	70.83	90.77
217	68.50	69.83	68.10	71.77	83.60
218	82.50	61.50	62.53	65.50	77.20
219	65.00	62.47	60.63	64.57	77.00
220	75.00	66.80	64.73	66.53	79.15
221	65.50	62.10	57.87	59.80	64.25
222	59.70	58.00	55.97	60.13	65.77
223	67.30	67.20	63.00	65.03	80.60
224	70.05	71.60	57.13	83.67	77.17
225	77.75	77.10	83.27	83.23	90.00
226	75.95	74.97	80.07	78.97	82.67
227	75.95	74.00	75.40	77.00	84.50
228	79.60	75.87	78.83	81.27	85.33
229	99.60	85.67	104.25	114.70	115.83
230	107.45	106.83	111.77	114.20	121.00
231	110.75	102.63	111.87	106.63	121.90
232	116.15	109.67	117.93	113.93	138.50
233	119.05	116.17	129.00	129.67	137.00

234	99.90	96.40	98.53	137.67	108.00
235				43.50	110.00
236	123.75	111.87	131.23	128.57	140.67
237	100.00	97.03	108.37	130.80	124.00
238	119.05	108.10	103.00	120.97	139.50
239	125.15	119.90	129.40	132.37	137.33
240	100.00	96.80	96.40	105.10	105.80
241	72.85	71.60	74.03	81.20	92.17
242	72.95	70.90	71.93	75.03	79.47


Average El Nido Groundwater Depth from 2011-2014
Groundwater Depth (ft from ground)
115
110
105
100
95
90
85
80
Aug-10
Feb-11
Sep-11
Apr-12
Oct-12
May-13
Nov-13
Jun-14

Summary of El Nido Private Wells that have Data for all years (2009-2013)

Page 13

Row Labels	Feb-11	Oct-11	Feb-12	Oct-12	Feb-13	Oct-13	Feb-14
18L1	52.5	52	48.5	52.4	51	57.2	57.3
19A1	127	134	129	154	145	174	176.5
19E1	88	107.3	102.4	130	104.5	137.7	126.7
20B1	54	51.1	49	54	52	61	61
21C1	54	39.4	42	43	42.5	59.7	56.2
21P1	87.8	55.8	56	87.7	78.2	97	91.3
23H1	90.5	117.5	102	138.5	102	144.2	141.8
26J2	78.5	73.8	74.2	78.7	77.3	89.3	120.2
32C1	86.8	80.5	90.5	92	85	103	121
33A1	128.5	138	117.5	169.2	144.8	191.5	168.8
Average	84.76	84.94	81.11	99.95	88.23	111.46	112.08

El Nido Private Wells Groundwater Distance from Ground Level Record D

Page 14

		2011		2012		2013		2014
		Level (Feb)	Level (Oct)	Level (Feb)	Level (Oct)	Level (Feb)	Level (Oct)	Level (Feb)
Well Number	USBR Well No.	**02/2011 Level**	**10/2011 Level**	**02/2012 Level**	**10/2012 Level**	**02/2013 Level**	**10/2013 Level**	**02/2014 Level**
13F1	9S13E13F1							
14H1	9S13E14H1		143.7					
23H1	9S13E23H1	90.5	117.5	102	138.5	102	144.2	141.8
24A1	9S13E24A1	105	107.6	101				
25H1	9S13E25H1		123		160		166.5	146.2
25L1	9S13E25L1		88.3			89.7	109	
26J2	9S13E26J2	78.5	73.8	74.2	78.7	77.3	89.3	120.2
17P1	9S14E17P1		43.4			45	59.7	58
18L1	9S14E18L1	52.5	52	48.5	52.4	51	57.2	57.3
18N1	9S14E18N1					67		
19A1	9S14E19A1	127	134	129	154	145	174	176.5
19E1	9S14E19E1	88	107.3	102.4	130	104.5	137.7	126.7
20B1	9S14E20B1	54	51.1	49	54	52	61	61
20P1	9S14E20P1							
21C1	9S14E21C1	54	39.4	42	43	42.5	59.7	56.2
21P1	9S14E21P1	87.8	55.8	56	87.7	78.2	97	91.3
28L1	9S14E28L1	49	40.5	68	52	57.1	65	
28R1	9S14E28R1		68.1	67.7	94	69	87	
29L1	9S14E29L1	110.2	69.5	128	156		165	164
29R1	9S14E29R1							
30B2	9S14E30B2		73.4					
30J1	9S14E30J1							132
32C1	9S14E32C1	86.8	80.5	90.5	92	85	103	121
33A1	9S14E33A1	128.5	138	117.5	169.2	144.8	191.5	168.8
33F1	9S14E33F1		88					

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-9

Technical Memorandum on Pilot Project Work Plan for Cressey Recharge Basin Assessment Project

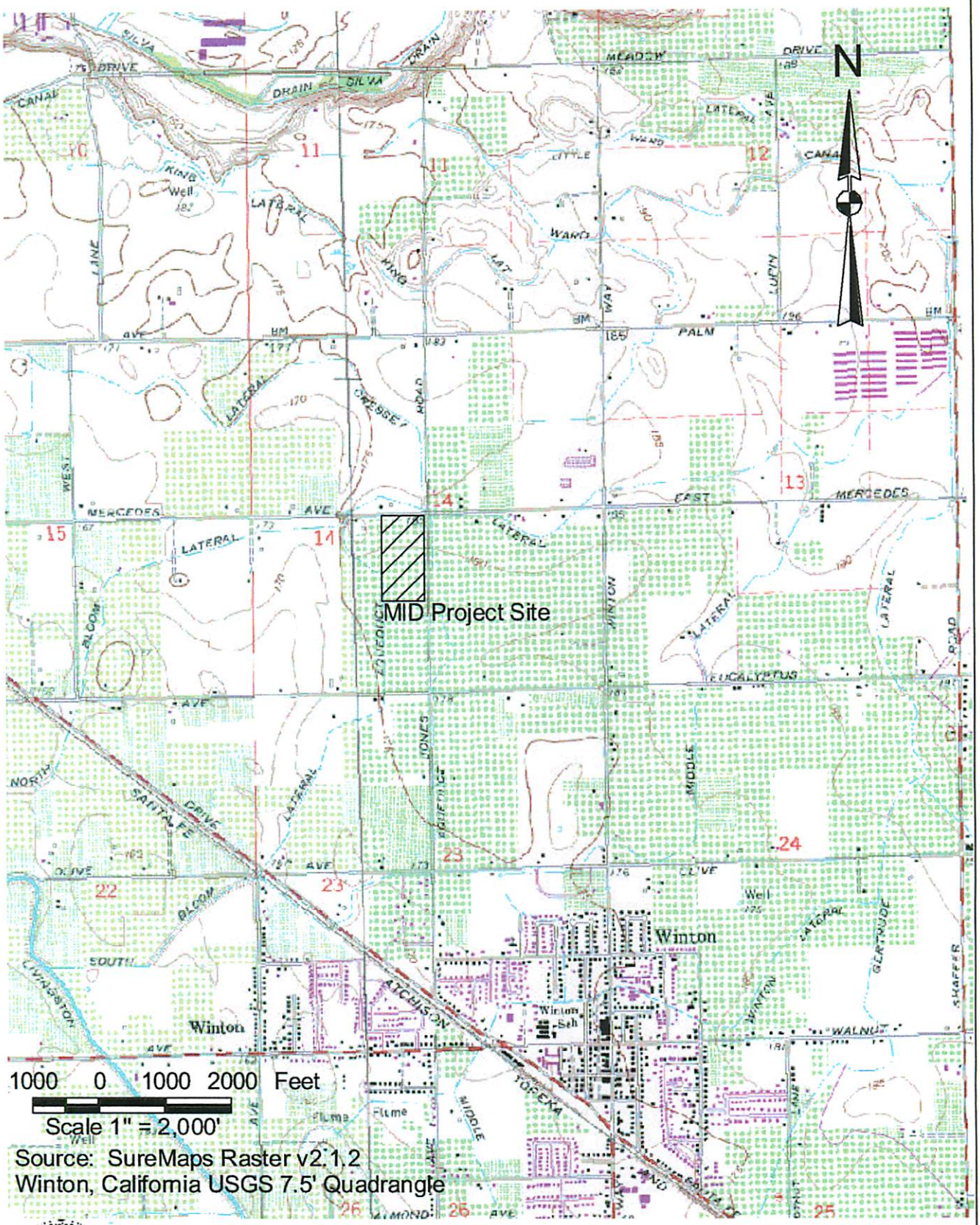
TECHNICAL MEMORANDUM ON PILOT PROJECT WORK PLAN FOR CRESSEY RECHARGE BASIN ASSESSMENT PROJECT

To:	Eric Hong, DWR Ted Selb, MAGPI	CC:	Russ Grimes, SKS
From:	Saquib Najmus, Mike Cornelius	Date:	August 6, 2002
Subject:	**Technical Memorandum on Pilot Project Work Plan for Cressey Recharge Basin Assessment Project**		
Project Reference:	Contract No.: 4600000734 Task Order: wrime-merced-0302-001		

SECTION 1 INTRODUCTION

The Merced Area Groundwater Pool Interests (MAGPI) is participating in the Integrated Storage Investigation (ISI) Conjunctive Water Management Program under a Memorandum of Understanding (MOU) with the California Department of Water Resources (DWR). The goal of the signatories of the MOU is to cooperatively promote conjunctive use and groundwater banking projects in the Merced Groundwater Basin that can help address local water supply issues and needs while concurrently increase the water supply reliability in the area.

MAGPI members and DWR have identified a potential recharge site in Merced County for pilot recharge project. This site, shown in Figure 1, is called Cressey Basin, and is located at the southwest Corner of Mercedes Avenue and Jones Road in the city of Winton. The site is approximately 20 acres in size and is owned by Merced Irrigation District (MID), a MAGPI member agency.



Department of Water Resources
Central District
Geology and Groundwater Section

Figure 1 Site Location Map
Merced Irrigation District Property
Winton, California

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The DWR Central District has just completed a hydrogeological evaluation of the site as a potential groundwater recharge location ("*Hydrogeologic Investigation of Merced Irrigation District Property, Winton, California, Memorandum Report, DWR, April 2002*"). As a follow up of this investigation, MAGPI members and DWR decided to develop a Pilot Project Work Plan (Work Plan), that will also identify the physical, legal, institutional, engineering, and data collection and analysis considerations that may be required for successful implementation of a Pilot Recharge Project.

SCOPE OF WORK

The scope of work consists of 6 major tasks, listed below:

Task 1: Project Coordination and Meeting– coordinate with the Merced Irrigation District staff and its contractor, and the DWR

Task 2: Identify Physical Considerations– describe the relevant issues and key features of the physical considerations related to a pilot recharge project, such as land use, geology, water supply, water quality, etc.

Task 3: Identify Legal and Institutional Considerations– describe the relevant issues and key features of the legal and institutional considerations related to a pilot recharge project, such as environmental documentation and permits.

Task 4: Identify Engineering Considerations– describe the relevant issues and key features of the engineering considerations related to a pilot recharge project, such as test operations, water conveyance, monitoring etc.

Task 5: Identify Data Collection and Analysis Considerations– describe the data collection and analysis needs to support the Cressey Basin Recharge Assessment Project.

Task 6: Prepare a Pilot Project Work Plan – prepare a detailed work plan for the Cressey Pilot Recharge Basin Assessment Project to be followed during the implementation of the pilot recharge project by the MID.

This technical memorandum is organized into six sections corresponding to each task listed above. Sections 2 to 5 describe different types of considerations related to a Pilot Recharge Project. Section 6 includes a Work Plan for the Cressey Recharge Basin along with a description of the site and current state of data collection.

SECTION 2 PHYSICAL CONSIDERATIONS

There are many physical considerations that need to be considered at different stages of a Pilot Recharge Project. The key considerations can be categorized into the following:

- Land Use
- Soil/Near Surface Conditions
- Geology/Hydrogeology
- Water Supply
- Water Quality

The relevant issues associated with each consideration are presented below in the form of questions that need to be answered by field survey, field sampling, literature reviews, research of regulatory databases, data analysis etc.

LAND USE CONSIDERATIONS

1. What is the proposed project site zoned for?
   - Industrial
   - Commercial
   - Domestic
   - Agricultural

2. What are the known levels and types of contamination present, and to what amount do any of the four land use types contribute to either soil contamination or water contamination?
   - What were the historical uses of the proposed project site
   - What were the historical uses of the adjacent lands?
   - What is the current zoning for the proposed project site and adjacent lands

3. What data/information has already been obtained related to the regional land use?
   - What is the data period and source
   - What additional data/information is needed

SOIL/NEAR SURFACE CONSIDERATIONS

1. What are the soil characteristics?
   - What are the soil classifications

- What are the soil infiltration capacities
- Does the soil contain hardpan, clays or packed silt, or high amounts of alkali or salinity
- Can textual and profile data provide an estimate of initial infiltration rates
- Do the data indicate any shallow restrictive layers; are these restrictive layers the intake-limiting factor of the profile.
- If so, could engineering procedures improve the rate (For example, excavation of near surface restrictions.)

2. What are the soil profiles of the proposed project site and adjacent lands?
   - Are soil maps and soil profiles readily available
   - At what depth do the different types of soils occur
   - Are there any soil contamination problems that need to be considered
     i. Salinity
     ii. Pesticides/Herbicides
     iii. Nitrates
   - Does the amount of contamination present fall within the State and Federal regulations
   - What are the affects of these contaminants on the current soil conditions and groundwater quality

GEOLOGY/HYDROGEOLOGY CONSIDERATIONS

1. Do the characteristics and extent of water bearing deposits meet the requirements of the recharge project?
   - Are the aquifers confined or unconfined
   - What is the approximate geometry, orientation, and depth of aquifers
   - What quantitative evaluation can be given to the hydraulic properties of aquifers
   - Do these estimates check hydrologically with existing data on recharge, discharge, and storage change

2. What defines the groundwater aquifer system?
   - What are its horizontal and vertical dimensions of the aquifer, and its potential and available storage capacities
   - Where and how will future cyclic water use influence the aquifer and groundwater flow patterns near the recharge area
   - What is the current groundwater depth
   - What are typical pumping and drawdown rates
   - What are the mean well depths within the region
   - What could be the new expected groundwater level resulting from infiltration
   - How does this new level affect the surrounding region?
   - What new drawdown rate can be established that would not impact the region

WATER SUPPLY CONSIDERATIONS

1. What are all the possible sources of water for the recharge program?
   - Where is the point of diversion
   - How reliable is the flow at the diversion point
   - Can the sources be accurately defined
     a. In volume discharge
     b. In time when water is available
     c. In position within the basin

2. What is the intended use of the water? And, how much water is needed to meet this use?
   - How many wells are needed to extract this amount (consider pumping cost vs. groundwater depth)
   - At what water quality levels will the extracted water need to be in order to avoid violating any local, state, Federal regulations. If poor water quality, is a water treatment facility needed
   - Will the extracted water be transferred though pipes or canal to final destination
   - Will recharged water be used by surrounding groundwater users

WATER QUALITY CONSIDERATIONS

1. What is the quality of source water?
   - Does it meet local, State, and Federal regulations
   - What is the expected water quality level entering the groundwater source
   - What is the expected impact to the existing groundwater quality from the put water
   - After mixing, what is the water quality in the basin
   - What is the quality of the extracted water
   - Are any local, State, Federal regulations violated

SECTION 3 LEGAL AND INSTITUTIONAL CONSIDERATIONS

There are many legal and institutional considerations that need to be considered at different stages of a pilot recharge project. The key considerations can be categorized into the following:

- Water Rights
- Regulatory (NEPA/CEQA and Others)
- Institutional and Political

The relevant issues associated with each consideration are presented below in the form of questions that need to be answered by water rights/contracts review and consultations, groundwater ordinances, regulatory consultations, environmental documentation, JPA formation, institutional arrangements, and public outreach.

WATER RIGHTS CONSIDERATIONS

1. Does MID hold legal rights to divert and or store diverted/runoff water
   - If not, can legal rights be obtained
   - What is the correct procedure to obtaining the rights
   - What water contracts or transfer obligation does MID have with neighboring counties, water districts, farmers, or general users
   - Are the contracts renegotiable, terminable, or fixed based on potential use of new stored water
2. Are the correlative rights of the overlying landowner protected
   - How are these right affected? How will the water rights potentially be restructured
   - How will these restructured water rights be upheld so as to avoid violation
3. Are other (irrigation district, water agencies, private owners) able to claim ownership to the potential stored water

REGULATORY (NEPA/CEQA) CONSIDERATIONS

1. Environmental
   - Overview of potential impacts
   - Threatened or endangered species
     - Are there any threatened or endangered species and animals within the project region

    - Does an environmental assessment of the project area need to be conducted to identify possible concerns or has an assessment already taken place
    - To what level would an assessment need to be conducted
    - If a threatened or endangered species or animal exist, what preventative measure needs to be take to minimize disturbance
    - What is the possibility that the project would create or destroy habitat
  - What are the affects to nearby streams and creeks
    - Are flow patterns altered (increased or reduced)
      - due to pumping
      - due to groundwater fluctuation
    - Are water temperatures affected
    - Are there impacts to riparian habitat and wildlife
  - How would new water quality levels affect the nearby ecologic system
  - Do new concerns arise

2. Permitting Requirements
   - Who will be the lead agency for EIS/EIR
   - Regulatory compliance
     - State/Federal Endangered Species
     - Clean Water Act Section 401 (sediment and erosion)
     - Clean Water Act Section 404 (wetlands)
     - Streambed alteration agreement with CDFG
     - Executive Order 11988 (FEMA – project impacts to flood plain)
     - SWRCB
     - DHS approval of recharge water quality
     - Local requirements

3. Preliminary Third Party Impact Assessment
   - Upstream users
   - Downstream users
   - Others

INSTITUTIONAL AND POLITICAL CONSIDERATIONS

1. Local
   - Do any stakeholders have any concerns/opposition to the MID proposed recharge basin or surface storage pond
   - What level of public outreach work is needed to address the concerns
   - What level of public outreach work is needed to inform the public of the process involved and the benefits or cost associated with the project
   - What local permits and ordinances are required

2. Regional
   - Are there any regional issues outside the boundary of the local watershed or groundwater basin
   - Are there any regional partners in the recharge program

SECTION 4 ENGINEERING CONSIDERATIONS

There are many engineering considerations that need to be considered at different stages of a Pilot Recharge Project. The key considerations can be categorized into the following:

- Preliminary Conceptual Design and Analysis
- Recharge Facilities
- Water Conveyance and Extraction Facilities
- Groundwater Monitoring Program
- Surface water Monitoring Program
- Infiltration Monitoring Program
- Testing and Operation

The relevant issues associated with each consideration are discussed below with general guidelines and common practices, where applicable.

PRELIMINARY CONCEPTUAL DESIGN AND ANALYSIS

A key issue with recharge projects is to develop a preliminary conceptual design for pilot test facilities with proper considerations for the probable physical layout of the full-scale facilities for long-term implementation and operation. This ensures that the pilot test facilities are located and constructed reasonably consistently with an ultimate plan. It is also recommended that both preliminary hydraulic analysis and economic analysis be completed to provide a basis for conceptual design and consideration of unit capital and operating costs for expansion to peak water supply and recharge capacity.

Hydraulic Analysis

The application of computer analytical tool or a model at this point in the recharge program should be considered. In some situations the data available from literature sources may be sufficient to justify hydraulic analysis of proposed recharge operations and to provide an improved basis for conceptual design of facilities and planning of the test program.

Hydraulic analysis activities include three different objectives:

- Hydraulic analysis of mounding and subsequent dampening of the mound
- Hydraulic analysis of the well field design and operation

- Salt balance analysis (or simplified solute transport modeling) to evaluate mixing between stored and native water in the presence of aquifer minerals

RECHARGE FACILITIES

The recharge facilities depend on the recharge technique selected for the pilot test. The list of potential surface recharge techniques that may be utilized for this project include: unlined canals, flooded fields, shallow spreading basins, excavated spreading basins, or natural stream bed recharge, and detention basins. Each of these requires a different level of planning, design and construction to implement. For example, a shallow spreading basin would require less design and construction than an excavated basin as described below.

For a shallow spreading basin, surface water is applied to a shallow depth to a bermed field. The berm is typically constructed at a height of 2 to 3 feet around the perimeter of the field. Interior berms are used to divide the field into cells, with each cell having check structures to allow water to flow from one cell to the next depending on the amount of available for recharge.

An excavated spreading basin may be constructed to a depth of 4 or 5 feet, with the excavated material being used to construct a berm around the basin. Up to 3 or 4 feet of water may be placed in the recharge basin. Several excavated basins may be constructed in series with a 10 to 20 foot berm between basins. Excavated basins require significantly more earthwork than shallow spreading basins.

WATER CONVEYANCE AND EXTRACTION FACILITIES

The frequency, timing, and quantity of water available at the water source for recharge needs to be known before designing water conveyance facility. The following questions need to be answered in order to design water conveyance facilities. These may be applicable to a lesser extent to a pilot project than in the case of full implementation.

- Will the water be conveyed through pipes, canals, or through runoff means?
- How far will the water need to be conveyed?
- Have conveyance routes been considered? How much land will need to be evaluated for right of way, purchase, and easement permission?

- What is the expected construction cost for developing a conveyance system?
- Will there be pump stations along the conveyance line?

The conveyance facilities are often designed to convey the maximum amount of water available for recharge and are constructed through the berm on the upward slope of the recharge area.

Facilities also need to be constructed for extraction of recharged water from the aquifer. The following questions need to be answered in that regard. It should be noted that these considerations are more applicable in the case of full implementation than in the case of a pilot project.

- How many wells are needed to extract the target amount (consider pumping cost vs. groundwater depth)?
- What needs to be the water quality of extracted water in order to avoid violating any local, state, Federal regulations?
- If water quality of extracted water were poor, would water treatment facility be needed?
- Will the extracted water be transferred though pipes or canal to final destination?

GROUNDWATER MONITORING PROGRAM

The purposes of the monitoring program are: (i) to measure the effect of recharge program on local as well as regional groundwater levels and quality; and (ii) to estimate the lateral movement of recharged water. There should be at least one on-site monitoring well screened at the water table and one or more background monitoring wells near the recharge area. This set-up will allow comparison of on-site water level and quality changes with regional conditions. If it is anticipated that the recharge water could become perched on one or more intermittent aquifer layers, additional monitoring wells will be needed at discrete depths to monitor the water mounding.

The number of required monitoring wells depend on many factors, including the size of the recharge area, depth of vadose zone, neighboring land use, aquifer hydrogeology, and hydraulic parameters of the aquifer.

In addition, there could be special field conditions, such as nearby orchard land use, which is negatively impacted from prolonged flooding of the root zone, requiring more extensive monitoring of the near surface wetting front using tensiometers. Also, more monitoring wells may be required, if there are issues associated with environmental mitigation.

SURFACE WATER MONITORING PROGRAM

It is also important to monitor the quality of surface water used for groundwater recharge. If winter floodwater is the primary source for recharge, turbidity will be an issue. Turbid water can plug the recharge facility, thereby decreasing percolation rates. Filtering floodwater through a wetland area prior to recharge can minimize the effects of turbidity.

Suspended sediment and biologic constituents in the source water also need to be monitored from time to time to avoid reduction in conveyance pipeline efficiency or chemical precipitation in the recharge basin.

It is recommended that the source surface water be sampled and laboratory tested for major anions, major cations, TDS and nitrate. Turbidity is typically measured in the field and would not require a laboratory analysis. Additional analyses, such as Title 22 metals, may be needed depending on the site-specific conditions.

INFILTRATION MONITORING

Infiltration rate monitoring helps determine the amount of water that can be conveyed to the recharge facility and identify the need to service the facility. Continuous monitoring of the infiltration rate will also provide valuable information regarding the changes in site performance relative to other changes, such as source water quality, water temperature, biotic activity, and groundwater levels. This information should be collected during the pilot phase of a project to guide design and operation criteria for the long-term project implementation.

TESTING AND OPERATION

Testing and operation of Pilot facilities should be done diligently and periodic adjustments will be necessary depending on site-specific conditions.

The following consideration should be given in the design of a test program:

- Mixing characteristics between stored and native water
- Water quality changes for selected non-conservative constituents of interest
- Effect of storage time on water quality response
- Recovery efficiency
- Regional and local response of water levels (recharge, storage, recovery)

At first, the baseline hydraulic and water quality testing is conducted before any significant recharge activity takes place. This establishes a reference point against which future test results are compared.

Testing is conducted at regular intervals, with higher frequency of sampling at the beginning of the program. If water quality difference between stored and native water is small and there are no significant potential for alteration of water quality through geochemical reactions, then a small number of long cycles of sampling is adopted in order to focus on plugging rates and back flushing frequency required to maintain recharge rates.

In case there is a significant potential for alteration of water quality through geochemical reactions, the recharge rate should be lowered and controlled to avoid shocking the aquifer formation with a sudden change in water quality. In addition, test program should be designed to account for storage time for chemicals, such as manganese, the dissolution of which requires several days or weeks.

Recharge facilities should be operated and maintained to maximize the use of available water supply and recharge capacity. Bouwer (1999) provided several operational techniques to maximize the infiltration rates of flooded fields and shallow basins, including:

- Slow initial flooding to minimize disturbance and mobilization of fine-grained material in the bottom of the basin;

- Alternate wet and dry cycles to allow organic and clay clogging layers to crack and curl up.
- Drain off excess water for the drying cycle to speed the drying process, minimize down time, and minimize compaction during maintenance.
- Experiment with controlling fines through the use of ridges and furrows in the basins and operate water levels to clean ridges naturally with wave action to maintain high infiltration rates (Peyton, 2001).
- Determine and maintain the optimum water depth, which depends on a number of factors and is therefore, site-specific.
- Monitor algae growth and pH (which increases with photosynthesis and leads to the precipitation of calcium carbonate), taking steps to mitigate as necessary.
- Monitor turbidity of floodwaters and let high turbidity water pass by to minimize siltation in the basin or conduct pretreatment.
- Monitor the sodium adsorption ratio (SAR) of the recharge water to prevent clays from being dispersed and clogging the basin.
- Promote beneficial weed growth that provides favorable wildlife habitat and can break up fine soils with root growth, while controlling non-beneficial weed growth.
- Monitor groundwater depths, including above potential perching layers, to avoid mounding that produces decreased infiltration rates.
- If mounding becomes a problem, redesign basins (such as using long, narrow basins) and reoperate to minimize mounding.

SECTION 5 DATA COLLECTION AND ANALYSIS CONSIDERATIONS

The data collection and analysis program needs to be designed to answer specific questions about the impacts of the pilot project on the surrounding aquifer system. Table 1 identifies specific monitoring actions, the frequency of monitoring, and the purpose.

Groundwater level monitoring needs to be completed to establish the regional groundwater trends, local groundwater flow patterns, and on-site changes in water table elevations due to the pilot recharge project. Tensiometers need to be included in the monitoring program to track the wetting front of the recharged water in the unsaturated zone.

Water quality monitoring will also normally be appropriate to record the effect of the project on local groundwater quality. It is anticipated that an average of five monitoring wells will be sampled semiannually for general water quality parameters, including major anions, major cations, TDS and volatile organic compounds (VOC). As site-specific conditions require, additional analyses such as Title 22 metals or nitrate would be added.

Hydrologic monitoring is required to adjust the estimates of infiltration due to daily weather conditions.

The inflow water supply needs to be carefully monitored in order to accurately estimate the volume of water delivered to the recharge basin. Water levels within the recharge basin need to be measured to estimate the daily infiltration rate.

Other observations such as the irrigation in nearby fields and the presence of algae in the recharge basin need to be observed and noted because of their potential effects on the estimated of recharge.

Calculations of recharge need to be made daily to assure the monitoring program is collecting the needed information to estimate the soils and aquifer parameters.

Table 1

Pilot Recharge Project Data Collection and Analysis Considerations

Monitoring Action	Frequency of Monitoring	Purpose
Water Level and Vadose Zone Monitoring		
Regional monitor wells	Begin several weeks before test begins, continue weekly during recharge test.	Monitor groundwater levels outside of project impact area to develop background conditions.
Monitor wells up gradient and down gradient of recharge site.	Begin several weeks before test begins, continue weekly during recharge test.	Establish background conditions, develop local groundwater flow patterns.
Monitor wells at project site.	Use data loggers for multiple readings per day.	Track wetting front in the project area.
Monitor Tensiometers	Daily to every other day.	Track wetting front in the unsaturated zone.
Water Quality Sampling		
Regional background water quality	Before recharge test begins	Develop background water quality data.
Local wells water quality	Before recharge test begins	Develop background water quality data.
On-site monitor wells water quality	Before recharge test begins	Develop background water quality data.
On-site wells water quality once water reaches water table	Sample weekly after water arrives at water table.	Identify changes in groundwater quality due to recharged water.
Recharge source water.	At beginning, middle, and end of recharge test.	Identify recharge water quality.
Water quality in test pond.	Weekly during recharge test.	Identify potential biologal components that may clog recharge basin.
Climate Data Collection		
Evaporation	Daily	Monitor effects on pond recharge rates.
Rainfall	Daily	Monitor effects on pond recharge rates.
Temperature	Daily	Monitor effects on pond recharge rates.
Pond Measurements		
Survey recharge basin.	At beginning of project, before initial filling	Develop area-capacity curve for recharge basin.
Depth of water in pond	At least daily (before and after every fill period).	For infiltration calculation.
Time and date of measurement	Daily, or every time fill pond (may be more than once a day.	For infiltration calculation.
Duration of refill period	Daily, or every time fill pond (may be more than once a day.	For infiltration calculation.
Condition of water in basin	Daily, or every time fill pond (may be more than once a day.	For infiltration calculation.
Flow meter (inflow to pond)	Daily, or every time fill pond (may be more than once a day.	For infiltration calculation.
Flow meter (inflow to pond)	Daily, or every time fill pond (may be more than once a day.	For infiltration calculation.
Water Supply Data		
Inflow to recharge basin	Daily (may need to fill basin more than once per day at beginning of test until initial infiltration rate declines.	Monitor daily inflow to recharge basin.
Cumulative flow into recharge basin	Daily	Monitor total inflow to recharge basin.
Other Observations		
Monitor irrigation in nearby fields	Daily	Identify other potential sources of water that may be detected in monitoring program.
Calculations		
Estimate daily infiltration rate	Daily	Complete preliminary calculations daily to confirm test protocol is correct and determine if adjustment are needed to recharge test or data collection program.
Average recharge rate	Daily	
Monitor change in infiltration rate	Daily	
Daily volume of water recharged	Daily	
Estimate lateral migration of recharged water	Daily	
Soil conductivity	Daily	

SECTION 6 PILOT PROJECT WORK PLAN

A Pilot Project Work Plan for the Cressey Basin Recharge Project is presented in this section of the technical memorandum. It should be noted that the project consideration discussed in Sections 2 to 5 apply to this Work Plan at different stages of the Pilot Project. Therefore, due attention should be given to these considerations as the Pilot Project Work Plan is implemented.

The purpose of the Cressey Basin Pilot Recharge Project (Pilot Project) is to determine the feasibility of developing a full-scale recharge facility at this location. Although this area has received surface water from Merced Irrigation District, groundwater elevations in this portion of the Merced Groundwater Basin have been declining at a rate of about 1 foot per year for the last 25 years. This decline is due to groundwater pumping within MID area as well as in areas north of the MID boundary, which did not receive surface water deliveries.

The Pilot Project is intended to assess the recharge potential of the area. Currently, it is anticipated that there will be no extraction component to this Pilot Project. It is assumed that the water recharged by the Pilot Project or by the full-scale Recharge Project would be available for extraction by existing pumping wells in the vicinity, including both MID wells and private groundwater wells.

The work plan consists of five major tasks, listed below:

Task 1: Site Selection (already completed)
Task 2: Design of Pilot Recharge Tests and Monitoring Program
Task 3: Construction of Pilot Project
Task 4: Data Collection of Pilot Recharge Test
Task 5: Documentation of Pilot Recharge Test Results

Each of these tasks is described below.

Task 1: Site Selection (Already Completed)

It should be noted that the recharge site has already been selected by the Project Sponsors. It is shown in Figure 1. The physical, legal, and institutional considerations discussed in Sections 2 and 3 of this technical memorandum provided the necessary guidelines in completing this task.

PROJECT SITE

Cressey Basin Project Site (Project Site) is located at the southwest corner of the intersection of Jones Road and Mercedes Ave about one and a half miles north of the town of Wilton as shown in Figure 1. The following description of the Project Site is based on (a) information provided by MID; and (b) investigations completed by DWR. Additional information about the Project Site and the Pilot Project is based on additional information collected during a site visit with MID staff, DWR project manager, and WRIME staff.

The Project Site and the adjacent lands are irrigated with surface water provided by Merced Irrigation District through the Cressey Lateral. The Cressey Lateral has a delivery capacity of 75 cubic feet per second (Photo 1). Near the Project Site, the Cressey Lateral parallels Mercedes Avenue. It flows beneath the intersection of Jones Road and Mercedes Avenue. After reaching the northwest corner of the intersection, the Cressey Lateral bifurcates with the Cressey Lateral continuing northward along Jones Avenue, and the Bloom Lateral continuing westward along Mercedes Ave. From the intersection of Mercedes Ave and Jones Road, the Cressey Lateral also continues southward along the east side of Jones Road for about one-quarter mile.

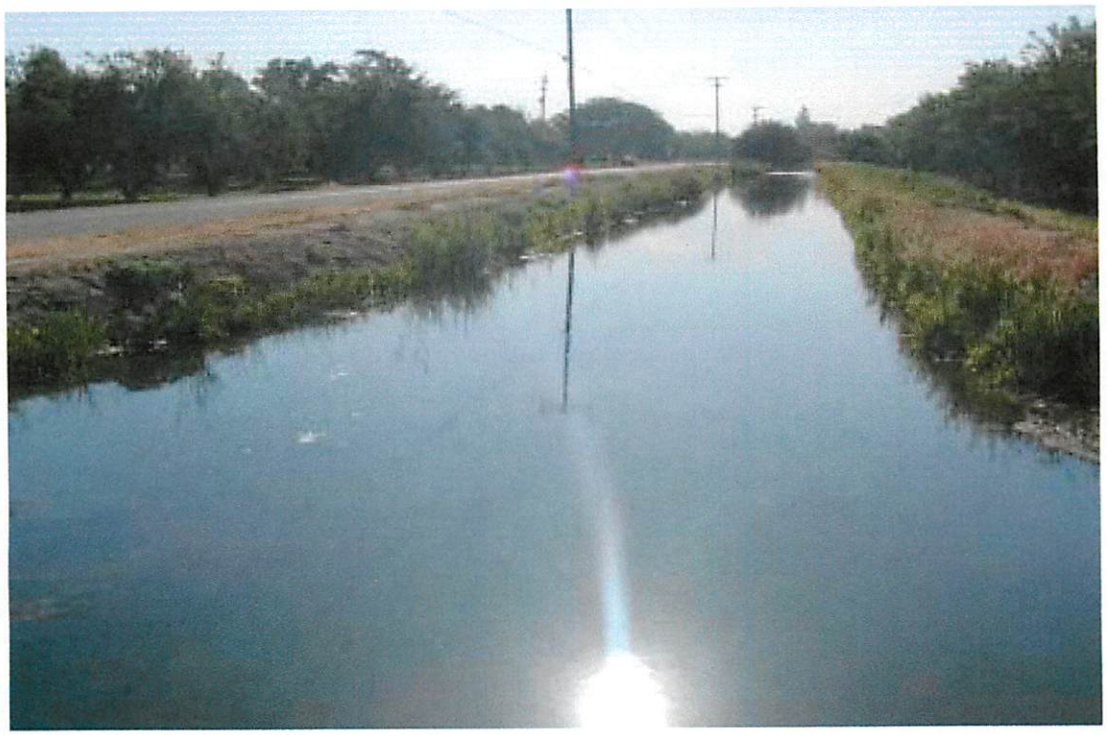

Photo 1: Cressey Lateral looking eastward from Project Site (Mercedes Avenue is on the left side of photo).

LAND USE

The 18-acre Project Site is currently fallow (Photo 2). The last irrigated crop is believed to have been strawberries a couple of years ago. It has not been determined if the land was ever used for growing almonds. Almond orchards currently are grown adjacent to the Project Site in north, east, and south. A recharge project (pilot or full scale) should take into consideration existing land use in the neighboring land and ensure not to create a groundwater mound, which could impact the root zone of the crops.

Photo 1: Cressey Lateral looking eastward from Project Site (Mercedes Avenue is on the left side of photo).

LAND USE

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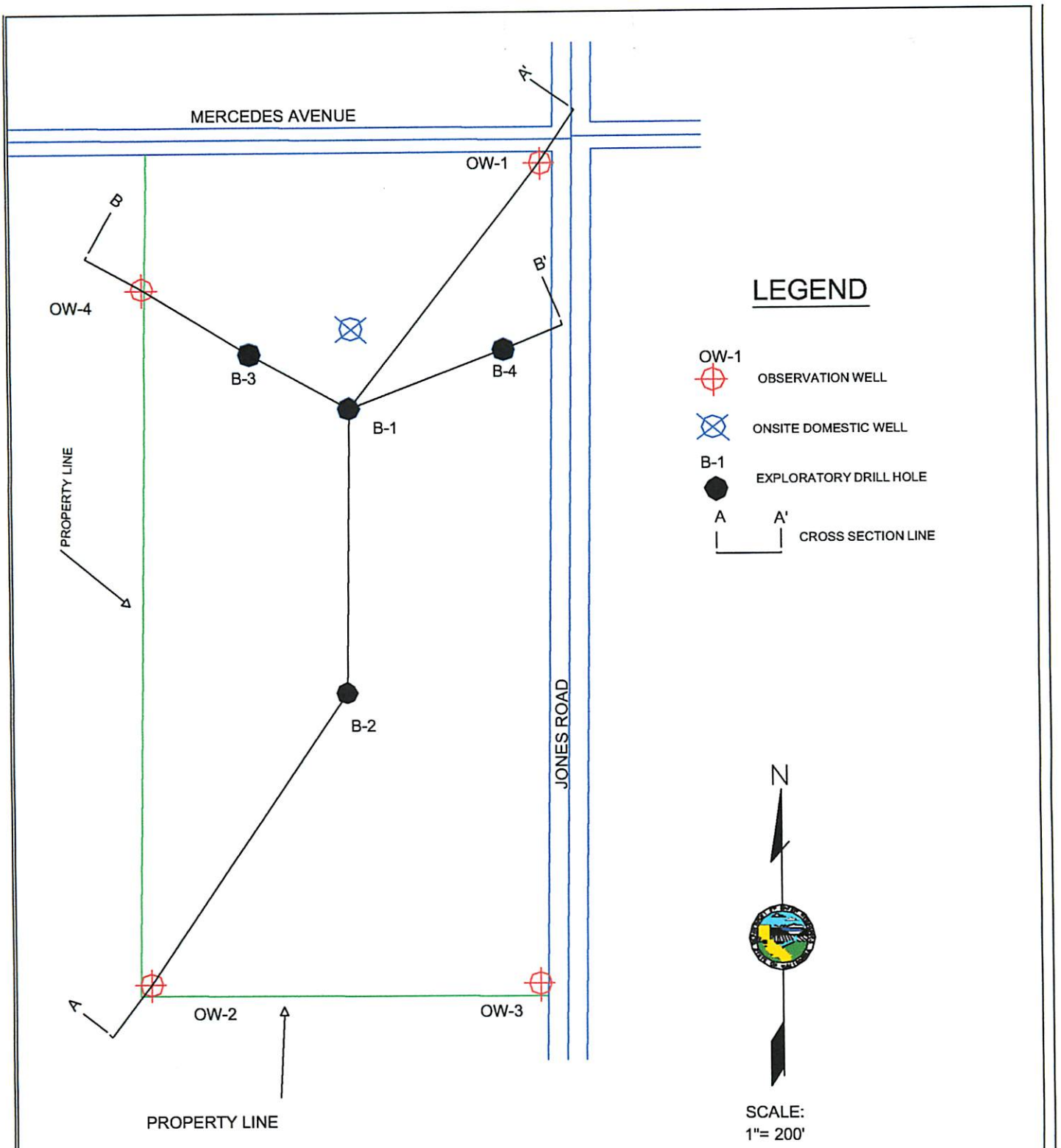
Photo 2: Looking south across the Project Site (Almond orchards in background)

NEAR SURFACE AND GEOLOGY/HYDROGEOLOGY CONDITIONS

A hydrogeologic investigation of the Project Site was completed by the DWR in March 2002. The information from this investigation was presented in the report titled 'Hydrogeologic Investigation of Merced Irrigation District Property, Winton, California'. The hydrogeologic investigation included drilling eight exploratory drill holes to a depth of approximately 100 feet. Four of these drill holes were developed into dual completion monitor wells. The locations of the four exploratory holes and four monitor wells are shown in Figure 2. Summary information for the exploratory holes is provided on Table 2.

The upper 60 feet of the unsaturated zone is composed of primarily of sandy sediment, especially along the northern portion of the Project Site. A hardpan layer was identified in seven of the eight borehole locations. No hardpan was present in OW-1 located in the



DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
GEOLOGY AND GROUNDWATER SECTION

MERCED IRRIGATION DISTRICT PROPERTY
HYDROGEOLOGIC INVESTIGATION

FIGURE 2- DRILL HOLE AND WELL LOCATION MAP

Table 2
Hydrogeologic Summary Table (1)

	Ground Surface Elevation (feet)	Total Depth (feet)	Depth to Perforation Interval (feet)		Depth to Hard Pan (feet)		Hardpan Thickness (feet)	Depth to Impermeable Layer (feet)		Drilling Water Table Depth (feet)	Drilling Water Table Elevation (feet above msl)
			Top	Bottom	Top	Bottom		Top	Bottom		
Borings											
B-1	184	95	NA	NA	2	6.5	4.5	60	65	85	99
B-2	182	100	NA	NA	2.5	4	1.5	47	49	80.5	101.5
B-3	183	90	NA	NA	2	14	12	56	59	85	98
B-4	186		NA	NA	4	13	9	31	35.7	80	106
Well Completions											
OW-1A	185	85	31	50	NA	NA	NA	50.5	52		
OW-1B	185	85	60.5	79.5	NA	NA	NA	45.5	47.5		
OW-2A	180	93	27	48	4	11	7			78	102
OW-2B	180	93	67	86	4	11	7			78	102
OW-3A	183	100	26	45	11	14	3	54	59	80	103
OW-3B	183	100	67	86	11	14	3	54	59	80	103
OW-4A	185	103	33	52	3.5	14	10.5	67.5	71.5	85	100
OW-4B	185	103	71.5	100.5	3.5	14	10.5	67.5	71.5	85	100

Note: (1) Hydrogeologic Investigation of Merced Irrigation District Property, Winton, California, DWR San Joaquin District, 2002

northeast corner of the Project Site. Along the east central and southeast portions of the site, interbedded finer-grained (silt and clay) sediments occur at depths of 25 to 30 feet below ground surface.

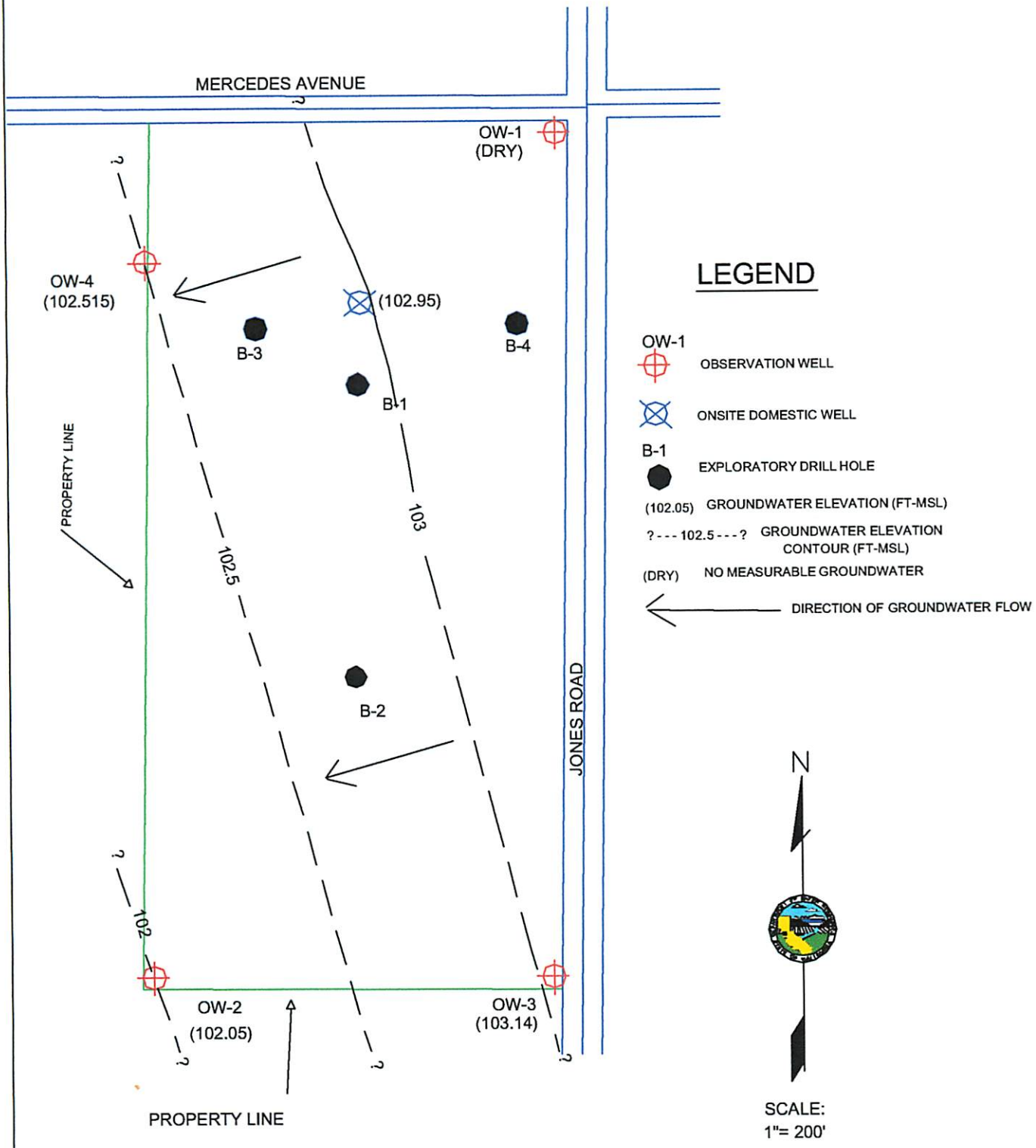
The groundwater elevations near the recharge site are shown in Figure 3. The groundwater elevations across the Project Site range from 102 to 103 feet, which results in an approximate depth to groundwater of 80 feet. Groundwater was also observed in some locations at shallower depths as low as 35 feet. The shallow groundwater levels are likely due to interbedded silt and clay soils perching seepage water from the nearby unlined canals.

RECHARGE WATER SUPPLY

The water supply for the Pilot Project and a potential full-scale recharge project would be provided by MID and delivered through the Cressey Lateral to the Project Site. The recharge water is generally considered to be of excellent quality. MID is currently planning to deliver water to the recharge basin during the March to October period. MID may also try to deliver Pre-1914 water rights water to the recharge basin during the winter period. Currently, there is some uncertainty on MID's ability to deliver the winter water.

GROUNDWATER QUALITY

The general groundwater quality near the Project Site is considered very good, but nitrate contamination is a growing concern in the Merced Basin. Common sources of nitrate contamination are commercial dairy operations, agricultural fertilizers, and domestic waste. Pesticide contamination exists within the Merced Basin. Dibromocholopropane (DBCP) and ethylene dibromide (EDB) were used primarily on vineyards and orchards, but were banned in 1977 and 1980 respectively. Both DBCP and EDB are detected in the groundwater at few locations in the Merced Basin. Currently, it is not known if DBCP or EDB are present at the Project Site.



DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
GEOLOGY AND GROUNDWATER SECTION

MERCED IRRIGATION DISTRICT PROPERTY
HYDROGEOLOGIC INVESTIGATION

FIGURE 3 - GROUNDWATER ELEVATION CONTOUR MAP - REGIONAL WATER TABLE

SITE VISIT

On May 31, 2002, WRIME staff met with MID staff and the DWR project manager at the Project Site. Several decisions were made on the Project Work Plan based on the conversations during this field visit. Some of the decisions are listed below:

- Two Pilot Project recharge ponds would be developed and tested to determine the different infiltration rates across the Project Site. It is believed that the infiltration rate will be greater in the northern area due to more coarse-grained material in the upper 60 feet of the ground surface. The finer-grained material in the south part of the Project Site may have a lower infiltration rate.
- MID staff plan to excavate the hardpan from the recharge basin and store excavated material onsite.
- No material will be removed from the Project Site.
- MID will design and construct facilities to deliver and measure the water supply to each of the recharge ponds. The recharge water will be delivered to the two recharge ponds from the existing canal system by gravity.
- Currently, the location of the delivery pipeline has not been identified.
- MID will immediately start taking water level measurements at the observation wells located on the Project Site. The month before the Pilot test begins, the frequency of the onsite water level measurements will increase to weekly. Nearby MID production wells will continue to be monitored monthly at this time. The monitoring frequency should increase to weekly once the Pilot Project begins.
- The duration of the pilot test, extent of the hardpan delineation, and the level on pond instrumentation, and monitoring will be determined by MID staff.

HARDPAN DELINEATION/ POND LOCATIONS

- A near surface investigation should be conducted using a Geoprobe to delineate the lateral extent and thickness of the hardpan layer in the immediate vicinity of the pond sites. The hardpan delineation at each pond site will consist of approximately 25

exploration points using a Geoprobe conductivity probe to a total depth of about 15 feet, or one foot beyond the bottom of the hardpan layer. The 25 exploration points should be located in a grid pattern with a 50-foot spacing. MID staff will map the location of each exploration point. The logs from the conductivity probe will be used to map the lateral extent and depth of the hardpan layer.

- The exact location of each recharge basin will be determined based the thickness and extent of the hardpan layer. The hardpan delineation will also be used to place tensiometers around the pond window to track the wetting front.
- For each group (or nest) of tensiometers, a tensiometer should be placed immediately above the hardpan layer (approximate depth of 5 to 15 feet). A second tensiometer will be added at the same location at a depth of approximately 20 to 30 feet. The second tensiometer should be located above a fine-grained layer (if present) at that location.
- It is anticipated that it will take one day to complete the delineation for each pond site. The actual number of conductivity exploration points completed in a day is dependent upon local conditions, condition of equipment, and operator skill. The order of the exploration points should be prioritized to provide adequate coverage for the hardpan delineation in case all 25 exploration points cannot be completed in one day.
- The two recharge ponds will be located near the center of the Project Site about 500 feet apart from each other (north-south distance).
- The ponds will be located no closer than 100 feet from the site boundary.
- Pond A (northern pond) would be located northeast of the existing onsite domestic well. Based on existing information, the hardpan should be fairly thin at this location and near the ground surface. Information from the hardpan mapping will be used to refine the Pond A location.
- Pond B (southern pond) will be located just east of Exploration drill hole B-2. Based on the existing information, the hardpan at B-2 was only 1.5 feet thick and located within four feet of the ground surface.

Task 2 –Design of Pilot Recharge Tests and Monitoring Program

In this task, conceptual designs for the pilot recharge test are prepared. The necessary hydraulic analysis of mounding and drawdown is also conducted at this stage to assist in the conceptual design. The actual facilities construction and testing will be the responsibility of the Merced Irrigation District. A methodology will be developed to conduct such pilot recharge tests, including general operation and monitoring requirements.

This task consists of the following subtasks. The engineering considerations discussed in Section 4 provides the necessary guideline for performing these subtasks

Subtask 2.1 Hydraulic Analysis of Recharge/Extraction Program

Subtask 2.2 Conceptual Design of Test Facilities

Subtask 2.3 Design Recharge Ponds

The two recharge ponds will be of similar construction, which includes:

- A pond bottom area of approximately one-quarter acre (100 feet by 100 feet).
- The ponds will be excavated to a depth (maximum 10 feet) needed to remove the hardpan.
- MID staff has determined to construct the ponds to a depth necessary to remove the hardpan layer from the pond site.
- Excavated material will be used to construct a berm around each pond. Any remaining material will be stored on site adjacent to the recharge basin.

Subtask 2.4 Design Water Conveyance Facilities

Water will be delivered to the recharge ponds from the Cressey Lateral. MID staff is considering different options to deliver water to the recharge ponds. These include:

- Diverting water from the Cressey Lateral beneath Jones Road, just south of Mercedes Avenue, to the Project Site. (See Photo 1)

- Diverting the water from the Cressey Lateral, beneath Jones Road, about one-quarter mile south of the intersection of Jones Road and Mercedes Ave. (See Photo 3)
- Divert water from the northern lateral beneath Mercedes Avenue, just west of the intersection with Jones Road. (See Photo 4)

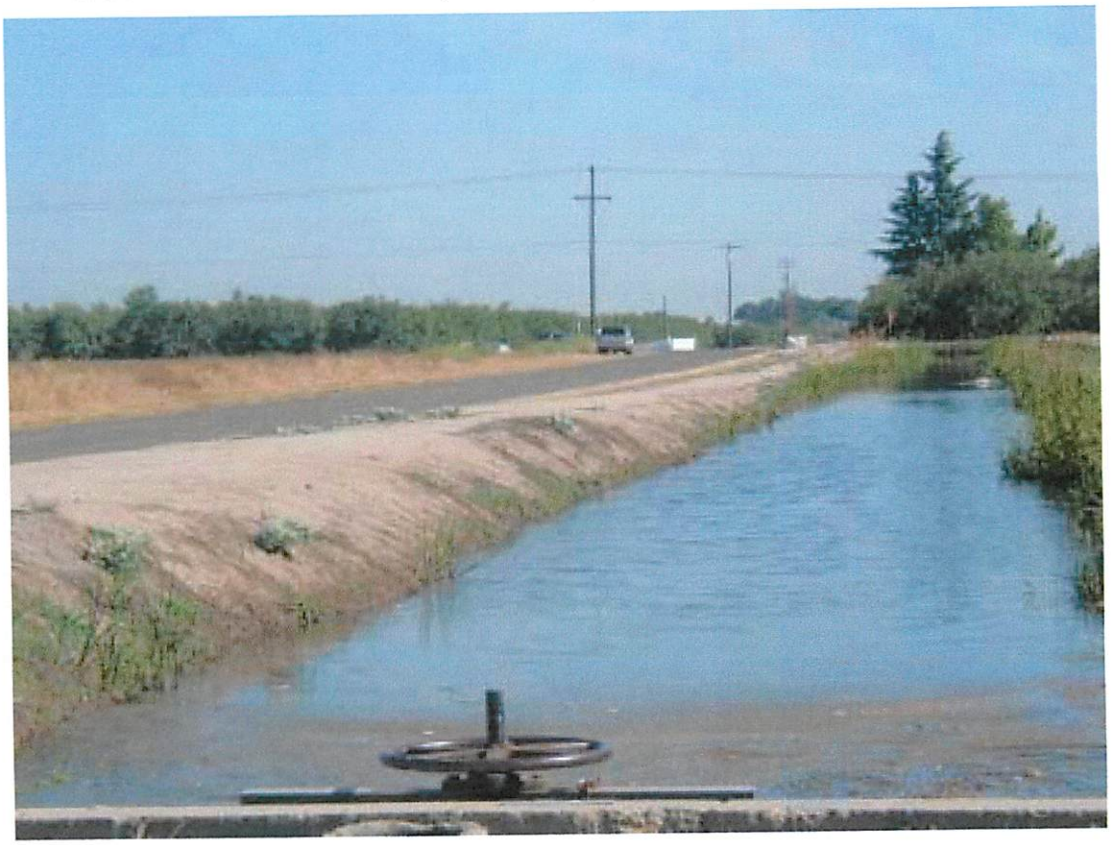


Photo 3: Looking north along turnout of Cressey Lateral (Project Site is on left side of picture).

Photo 4: Looking north on Jones Avenue at the northeast corner of the Project Site

Subtask 2.5 Design Monitoring Network and Data Collection Program

MID should run the pilot test until there is clear evidence that recharge water has reached the water table as indicated in the on-site observation wells. The pilot test could take up to 120 days. The pilot test may be stopped if the lateral migration of recharged water within 10 feet of the ground surface migrates off the Project Site. This may impact nearby almond orchards.

MONITORING/DATA COLLECTION

Monitoring and data collection for the Pilot Recharge Project includes monitoring groundwater levels, water quality, tracking the wetting front in the unsaturated zone.

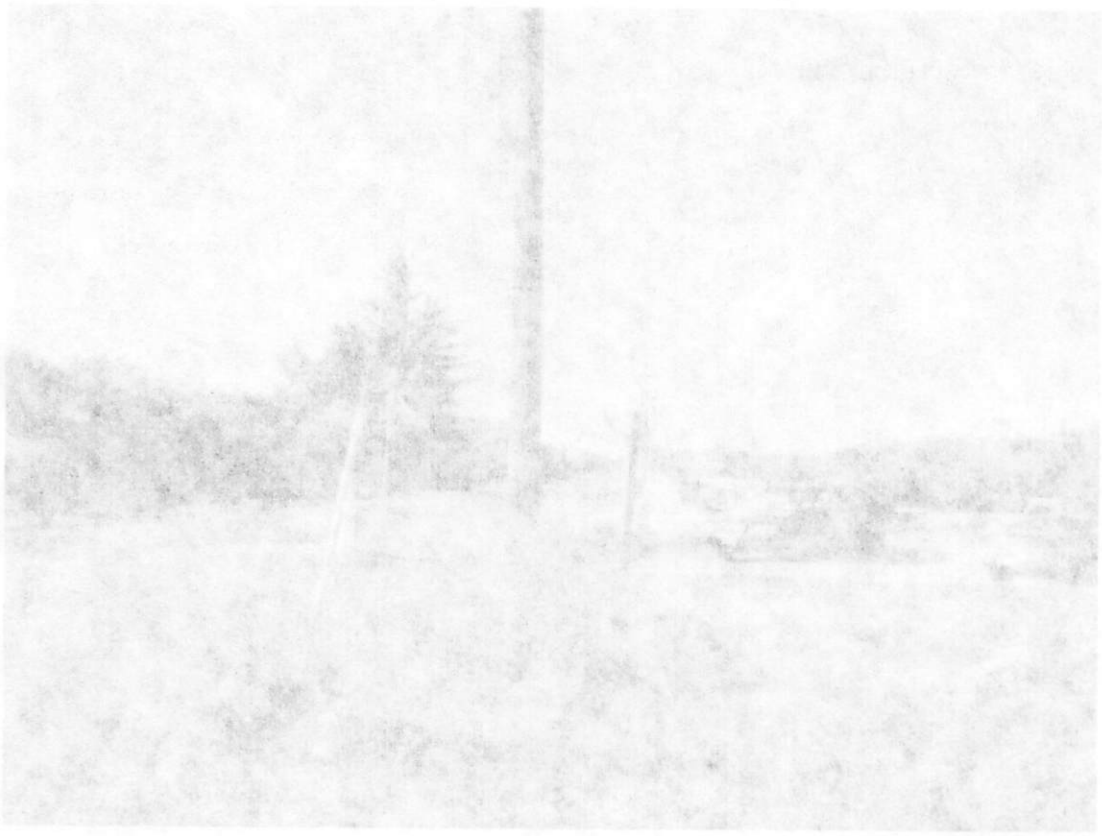


Photo 4: Looking north on Jones Avenue at the northeast corner of the Project Site

Subtask 2.5 Design Monitoring Network and Data Collection Program

MID should run the pilot test until there is clear evidence that recharge water has reached the water table as indicated in the on-site observation wells. The pilot test could take up to 120 days. The pilot test may be stopped if the lateral migration of recharged water within 10 feet of the ground surface migrates off the Project Site. This may impact nearby almond orchards.

MONITORING/DATA COLLECTION

Monitoring and data collection for the Pilot Recharge Project includes monitoring groundwater levels, water quality, tracking the wetting front in the unsaturated zone

GROUNDWATER LEVELS

One-month prior the start of the Pilot Project, groundwater elevations data needs to be collected weekly at wells at the Project Site and at selected MID wells surrounding the Project Site. All the wells will need to be monitored on the same day each week.

WATER QUALITY

Water quality monitoring at both the available surface supply and groundwater basin should begin prior to the Pilot Project. It should continue through the Pilot Project as listed on Table 1.

WETTING FRONT

The wetting front from the recharge program will be monitored within approximately 25 feet of the ground surface using tensiometers. The tensiometers will be installed using the Geoprobe. The number and location of tensiometers will be determined based on the ease of installation. The tensiometers will be located just above the hardpan layer (approximate depth of 2 to 10 feet below ground surface) and at a depth of about 20 to 25 feet below ground surface.

The tensiometers will be placed on each side of the rechage basins. Approximately 6 shallow and 4 deep tensiometers may be installed per recharge basin. The specific locations of the tensiometers will be determined based on the information collected from the delineation of the hardpan layer.

Subtask 2.6 Write Operation Guidelines Specific to Field Conditions

An operation guideline document will be written as part of this subtask.

Task 3 –Construction of Pilot Project

Merced Irrigation District will take the responsibility to construct the necessary physical facilities, such as recharge ponds, berms, fences, water conveyance pipelines and structures, monitoring wells, and other necessary field facilities specific to the site conditions. All necessary regulatory approvals will be obtained prior to construction.

This task consists of the following subtasks. These subtasks will be performed with due attention to the legal, regulatory, and engineering considerations discussed in Section 3 and 4 of this technical memorandum. It should be noted that these subtasks are not sequential and therefore do not necessarily require completion of one before another, unless otherwise obvious or mentioned.

Subtask 3.1 Obtain All Required Permits and Agency Approvals Before Any Construction
Subtask 3.2 Construct Recharge Pond with Berms
Subtask 3.3 Construct Water Conveyance Facilities
Subtask 3.4 Drill Groundwater Monitoring Wells
Subtask 3.5 Install Flow Meters, Check Structures
Subtask 3.6 Install Infiltration Monitoring System
Subtask 3.7 Survey Well Elevations, Recharge Ponds

Task 4 – Collect and Analyze Pilot Recharge Test Data

The data collection and analysis of the Pilot Recharge Test is the most important task. Different types of data (water level, water quality, infiltration rate, rainfall, pan evaporation) are collected at specified time intervals as per the data collection program defined under Task 2. These data are stored and analyzed using the guidelines provided in Section 5 of this technical memorandum and as per the data analysis program defined under Task 2.

The infiltration data will be compiled in spreadsheets, corrected to account for evaporation and rainfall during the testing, and plotted on graphs to display recharge rates over time. The groundwater elevations and groundwater quality data will also be compiled in spreadsheets and plotted on graphs to display water elevations during the test period.

The frequency of the data collection was summarized on Table 1 of this technical memorandum. It includes monitoring the following parameters:

- Water Supply to the Recharge Basins
- Water Levels (onsite and off site)
- Water Quality (in onsite wells, in recharge basin, and water supply)
- Tensiometers (soil moisture content to detect the progression of the wetting front)
- Temperature
- Rainfall
- Evaporation
- Surface water Quality (In)
- Groundwater Quality

Task 5 – Documentation of Pilot Recharge Test Results

In this task, a final report is prepared documenting the entire process of Pilot Recharge program from site selection to environmental permitting to well drilling to construction to results of data collection and analysis. This report provides the basis for full-scale implementation and operation of a recharge project.

A sample Table of Contents of the final report is provided below for use only as a guideline.

A process diagram for Cressey Basin Recharge Project with necessary key tasks is provided in Figure 4.

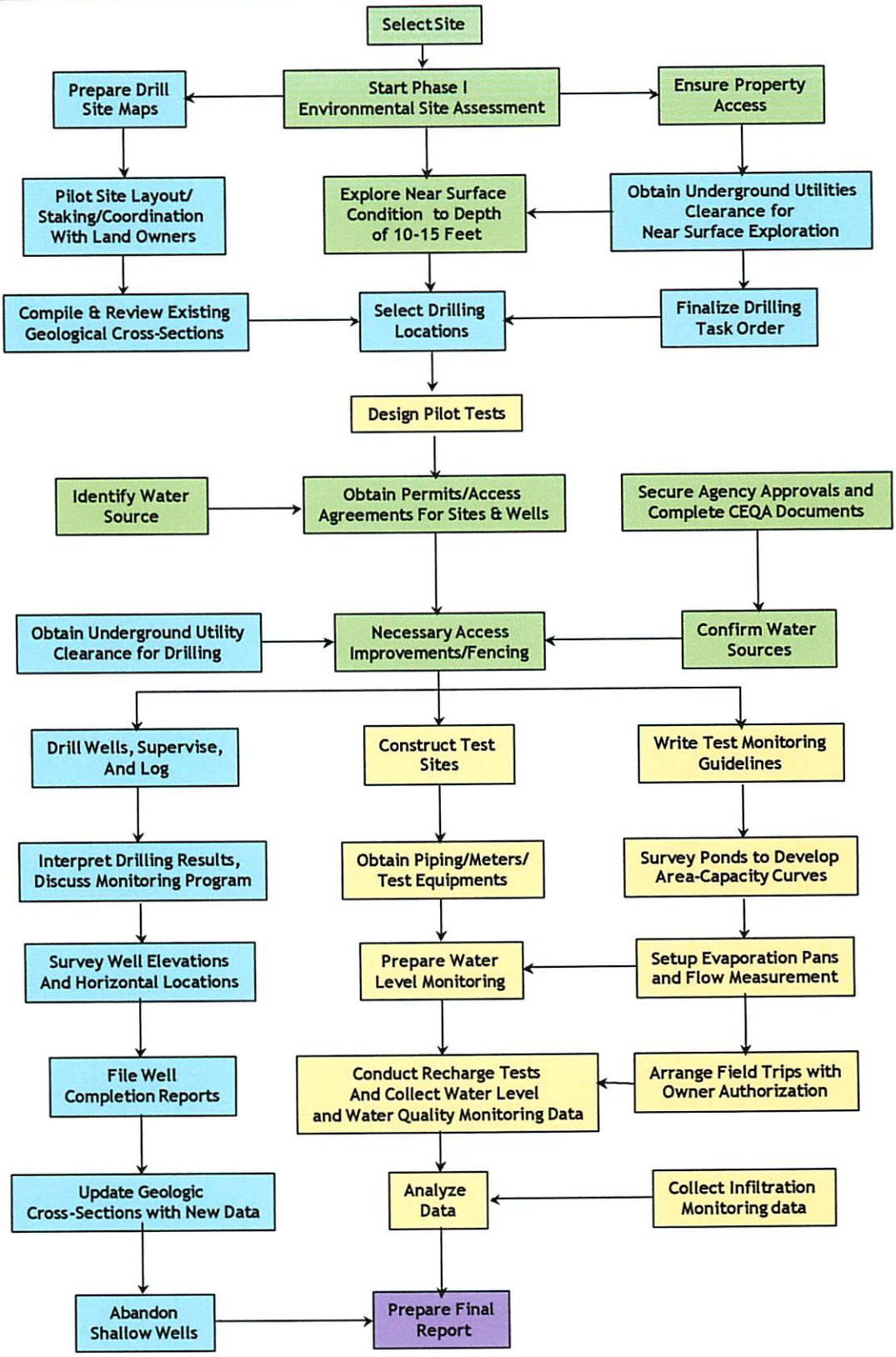


Figure 4 - Process Diagram for Cressey Basin Recharge Project

SAMPLE TABLE OF CONTENTS OF PILOT RECHARGE TEST REPORT

CHAPTER I. INTRODUCTION

- Purpose and Scope of Study
- Study Participants and Coordination
- Prior Studies and Reports

CHAPTER II. SITE SELECTION

- **Description of Study Area**
  - Geologic Setting
  - Aquifer Stratigraphy
  - Soil Infiltration Characteristics
  - Hydrogeology
  - Environmental Resources and Issues
  - Land Use
  - Special-Status Species
  - Hazardous and Toxic Waste Assessment
  - Pesticide Leaching Potential
  - Pesticide Groundwater Monitoring Results
  - Surface Water Supplies
  - Water Conveyance Facilities

- **Preliminary Site Screening**
  - Location of Initial Sites
  - Site Visit Reports
  - Site Selection Criteria
  - Site Screening and Selected Sites
  - Phase I Environmental Site Assessment for Selected Sites

- **Field Assessment Reports**
  - Soil/ Near Surface Assessment
  - Hydrogeologic Assessment

CHAPTER III. DESIGN OF PILOT TEST AND MONITORING PROGRAM

- Conceptual Design
- Design of Recharge Ponds
- Design of Water Conveyance Facilities
- Design of Monitoring Network
- Pilot Test Program
- Data Collection Methods and Protocols
- Drilling Program Results and Pilot Test Designs

CHAPTER IV. DATA COLLECTION AND ANALYSIS

- Description of collected data (time and frequency)
- Hydraulic Analysis Results
- Analysis of Groundwater Levels
- Analysis of Water Quality Data
- Analysis of Infiltration Rates Data
- Other Data Analysis

CHAPTER V. FINDINGS AND CONCLUSIONS

- Results of Pilot Test Program
- Summary of Findings
- Conclusions and Recommendations

Merced Integrated Regional Water Management
Drought Grant Proposal

Appendices 3-10 to 3-15

App. #	Document Title	File Name
App. 3-1	Highlands Groundwater Conservation Project - Conceptual Design	Att3_DG_ProJust_2of4
App. 3-2	Highlands Groundwater Conservation Project - Property Information and Acreage of Land on Surface and Groundwater Supply	
App. 3-3	Highlands Groundwater Conservation Project – Water Supply Benefits Analysis	
App. 3-4	Highlands Groundwater Conservation Project – Energy and GHG Emissions Benefits	
App. 3-5	Merced IRWM Plan Ground Recharge Feasibility Study	
App. 3-6	Terms and Conditions of License for Unconstructed Major Project Affecting Lands of the United States	
	United States of America Federal Energy Regulatory Commission Notice of Authorization for Continued Project Operation (pages	
	US Fish and Wildlife Letter Requesting During Drought That Ecosystem Demand Requirements May Not Be Met	
App. 3-7	MID Production Wells Rendered Inoperable During the 2014 Irrigation Season Due To The Drought	
App. 3-8	MID and El Nido Groundwater Level Data	
App. 3-9	Technical Memorandum On Pilot Project Work Plan For Cressey Recharge Basin Assessment Project	
App. 3-10	Hydrogeological Investigation of the Cressey Pilot Project Site	Att3_DG_ProJust_3of4
App. 3-11	Improvement Plans for MID Cressey Groundwater Recharge Basin	
App. 3-12	MID Cressey Recharge Basin Initial Study/Proposed Negative Declaration	
App. 3-13	Description of Cressey Recharge Basin Enlargement Project	
App. 3-14	Cressey Existing Basin Infiltration Rate	
App. 3-15	Cressey Length of Irrigation Season Based on Historical Record	

App. #	Document Title	File Name
App. 3-16	Le Grand CSD Final Design Drawings	Att3_DG_ProJust_4of4
App. 3-17	Groundwater Level Changes in Le Grand	
App. 3-18	Merced IRWM Salt and Nutrient Study (excerpt)	
App. 3-19	LGCSD Water Meter Conservation Project Water Supply Benefits	
App. 3-20	LGCSD Water Meter Conservation Project Energy Usage from 2013-2014 and Reduction in Energy Usage Benefits	
App. 3-21	LGCSD Water Meter Conservation Project Chemical Usage in 2013 and Reduction in Chemical Usage Benefits	

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-10

Hydrogeological Investigation of the Cressey Pilot Project Site

TABLE OF CONTENTS

Introduction.....1
Purpose and Scope of Work.....1
Field Activities.....2
Exploratory Drill Holes.....2
Well Installation.....3
Well Development.....4
Groundwater Level Monitoring.....4
Findings.....4
Conclusions.....5
Recommendations.....6
References Cited.....7

FIGURES

Figure 1 – Site Location Map
Figure 2 – Drill Hole and Well Location Map
Figure 3 – Groundwater Elevation Contour Map – Regional Water Table

PLATE

Plate 1 – Geologic Cross Section A-A' and B-B'

TABLES

Table 1 – Observation Well Construction Details
Table 2 – Summary of Well Development Parameter Measurements
Table 3 – Summary of Groundwater Level Measurements

APPENDIX

Appendix A – Drill Hole Logs and Well Construction Details

Hydrogeologic Investigation of Merced Irrigation District Property Winton, California

This memorandum report presents the hydrogeologic investigation of the Merced Irrigation District (MID) property, located in Winton, California. The investigation was completed at the request of Integrated Storage Investigations (ISI) staff in Sacramento by Geology and Groundwater Section staff from the Department of Water Resources' (DWR) Central District (CD) office, in cooperation with MID staff and consultants and DWR consultants, Saracino-Kirby-Snow. Spectrum Exploration, Inc., under contract with DWR's ISI program, provided drilling services. Well installation and development occurred in December 2001. Groundwater level monitoring was conducted during December 2001 and January 2002.

Introduction

The project site is in Merced County, California at the southwest corner of Mercedes Avenue and Jones Road in the City of Winton (see Figure 1). The site is approximately 20 acres in size and is owned by MID. The site is currently a tilled agricultural field, most recently used for strawberry cultivation. Almond orchards are present on the north, east, and south sides of the property; and specialty herbs are farmed to the west of the property. Irrigation canals are located adjacent to the project site on the east and northeast. During the period of investigation, these canals were not in use but did contain a minor amount of water along the northeast portion of the site.

The project site is in the Merced Groundwater Basin (DWR 1980) in an area mapped as sand dunes of Holocene Age (Page 1986). These deposits are reported to consist of cross-bedded, well-sorted, medium to coarse sand and some very fine to fine sand and silt. In most places, the sand dune deposits lie above the groundwater table, but their permeability permits recharge from stream runoff, precipitation, or irrigation return (Page 1986).

Purpose and Scope of Work

The purpose of the investigation was to collect geologic and hydrogeologic data from the subsurface to be used for an evaluation of the site as a potential groundwater recharge location.

The original scope of work included the drilling of five exploratory drill holes to a maximum depth of 150 feet below ground surface (bgs) and conversion of three drill holes into multiple-completion monitoring wells. The CD geologist and project cooperators decided in the field that, due to the lithologic variability encountered

during drilling, additional investigation would be beneficial. As a result, three additional drill holes were drilled and one additional well was installed on the northern portion of the site.

Field Activities

Prior to drilling, MID staff and consultants selected the drilling locations and visited the field site to mark the proposed boring and well locations. Additionally, the site boundaries were identified on the ground in preparation for a site visit from Underground Service Alert (USA). USA was notified at least two days prior to the start of field activities to allow sufficient time for operators of public and private utilities to mark their underground services in the vicinity of the site and proposed boring locations.

MID obtained the required soil boring and well installation permits from Merced County Division of Environmental Health prior to, and during, the field activities. An environmental clearance permit for the project was obtained from DWR by Saracino-Kirby-Snow staff prior to the initiation of field activities. CD staff obtained a temporary entry permit from MID in order to perform field activities on the project site.

Drilling activities occurred from December 5, 2001 to December 19, 2001 and included the drilling of eight exploratory drill holes, conversion of four drill holes into observation wells, well development, and groundwater level monitoring. Groundwater level measurements were also collected from onsite wells on January 18, 2002.

Exploratory Drill Holes

Exploratory drill holes B-1 through B-4 and OW-1 through OW-4 were advanced at various locations onsite to depths ranging from 85 to 100 feet bgs by Spectrum Exploration, Inc. (see Figure 2). Drilling was performed using a Central Mining Equipment Company (CME) 750X all-terrain drilling rig utilizing hollow-stem auger drilling methods and 8-inch outside diameter (OD) augers. Soil cores were collected using the CME 5-foot continuous sample tube system. Recovered soil cores were photographed in the core tube and then placed into appropriately labeled core boxes for future reference and analysis. Soil core samples were logged by a CD geologist using the Unified Soil Classification System. Soil colors were described using Munsell Soil Color Charts. A detailed log was recorded for each exploratory drill hole, based on the recovered soil core material and drill rig performance. These logs are included with this report as Appendix A. Drill cuttings were stockpiled adjacent to each drill hole.

Following completion of field work, the soil core boxes were transported offsite by an MID contractor (Geomatrix Consultants) for storage.

Drill holes OW-1 through OW-4 were converted to observation wells, as described below. Drill holes B-1 through B-4 were backfilled. Drill holes B-1 and B-2 were sealed by backfilling with a Portland Type I/II cement slurry from their total depth to approximately 6 to 10 feet bgs while retracting the augers. After allowing the grout to settle, the upper portion of drill hole B-1, from approximately 0 to 9.5 feet bgs, was backfilled with Baroid 3/8-inch Hole Plug (bentonite chips). The upper portion of drill hole B-2, from approximately 0 to 6.5 feet bgs, was filled with excavated soil. Drill holes B-3 and B-4 were sealed by backfilling them with bentonite chips while retracting the augers. The bentonite chips were hydrated with potable water in lifts using 1-inch tremie pipe.

Prior to sealing the drill holes, Merced County Division of Environmental Health staff were notified for inspection purposes. All backfill materials and placement methods used were verbally approved by County Environmental Health staff prior to the drill holes being sealed. County Environmental Health staff visited the site on several occasions to observe drilling and sealing activities.

Well Installation

Dual-completion observation wells, OW-1 through OW-4, were installed in selected borings onsite to total depths ranging from 80 to 100 feet bgs (see Figure 2). Before the drill holes were converted to wells, the pilot holes were reamed with 10-inch OD augers to allow the placement of two well casings. The lower well screen intervals were selected to intersect the regional groundwater table and the upper screen intervals were selected to monitor zones where perched water table conditions may be encountered.

The wells were constructed using 2-inch inside diameter (ID), Schedule 40 polyvinyl chloride (PVC) blank and machine-slotted casing. Machine-slotted screens with 0.010- and 0.020-inch slots and total lengths of 20 to 30 feet were used. RMC Pacific Number 2-/16 and Number 3 sands were used as filter pack material adjacent and above the well screen intervals. Bentonite seals, consisting of bentonite chips, were placed above the filter pack and between the screened intervals. Bentonite seals were hydrated with potable water in lifts during placement. The remaining annular space above the upper seal surrounding the blank casings was backfilled with bentonite chips that were hydrated with potable water in lifts to approximately 2 feet bgs.

A layer of excavated sand, approximately 0.5 foot thick, was placed above the bentonite chips and below the concrete surface seal. Well heads were covered with locking plugs and enclosed in a steel protective vault set approximately 3 feet above ground surface (ags) and encased in a concrete surface seal from 0 to approximately 1.5 feet bgs. The well vaults were secured with a lock supplied by MID. Well construction details are shown in the drill hole logs in Appendix A and tabulated in Table 1.

Prior to placement of the upper well seals, Merced County Division of Environmental Health staff were notified for inspection purposes. All backfill materials and placement methods used were verbally approved by County Environmental Health staff prior to the wells being sealed. County Environmental Health staff visited the site on several occasions to observe drilling and sealing activities.

The wellhead elevations and locations were surveyed by an MID surveyor.

Well Development

Wells with saturated well screen intervals, OW-2B, OW-3B, and OW-4B, were developed using bailing, surging, and pumping methods. All development equipment was steam cleaned and/or cleaned with Alconox and water before it was used onsite. Depth to groundwater and well total depths were measured in each well prior to the start of development and recorded in a field log. Depth to water and well total depths were measured using an electric water level sounder, accurate to 0.01 inch.

Periodically during development, a grab water sample was collected from the wells and the water quality parameters pH, temperature, and electrical conductivity were measured using a calibrated HyDac multiparameter tester. Turbidity readings on the grab water samples were also measured periodically using a calibrated Hach 2100P turbidimeter. All water quality parameter measurements were recorded in a field log.

Following surging and bailing, a Grundfos Rediflo-2 submersible pump was lowered to approximately one foot from the base of the well and used to complete the development. Pumping continued at each well until development water was clear and turbidity measurements were low (<23 nephelometric turbidity units [NTUs]). Following completion of well development, the depth to groundwater and well total depth was measured and recorded in a field log.

Development water was discharged to the ground surface adjacent to each well.

A summary of well development parameter measurements is provided in Table 2.

Groundwater Level Monitoring

Groundwater levels were monitored at onsite well locations periodically during the course of the field work and on January 18, 2002. These measurements are tabulated in Table 3. Additionally, water levels were collected during the project at a domestic well on the northern part of the property. This well's location and elevation were also surveyed by MID.

Findings

A zone of fine to medium sand with some silt layers is present below the majority of the site to depths ranging from approximately 45 to 60 feet bgs (see Plate 1).

Between the depths of 45 feet to a maximum of 95 feet bgs, the subsurface becomes significantly more interbedded as silts and clays become more common, although some continuous sand layers are still present. This interbedded zone is encountered at shallower depths along the east central and southeast portions of the site, as evidenced in drill holes OW-3 at 26 feet and B-4 at 31 feet. At depths ranging from approximately 76 to 95 feet bgs, another primarily sandy zone occurs to the total onsite exploration depth of 103 feet bgs.

A zone of partially cemented "hard pan" silty sand soil was encountered in all of the drill holes, except OW-1, at depths ranging from 2 to 14 feet bgs.

First encountered groundwater was observed in the drill holes at depths ranging from 35 feet bgs in B-4 to 85 feet bgs in drill holes B-1, B-3, and OW-4. The shallowest first encountered groundwater levels were observed in drill holes B-4 (35 feet bgs), OW-1 (60.5 feet bgs), and OW-3 (64.5 feet bgs). These shallow water strikes are probably due to interbedded silt and clay soils at those depths combined with water seepage from an unlined earthen agricultural water canal, located on the east side of Jones Road adjacent to the MID site.

The lower level screen interval for well OW-1, identified as OW-1B, was installed from approximately 61 to 80 feet bgs, based on the presence of multiple water strikes starting at about 60 feet bgs. Based on the presence of little to no water in well OW-1B following installation, this elevated area of groundwater appears to be perched and localized adjacent to the canal area and, therefore, is not representative of the regional groundwater table. The regional groundwater table in the northeast area of the site near well OW-1 appears to begin below approximately 80 feet bgs. Across the remainder of the site, the regional water table is situated at about 76 to 83 feet bgs.

Based on water levels measured on January 18, 2002, groundwater is present beneath the site at measured elevations of about 102 to 103 feet above mean sea level (feet-msl) and flows to the west-southwest at an approximate hydraulic gradient of 0.002 ft/ft.

Conclusions

The lithology data collected as part of this investigation indicates that primarily sandy sediment lies beneath the majority of the site, to an average depth of about 50 feet bgs. The thickest section of this primarily sandy sediment (0–60 feet) occurs on the northern portion of the site in the vicinity of drill hole B-1. An exception to this was found on the east central and southeast portions of the site, where interbedded finer-grained (silt and clay) sediment occurs at shallower depths of about 25 to 30 feet bgs.

Below the upper sandy zone, there is an interbedded zone of clay, silt, and sand. This interbedded zone will act to slow the movement of recharge water to the water

table. Perched water was found within this interbedded zone in drill holes B-4, OW-1, and OW-3 along the eastern side of the site. Observation wells were constructed in multiple locations across the site in the unsaturated zone, within or above this interbedded zone, to detect the presence of future perched water. No perched water was observed in any of the shallow screened wells following installation.

Recommendations

1. Periodic groundwater level monitoring should be performed at all observation wells to further evaluate long-term regional groundwater conditions at the site and to monitor for the presence and magnitude of perched water in the shallow screened wells.

2. MID should continue to use the onsite domestic water well for water level monitoring, since the water level in this well appears to be representative of the regional water table.

3. Groundwater from the observation wells with saturated screen intervals should be sampled to establish baseline water quality beneath the site. Groundwater should be tested for general minerals, metals, inorganic constituents, pesticides, herbicides, and any other chemicals of potential concern.

4. The shallow zone observation wells (OW-1A through OW-4A) and deep zone observation well OW-1B should be developed and sampled (in the future) when sufficient water is present within the well screen intervals.

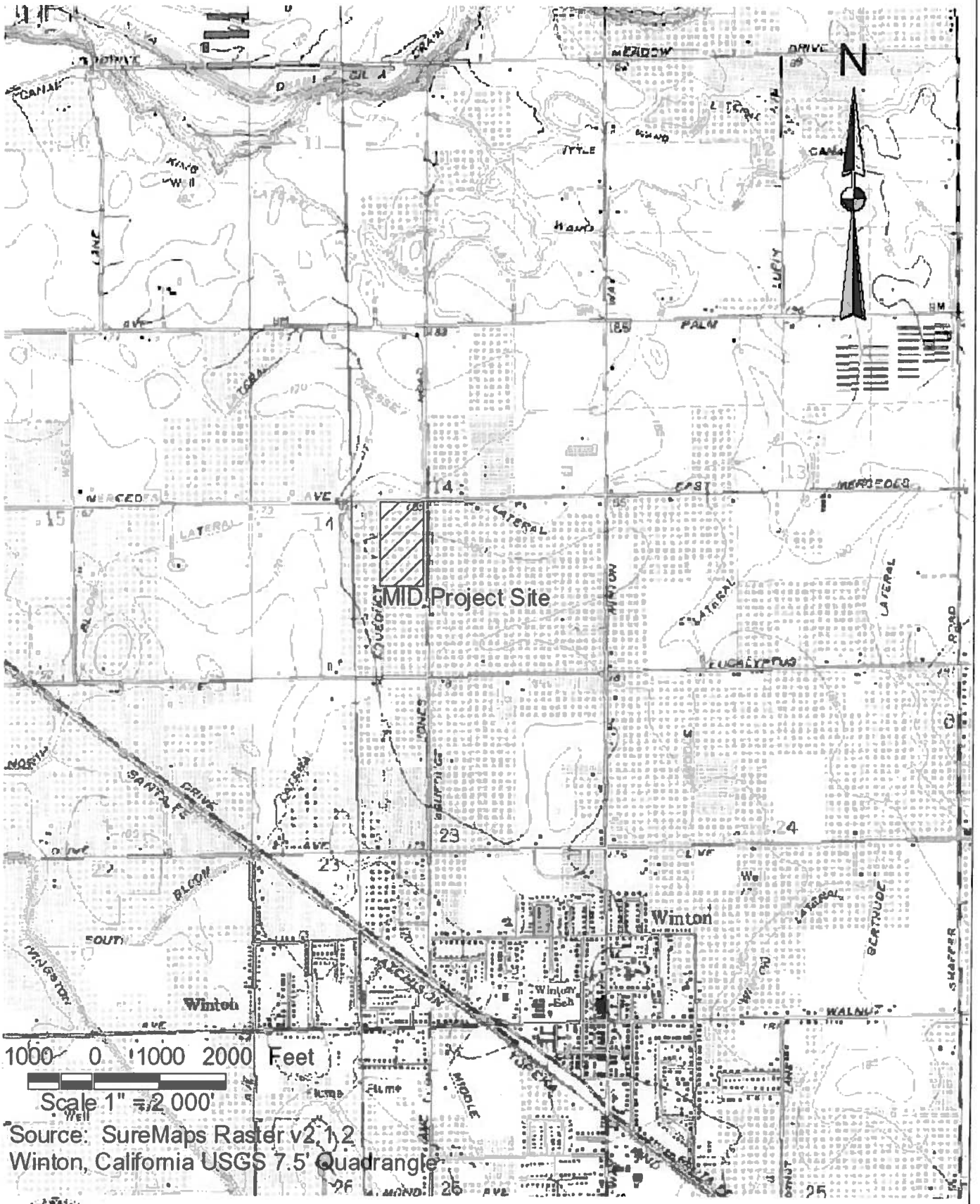
5. Surface infiltration testing should be performed at the site to evaluate the hydraulic properties of the shallow soil and "hard pan" zone in order to determine if this zone requires any modification or excavation prior to initiating further recharge testing and/or larger scale operations.

6. Because the four observation wells installed as part of this investigation are located on the perimeter of the site, additional observation wells may be needed on the internal portions of the site, depending on where any test pits and/or recharge basins are located.

References Cited

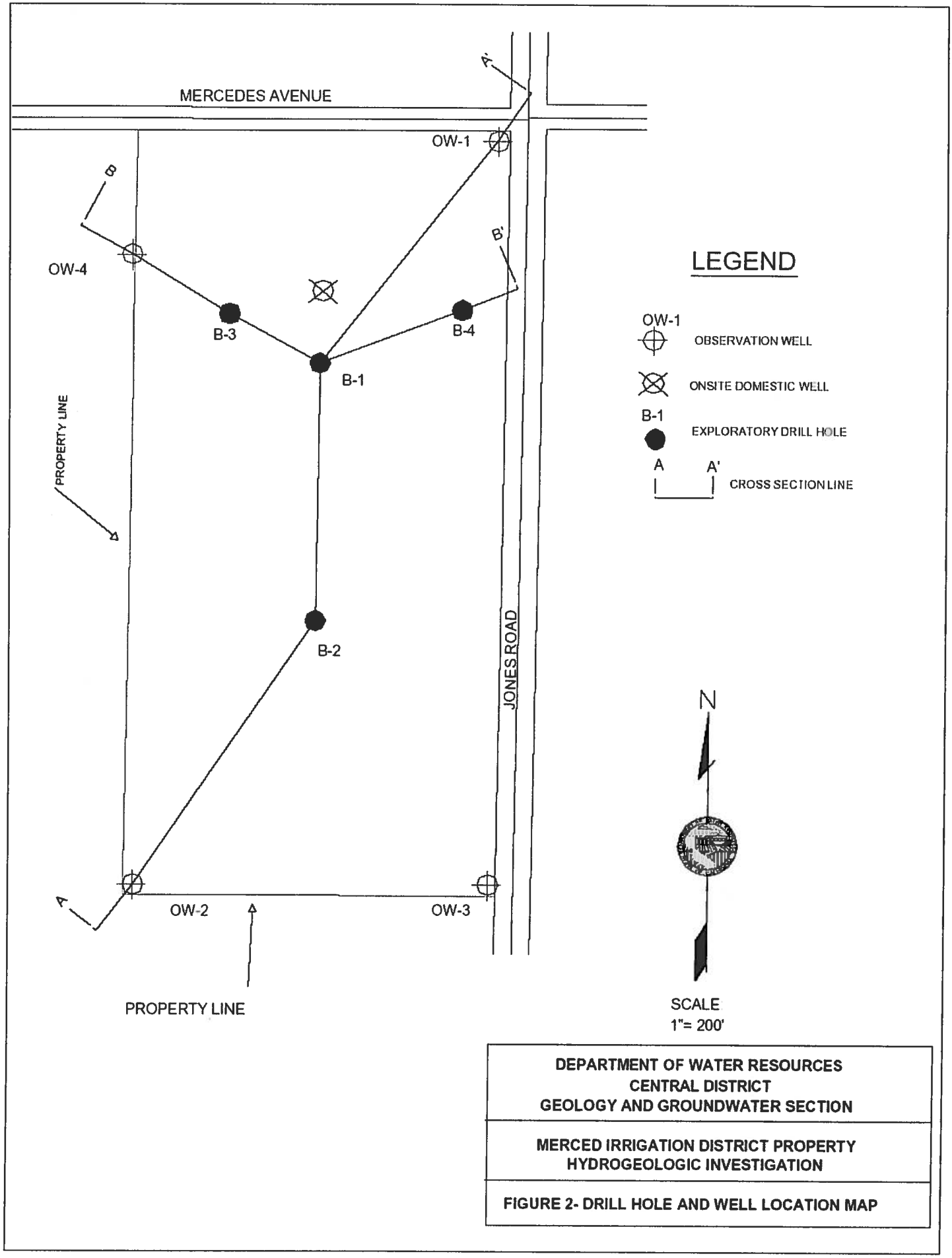
California Department of Water Resources (DWR) 1980. Ground Water Basins in California. Bulletin 118-80. January.

Page, R.W. 1986. Geology of the Fresh Ground-Water Basin of the Central Valley, California, with Texture Maps and Sections. Regional Aquifer-System Analysis. U.S. Geological Survey Professional Paper 1401-C.



Department of Water Resources
Central District
Geology and Groundwater Section

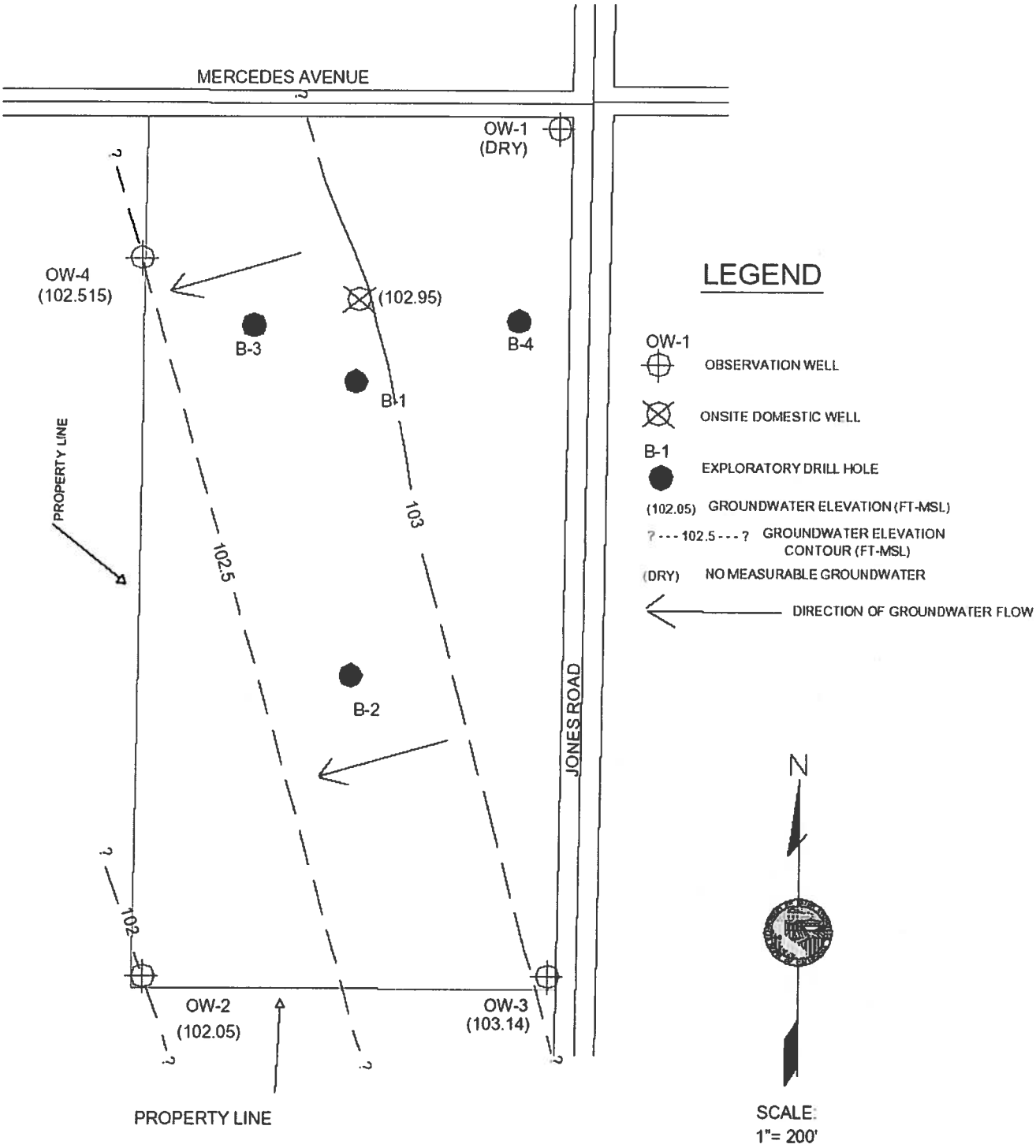
Figure 1 Site Location Map
Merced Irrigation District Property
Winton, California



DEPARTMENT OF WATER RESOURCES
CENTRAL DISTRICT
GEOLOGY AND GROUNDWATER SECTION

MERCED IRRIGATION DISTRICT PROPERTY
HYDROGEOLOGIC INVESTIGATION

FIGURE 2- DRILL HOLE AND WELL LOCATION MAP



DEPARTMENT OF WATER RESOURCES **CENTRAL DISTRICT** **GEOLOGY AND GROUNDWATER SECTION**
MERCED IRRIGATION DISTRICT PROPERTY **HYDROGEOLOGIC INVESTIGATION**
FIGURE 3 - GROUNDWATER ELEVATION CONTOUR MAP - REGIONAL WATER TABLE

Table 1
Observation Well Construction Details
Merced Irrigation District Property
Winton, California

Well #	OW-1A	OW-1B	OW-2A	OW-2B	OW-3A	OW-3B	OW-4A	OW-4B
Installation Date	12/12/2001	12/12/2001	12/10/2001	12/10/2001	12/11/2001	12/11/2001	12/13/2001	12/13/2001
Ground Surface Elev. (ft-msl)	184.77	184.77	178.73	178.73	178.73	178.73	185.40	185.40
Pilot Drill Hole Total Depth (ft)	85	85	90	90	100	100	100	100
Pilot Drill Hole Diam. (in.)	8	8	8	8	8	8	8	8
Final Drill Hole Depth (ft.)	82	82	93	93	90	90	103	103
Final Drill Hole Diam. (in.)	10	10	10	10	10	10	10	10
Surface Protective Casing Type	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Surface Protective Casing Size (in.)	8	8	8	8	8	8	8	8
Well Casing Diam. (in.)	2	2	2	2	2	2	2	2
Top of Casing Elev. (ft-msl)	187.64	187.58	181.95	181.85	181.64	181.52	187.55	187.48
Well Casing Stickup (ft.)	2.87	2.81	3.22	3.12	2.91	2.79	2.15	2.08
Well Casing Type	Schedule 40	Schedule 40	Schedule 40	Schedule 40	Schedule 40	Schedule 40	Schedule 40	Schedule 40
Well Screen Size	20 Slot	10 Slot	10 Slot	10 Slot	10 Slot	10 Slot	10 Slot	10 Slot
Well Screen Length (ft)	18.89	19	18.88	18.9	18.9	18.9	19	29
Top of Well Screen (ft-bgs)	31.24	60.57	27.3	67.39	26.26	67.28	32.84	71.4
Bottom of Well Screen (ft-bgs)	50.13	79.57	46.18	86.29	45.16	86.18	51.84	100.4
Bottom of Well (ft-bgs)	51.13	80.57	47.18	87.29	46.16	87.18	52.84	101.4
Filter Pack Type	# 3 Sand	# 2-/16	# 2-/16	# 2-/16	# 2-/16	# 2-/16	# 2-/16	# 2-/16
Filter Pack Length (ft.)	26	26	26.5	29	27	29	27	38
Top of Filter Pack (ft-bgs)	26	56	21	61	20	61	27	65
Bottom of Filter Pack (ft-bgs)	52	82	47.5	90	47	90	54	103
First Water Encountered (ft-bgs)	60	60	78	78	64.5	64.5	85	85
Depth to Static Water (ft-btoc) - 1/18/02	Dry	Dry	Dry	79.8	Dry	78.38	Dry	84.96
Depth to Static Water (ft-bgs) - 1/18/02	Dry	Dry	Dry	76.68	Dry	75.59	Dry	82.88
Static Water Elev. (ft-msl) - 1/18/02	Dry	Dry	Dry	102.05	Dry	103.14	Dry	102.515

Notes:
ft. = feet
in. = inches
ft-msl = feet - mean sea level
ft-bgs = feet below ground surface
ft-btoc = feet below top of casing

Table 2
Summary of Well Development Parameter Measurements
Merced Irrigation District Property
Winton, California

Well #	Development Date	Time	Purge Volume (gallons)	Flow Rate (gpm)	Well Depth (feet btoc)	Depth to Water (feet btoc)	pH (pH units)	Elec. Conductivity (um/cm)	Temp. (deg. F)	Water Color (visual)	Turbidity (NTU)
OW-2B	12/17/2001	1:30 PM	0		90.6	80.48					
		2:38 PM	10	nm		nm	8.36	665	63.8	brown	high
		3:04 PM	25	1.0		80.60	8.39	643	65.9	clear	14.5
		3:20 PM	40	1.0		80.60	8.13	648	66.9	clear	2.53
		3:31 PM	50	1.0		80.60	8.02	651	66.4	clear	1.35
		3:40 PM			90.56	80.53					
OW-3B	12/17/2001	8:40 AM	0		89.5	78.97					
		9:55 AM	10	nm		81.25	7.78	1900	62.0	brown	high
		11:05 AM	35	nm		84.00	8.27	972	62.0	light brown	>1,000
		11:26 AM	50	nm		nm	8.19	769	66.7	brown	>1,000
		12:02 PM	65	nm		nm	8.13	664	66.0	brown	>1,000
		12:37 PM	75	nm		nm	8.14	642	66.8	light brown	>1,000
		1:09 PM	85	nm		nm	8.13	601	65.4	cloudy brown	197
		1:16 PM	90	nm		81.50	8.13	624	68.4	light brown	586
	12/19/2001	11:48 AM	100	0.7		nm	6.42	571	66.0	cloudy	47.3
		12:19 PM	120	0.7		79.80	6.67	532	66.7	clear	11.7
		1:00 PM	150	1.0		80.14	6.65	506	65.7	clear	6.83
		1:32 PM	180	1.0		80.78	6.70	505	65.7	clear	18.8
		1:55 PM	200	1.0		81.55	6.67	512	66.4	clear	21.9
		2:00 PM			90.4	79.00					
OW-4B	12/19/2001	8:25 AM	0		104.04	85.56					
		10:16 AM	15	0.6		85.90	7.06	551	65.6	light brown	>1,000
		10:27 AM	30	1.5		85.90	6.63	466	66.1	cloudy brown	128
		10:40 AM	50	2.0		85.95	6.50	430	65.6	cloudy to clear	21.4
		10:53 AM	75	2.0		85.95	6.42	422	66.2	clear	5.36
		11:07 AM	100	2.0		85.95	6.46	412	65.8	clear	3.15
		11:10 AM			104.0	85.57					

Note: gpm = gallons per minute
nm = not measured
btoc = below top of casing
um/cm = micromhos per centimeter
deg. F = degrees in Fahrenheit
NTU = nephelometric turbidity units

13

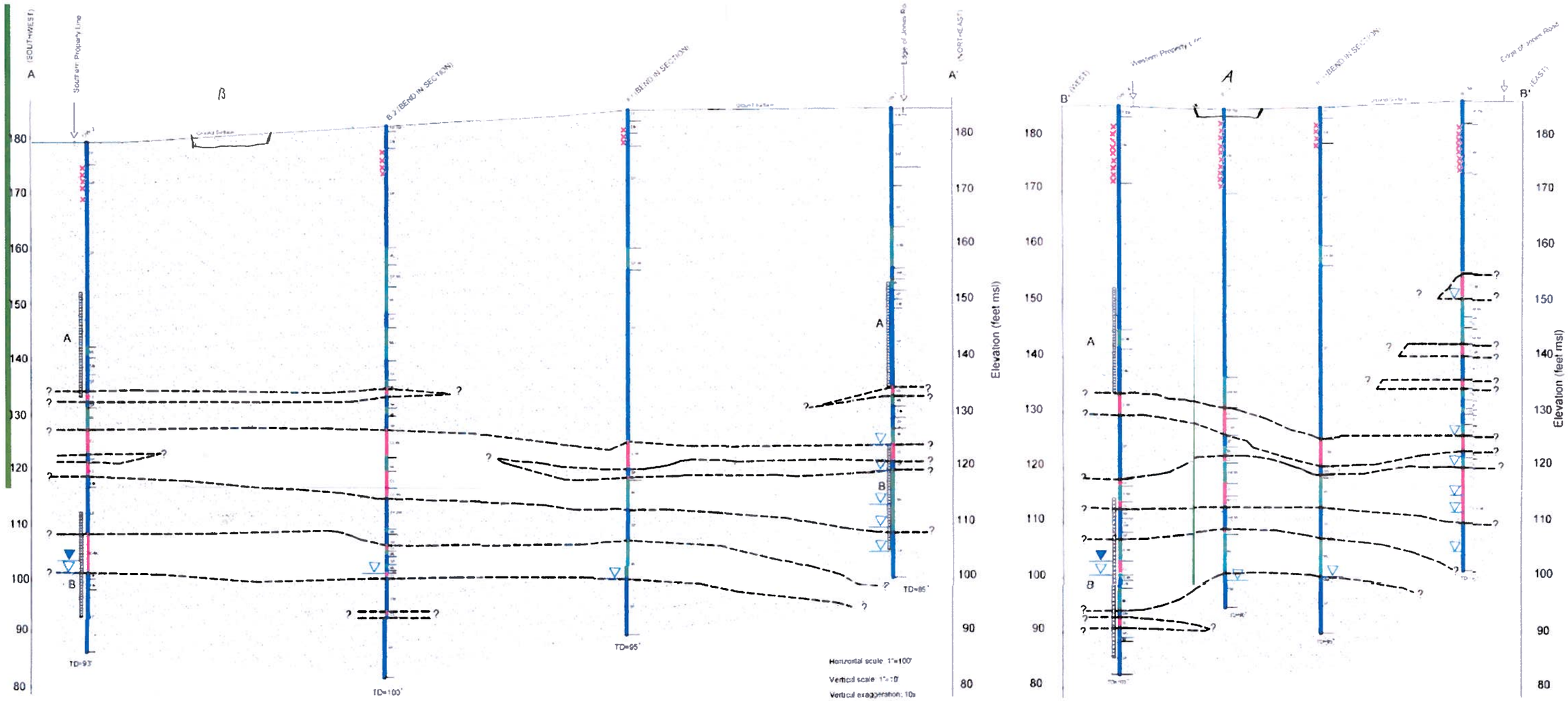
Table 3
Summary of Groundwater Level Measurements
Merced Irrigation District Property
Winton, California

Well ID	Date	Reference Point Elevation (ft-msl)	Depth to Groundwater (feet below reference point)	Groundwater Elevation (ft-msl)
OW-1A	19-Dec-01	187.64	Dry	
shallow screen	18-Jan-02	187.64	Dry	
surface elev. (184.77 ft-msl)				
OW-1B	12-Dec-01	187.575	Dry	
deep screen	13-Dec-01	187.575	Dry	
surface elev. (184.77 ft-msl)	14-Dec-01	187.575	82	105.575
	17-Dec-01	187.575	Dry	
	19-Dec-01	187.575	Dry	
	18-Jan-02	187.575	Dry	
OW-2A	17-Dec-01	181.945	Dry	
shallow screen	18-Jan-02	181.945	Dry	
surface elev. (178.73 ft-msl)				
OW-2B	10-Dec-01	181.85	80.69	101.16
deep screen	11-Dec-01	181.85	80.76	101.09
surface elev. (178.73 ft-msl)	11-Dec-01	181.85	80.7	101.15
	12-Dec-01	181.85	80.76	101.09
	13-Dec-01	181.85	80.65	101.2
	14-Dec-01	181.85	80.55	101.3
	17-Dec-01	181.85	80.48	101.37
	18-Jan-02	181.85	79.8	102.05
OW-3A	17-Dec-01	181.64	Dry	
shallow screen	18-Jan-02	181.64	Dry	
surface elev. (178.73 ft-msl)				
OW-3B	11-Dec-01	181.52	68.87	112.65
deep screen	11-Dec-01	181.52	71.57	109.95
surface elev. (178.73 ft-msl)	12-Dec-01	181.52	77.61	103.91
	13-Dec-01	181.52	78.87	102.65
	14-Dec-01	181.52	78.89	102.63
	17-Dec-01	181.52	78.97	102.55
	19-Dec-01	181.52	78.89	102.63
	18-Jan-02	181.52	78.38	103.14
OW-4A	19-Dec-01	187.55	Dry	
shallow screen	18-Jan-02	187.55	Dry	
surface elev. (185.40 ft-msl)				
OW-4B	13-Dec-01	187.475	85.69	101.785
deep screen	14-Dec-01	187.475	85.66	101.815
surface elev. (185.40 ft-msl)	19-Dec-01	187.475	85.56	101.915
	18-Jan-02	187.475	84.96	102.515
Onsite domestic well	5-Dec-01	186.05	84.21	101.84
surface elev. (185.72 ft-msl)	12-Dec-01	186.05	84.04	102.01
	14-Dec-01	186.05	83.78	102.27
	18-Jan-02	186.05	83.1	102.95

Table 2
Hydrogeologic Summary Table (1)

	Ground Surface Elevation (feet)	Total Depth (feet)	Depth to Perforation Interval (feet)		Depth to Hard Pan (feet)		Hardpan Thickness (feet)	Depth to Impermeable Layer (feet)		Drilling Water Table Depth (feet)	Drilling Water Table Elevation (feet above msl)
			Top	Bottom	Top	Bottom		Top	Bottom		
Borings											
B-1	184	95	NA	NA	2	6.5	4.5	60	65	85	99
B-2	182	100	NA	NA	2.5	4	1.5	47	49	80.5	101.5
B-3	183	90	NA	NA	2	14	12	56	59	85	98
B-4	186		NA	NA	4	13	9	31	35.7	80	106
Well Completions											
OW-1A	185	85	31	50	NA	NA	NA	50.5	52		
OW-1B	185	85	60.5	79.5	NA	NA	NA	45.5	47.5		
OW-2A	180	93	27	48	4	11	7			78	102
OW-2B	180	93	67	86	4	11	7			78	102
OW-3A	183	100	26	45	11	14	3	54	59	80	103
OW-3B	183	100	67	86	11	14	3	54	59	80	103
OW-4A	185	103	33	52	3.5	14	10.5	67.5	71.5	85	100
OW-4B	185	103	71.5	100.5	3.5	14	10.5	67.5	71.5	85	100

Note: (1) Hydrogeologic Investigation of Merced Irrigation District Property, Winton, California, DWR San Joaquin District, 2002



EXPLANATION

MERCED IRRIGATION DISTRICT PROPERTY
HYDROGEOLOGIC INVESTIGATION

PLATE 1 GEOLOGIC CROSS SECTION A - A' AND B - B'

Drawn by S. M. last revised on (03/24/2002)

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-1

Project No.: L 1202 CONJ422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth (ft / m)	Symbol	Description	Depth (ft) / Elev.	Core Run Number	Type	Recovery (%)	Time	
		Ground Surface						
		Sand (SP): red-gray (5YR 5/2); trace non-plastic fines; 100% fine to medium sand; loose; moist.	0.0					
		Silty Sand (SM): brown (7.5YR 5/4); 15% non-plastic fines; 85% fine to medium sand. Partially cemented zone (hard pan?) @ 3 to 6.5'	2.0	1		80	0840	3/8" bentonite chips
		Sand (SP): yellowish brown (10YR 5/6); 100% fine sand; loose; moist.	6.5	2		44	0850	
		Sand (SP): 100% fine to medium sand. Added sand catcher in an attempt to improve sample recovery.	11.0	3		36	0854	Portland Type III Cement
		Sand (SP): yellowish brown (10YR 5/6); 100% fine to medium sand; loose, moist.	16.0	4		15	0900	

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 95'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/5/01

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-1

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Depth (ft) / Elev.	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
21, 22, 23 (7), 24, 25		*Sand (SP):* light yellowish brown (2.5Y 6/3); 100% fine to medium sand; loose; moist.	21.0	5		20	0905	
26 (8), 27, 28, 29 (9)		*Sand (SP) and Silt (ML):* interbedded. SP: brown (7.5YR 5/4); 100% fine to medium sand; FeO stained; trace volcanic gravel clasts to 1.75"; angular to subrounded. ML: compact; blocky structure.	25.0	6		68		
30, 31, 32, 33 (10), 34		*Sand (SP):* light gray (2.5Y 7/2); 100% fine sand; loose; moist; minor FeO staining.	28.6	7		40	0930	Portland Type III Cement
35, 36 (11), 37, 38, 39 (12), 40		*Sand (SP):* yellowish brown (10YR 5/6) to reddish yellow (7.5YR 6/6); 100% fine to medium sand, loose; moist; FeO staining. @ 35 - 40': Drill rig chatter.	35.0	8		52	0935	
			40.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 95'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/5/01

Sheet: 2 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-1

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Depth (ft) / Elev.	Core Run Number	Type	Recovery (%)	Time	
41, 42, 43, 44, 45 (13)		*Sand (SP):* light gray (2.5Y 7/2); 100% fine to medium sand; loose, moist; minor FeO staining.		9		60	0945	
46, 47, 48, 49 (14, 15)		*Sand (SP):* light gray (2.5Y 7/2); 100% fine to medium sand; loose; moist; occasional black silt laminations; minor FeO staining.	45.0	10		60		
50, 51		*Sand (SP):* As above.	50.0					Portland Type I/II Cement
52, 53, 54 (16)		*Sand with Silt (SP-SM):* olive brown (2.5Y 4/4); 10% non-plastic fines; 90% fine sand; loose; very moist; minor FeO staining.	52.0 53.0	11		60	1000	
55, 56, 57, 58, 59, 60 (17, 18)		*Sand (SP):* light gray (2.5Y 7/2); 100% fine to medium sand; loose; moist; occasional FeO staining.	60.0	12		60	1015	

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Drill Method: Hollow-stem auger

Drill Date: 12/5/01

Hole Size: 8 inches to 95'

Datum: mean sea level

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-1

Project No.: L 1202 CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
61, 62, 63, 64, 65 (19)		*Clayey Silt (ML):* yellowish brown (10YR 5/6) to light olive gray (5Y 6/2); 100% low-plasticity fines; trace fine sand; laminated; compact; moist; FeO stained; blocky structure.		13		100	1020	
66, 67 (20)		*Sand (SP):* yellowish brown (10YR 5/6); 100% fine to medium sand; loose; moist.	65.0					
		Clay (CL): 100% low-plasticity fines; moist.	66.5					
68, 69 (21)		*Silt (ML):* yellowish brown (10YR 5/6); 100% low-plasticity fines; trace clay; compact; moist; blocky structure.	67.0	14		70	1040	
70, 71, 72 (22)				15		88	1100	Portland Type I/II Cement
73, 74		*Sand (SP):* yellowish brown (10YR 5/6); 100% fine to medium sand; silt (ML) interbeds common.	72.5					
75, 76 (23)		*Sand (SP):* light gray (2.5Y 7/1); 100% fine to medium sand; loose; moist; black silt laminations common.	75.0	16		66	1110	
77, 78, 79 (24)		*Silt (ML).*	78.5					
80			80.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 95'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/5/01

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-1

Project No.: L 1202/CON J 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100		*Silt (ML):* yellowish brown (10YR 5/6); 100% non- to low-plasticity fines; locally sandy silt; moist; blocky structure; FeO veining and staining common.		17		100	1115	
25		@ 85': First groundwater encountered.						
26		*Silty Sand (SM):* olive brown (2.5Y 4/4); loose; wet.	85.0 / 85.5					
27		*Sand (SP):* olive gray (5Y 6/2); 100% medium sand; loose; wet.		18		40	1130	Portland Type I/II Cement
28		*Sand with Gravel and Silt (SP-SM)* olive brown (2.5Y 4/4); 10% non-plastic fines; some subrounded gravel to 1- inch diameter; loose; wet.	90.0 / 90.5	19		80		
		@ 90': Flowing sands encountered.						
		Gravelly Sand (SP): mostly fine to medium sand; some subrounded to round gravel clasts; loose; wet.		20		92	1230	
29		@ 91.5': Hard drilling.	95.0					
		Drill hole terminated @ 95 feet.						
30		Target depth reached.						

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 95'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/5/01

Sheet: 5 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-2

Project No.: L 1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

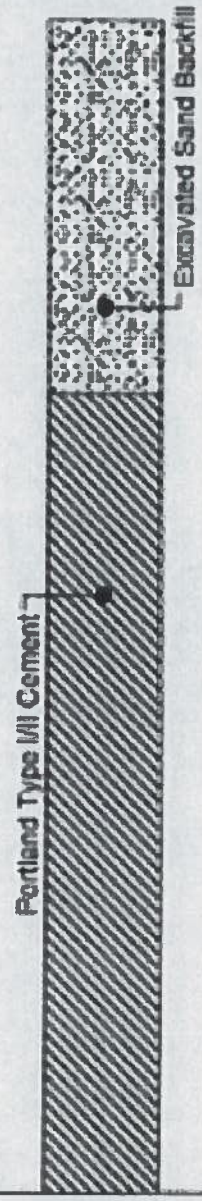
SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)
0		Ground Surface	
		Sand with Silt (SP-SM): light brown; 10% non-plastic fines; 90% fine to medium sand; loose; moist.	0.0
		Silty Sand (SM): 15% non-plastic fines; 85% fine to medium sand; loose; moist.	1.2
		Hard cemented zone in core starts @ 2.6'	4.2
		Sand with Silt (SP-SM): As above; yellowish orange.	
		Driller notes hard drilling @ 4'	7.2
		Sand (SP): Driller notes hard drilling till 9'. @ 10': olive brown (2.5Y 4/4); 5% non-plastic fines; 95% fine to medium sand; loose; moist.	
		Sand (SP): olive brown (2.5Y 4/4); 100% medium sand; loose, moist; homogeneous. Driller lengthened core barrel to approximately 6" ahead of lead auger in an attempt to increase sample recovery.	15.0
			20.0

SAMPLE

Core Run Number	Type	Recovery (%)	Time
1		54	0825
2		15	0845
3		10	
4		14	0915

Drill Hole Sealing Details



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Drill Method: Hollow-stem auger

Drill Date: 12/6/01

Hole Size: 8 inches to 100'

Datum: mean sea level

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-2

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
21, 22		*Sand (SP):* @ 21.4': Silt (ML) interbed; trace clay.						
23, 24 (7)		*Silt (ML):* light gray; 100% non- to low-plasticity fines; trace clay; compact; dry to moist; laminated.	22.0	5		40	0925	
25, 26 (8)		*Sand (SP) and Silt (ML):* interbedded. SP: yellowish brown (10YR 5/6); trace non-plastic fines; 100% fine sand; loose; moist; laminated; FeO stained.	25.0	6		58	0935	
29, 30 (9)		ML: yellowish brown (10YR 5/6); compact; moist; laminated; blocky structure; FeO stained.	29.0					
31, 32, 33 (10)		*Sandy Silt (ML):* pale yellow (2.5Y 7/4); 70% non-plastic fines; 30% fine sand; loose to compact; moist; laminated; FeO stained. @ 32': Hard drilling		7		84	0951	Portland Type III Cement
34, 35, 36 (11)		*Sand (SP):* pale yellow (2.5Y 7/3); 100% fine sand; loose; moist.	34.0					
37, 38, 39 (12), 40		*Sandy Silt (ML):* light gray (2.5Y 7/1); 70% non-plastic fines; 30% fine sand; loose; moist; green mottling common.	36.4	8		64	1020	
			40.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 100'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/6/01

Sheet: 2 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-2

Project No.: L 1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
41, 42		*Silt (ML):* As above; moist; green mottling; FeO stained.						
43, 44, 45	13	*Sand (SP):* light gray (2.5Y 7/2); trace non-plastic fines; 100% fine sand; loose, moist; mottled with green and orange.	42.4	9		78	1045	
46	14	@ 43.5': Silt (ML) interbeds common.	46.0					
47, 48		*Silt (ML):* gray brown (10YR 5/2); 90% non- to low-plasticity fines; trace clay; 10% fine sand; compact; moist; laminated and mottled with green and orange.	47.3	10		60	1100	
49, 50	15	*Clay (CL):* light olive gray (5Y 6/2) 100% low- to medium-plasticity fines; compact; moist; FeO stained; dark gray mottling common.	49.0					
51, 52		*Sand (SP):* trace non-plastic fines; 100% fine sand; loose; moist.	51.0					
53, 54	16	*Silt (ML):* light olive gray (5Y 6/2); 80% non- to low-plasticity fines; 20% fine sand; loose; very moist	52.5	11		50	1115	
55		*Sand (SP):* 100% fine to medium sand; loose; moist.	55.0					
56, 57, 58	17	*Clay (CL) and Silt (ML):* Interbedded. light olive gray (5Y 6/2); 100% low- to medium-plasticity fines; compact; moist; FeO staining, organic matter, and root casts common.		12		94	1125	Portland Type III Cement
59, 60	18		60.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 100'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/6/01

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-2

Project No.: L 1202 CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
61, 62, 63, 64, 65	19	*Silt (ML):* light olive brown (2/5Y 5/3); some sandy silt; loose; moist. @ 62': hard cemented nodules; FeO filled root casts and mottling common.	62.5	13		100	1135	
		Silty Clay (CL): 100% non- to low-plasticity fines; compact; moist; FeO filled root casts and mottling.	65.2					
66, 67	20	*Silt (ML) and Clay (CL):* interbedded. compact to loose; moist.	67.5	14		72		
68, 69	21	*Silty Sand (SM):* light olive gray (5Y 5/3); loose; moist; FeO staining common.	68.0					
70, 71, 72	22	*Sand (SP):* yellowish brown (10YR 5/6); 100% fine to medium sand; FeO stained. *Sand (SP):* pale yellow (2.5Y 7/3); 100% fine to medium sand; loose; moist; minor laminations.	70.0	15		66	1215	Portland Type VII Cement
73, 74		*Silt (ML):* light yellowish brown (2.5Y 6/3); 85% non- to low-plasticity fines; 15% fine sand; compact; moist.	72.7					
75	23	*Sand (SP):* 100% fine sand; loose; moist.	74.0					
76, 77		*Silty Clay (CL):* light olive brown (2.5Y 5/4); 100% low-plasticity fines; compact; moist.	76.0	16		77	1225	
78		*Silt (ML).*	77.0					
79	24	*Sand (SP).* pale yellow (2.5Y 6/2).	77.7					
80		*Silt (ML).*	79.4					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Drill Method: Hollow-stem auger

Drill Date: 12/6/01

Hole Size: 8 inches to 100'

Datum: mean sea level

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-2

Project No.: L 1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
81		Silty Sand (SM): loose; wet.	80.5 / 81.0					
82 – 25		First groundwater @ 80.5.	81.7					
83		Silty Clay (CL): light yellowish brown (2.5Y 6/4).		17		50	1235	
84		Silty Sand (SM): light olive brown (2.5Y 5/3); loose; wet.						
85 – 26								
86								
87				18		66	1245	
88		Silty Clay (CL): light olive brown (2.5Y 5/3); 100% low-plasticity fines; compact; very moist.	88.0 / 89.0					
89 – 27								
90		Sand (SP): light olive gray (5Y 6/2); 100% fine to medium sand; loose; wet; homogeneous.						
91								
92 – 28				19		88	1307	
93								
94								
95 – 29		Sand (SP): @ 95'; flowing sands encountered.	95.0					
96								
97		Added water in an attempt to control sand and then added bentonite mud to control sand.					1310	
98 – 30								
99		Drill hole terminated @ 100 feet; Target depth reached.						
100			100.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 100'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/5/01

Sheet: 5 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
0 / 0		Ground Surface						
		Sand with Silt (SP-SM): brown (7.5YR 5/4); 15% non-plastic fines; 85% fine to medium sand; loose; moist.	0.0					
			1.2					
		Silty Sand (SM): reddish gray (5YR 5/2); 30% non-plastic fines; 70% fine to medium sand; compact; moist.		1		42	1430	
		Driller notes hard drilling @ 2'.	5.0					
		Silty Sand (SM): 25% non-plastic fines; 75% fine to medium sand; compact to loose; moist.		2		16	1440	3/8" bentonite chips
		Silty Sand (SM): loose; moist.	10.0					
		Driller notes hard drilling till 14'.		3		16	1448	
		Silty Sand (SM).	14.0					
		Sand (SP): yellowish brown (10YR 5/6); 100% fine to medium sand; loose; moist; FeO stained.	15.3	4		20		
			20.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/13/01 - 12/14/01

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
21, 22, 23 (7), 24, 25		*Sand (SP):* compact to loose; moist. Interbeds of Silt (ML) @ 20 - 21'.		5		36		
26 (8), 27, 28, 29, 30 (9)		*Sand (SP):* light gray (2.5Y 7/2); 100% fine to medium sand; loose; moist.	25.0	6		36		
31, 32, 33 (10), 34, 35		*Sand (SP):* loose; moist.	30.0	7		34		
36 (11), 37, 38, 39, 40 (12)		*Sand (SP):* 100% fine to medium sand; loose; moist; occasional black silt (heavy mineral) laminations.	35.0	8		44		
			40.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/13/01 - 12/14/01

Sheet: 2 of 5

Log of Drill Hole: B-3

State of California
The Resources Agency
Department of Water Resources

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
41, 42, 43, 44	13	*Sand (SP):* loose; moist. @ 42': black silt (heavy mineral) laminations common.		9		46		
45, 46, 47, 48	14	*Sand (SP):* loose; moist; black silt (heavy mineral) cross laminations common.	45.0	10		48		
49, 50, 51, 52, 53	15, 16	*Silty Sand (SM) and Silt (ML):* interbedded. compact to loose; moist; laminations, liesegang banding, and FeO staining common. @ 52.5': Silty Clay (CL) interbed.	48.5	11		60		
54, 55	17	*Silty Clay (CL):* 100% low-plasticity fines; compact; moist; FeO veining common.	54.0					
56, 57, 58		*Clayey Silt (ML):* FeO veins and laminations common.	56.0	12		68		
59, 60	18	*Sand (SP):* Silt (ML) interbeds.	59.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/13/01 - 12/14/01

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
61								
62	19	*Silt (ML):*	61.1					
63		*Silty Clay (CL):* 100% low-plasticity fines; compact; moist; laminated.	62.7	13		78		
64			64.0					
65		Driller notes harder drilling @ 63'.						
66	20	*Silty Sand (SM) and Silt (ML):* Interbedded. compact to loose; moist; laminated.						
67				14		62	1615	
68		*Clay (CL):* 100% low- to medium-plasticity fines; very compact; dry to moist.	67.7					
69	21							
70		Driller notes very hard drilling @ 68'.	70.0					
71		*Silt (ML) and Clay (CL):* Interbedded. compact; moist.						
72	22	*Silty Sand (SM) and Silt (ML):* Interbedded. loose; moist.	72.0	15		68		
73								
74								
75	23							
76		*Silty Clay (CL):* compact.	76.0					
77		*Silt with Sand (ML):* 80% non-plastic fines; 20% fine to medium sand; compact to loose; moist.	77.0	16		92	1630	
78								
79	24							
80			80.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/13/01 - 12/14/01

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-3

Project No.: L 1202.CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 (25, 26, 27, 28, 29, 30)		*Sandy Silt (ML):* olive brown (2.5Y 4/4); 60% non-plastic fines; 40% fine sand; compact to loose; very moist; occasional laminations and FeO stains.		17		70	0735	
		@ 85': First groundwater encountered.	84.0					
		Silty Sand (SM): Sand (SP) interbeds; loose; wet.		18		72	0740	
		@ 90': Flowing sands encountered.	90.0					
		Drill hole terminated @ 90 feet; Target depth reached.						

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/13/01 - 12/14/01

Sheet: 5 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-4

Project No.: L 1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
		Ground Surface						
		Sand with Silt (SP-SM): reddish gray (5Y 5/2); 15% non-plastic fines; 85% fine to medium sand; loose; moist to very moist.	0.0	1		56	1004	
		Silty Sand (SM): brown (7.5YR 5/4); 30% non-plastic fines; 70% fine to medium sand; loose; moist. Driller notes hard drilling @ 4'.	4.0	2		26		3/8" bentonite chips
		Silty Sand (SM): trace clay; loose; moist. Driller notes hard drilling till 13'.	10.0	3		24	1020	
		Sand (SP): olive; 100% fine to medium sand; loose; moist; minor laminations.	13.0	4		34		
			20.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 85'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/14/01

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-4

Project No.: L.1202.CON.J 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
21, 22, 23, 24, 25		*Sand (SP)*: gray to white; loose; moist; homogeneous.		5		38		
26, 27, 28, 29, 30		*Sand (SP)*: gray to white; loose; moist.	26.0	6		28	1032	
31		*Sand (SP)*.	30.0					
32, 33, 34, 35		*Clayey Silt (ML)*: 100% non- to low-plasticity fines; compact; moist; blocky structure. @31.7': 100% non-plastic fines; compact to loose; moist; laminated. @ 32.6': very moist.	31.0	7		52		
36, 37, 38, 39		@35': very moist to wet. @35.3': Sand (SP) interbed. *Silty Sand (SM) to Sandy Silt (ML)* interbedded. olive to gray; laminated; loose; moist.	35.7	8		42		
40		*Silt (ML)*. @ 40.7': Grades into Clayey Silt.	39.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 85'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/14/01

Sheet: 2 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-4

Project No.: L.1202.CCNJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
41								
42		*Silty Sand (SM) to Sandy Silt (ML)* interbedded. olive; loose; moist; laminated.	41.0					
43	13			9		60		
44		*Clayey Silt (ML):* olive; very moist; blocky structure; laminated.	44.0					
45								
46	14	*Sand (SP):* gray to white; loose; moist; some laminations.	46.2					
47				10		56		
48								
49	15							
50								
51		*Silty Clay (CL):* olive; 100% non- to low-plasticity fines; compact; moist.	50.5					
52	16	*Silt (ML):* @ 52.4': Sand (SP) interbed. @53': very moist.	52.0	11		68		
53								
54		*Sand (SP):* gray to white; 100% fine to medium sand; loose; moist.	54.0					
55	17	*Silt (ML):* 100% non-plastic fines; compact to loose; very moist.	55.6					
56								
57		*Sand (SP):* loose; moist.	56.6	12		44		
58								
59	18	*Silt (ML):* olive. @ 60': wet.	58.5					
60								

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 85'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/14/01

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-4

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Drill Hole Sealing Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
61, 62, 63	19	*Silty Clay (CL):* very moist to wet.	60.5	13		86		
64, 65		*Sand (SP):* loose; very moist to wet; some interbedded Silty Sand (SM).	63.4					
66	20	*Silt (ML):* very moist.	64.5					
67, 68, 69, 70	21	*Silty Clay (CL):* wet. @ 66.7 - 67.2': Silt (ML). @ 70': very moist; heavy FeO mottling.	66.2	14		52		
71, 72, 73, 74, 75, 76	22, 23	*Silt (ML):* olive; 100% non-plastic fines; compact to loose; very moist to wet; laminated. *Clayey Silt (ML):* olive; 100% non- to low-plasticity fines; compact; very moist to wet.	70.4	15		62		
77, 78, 79, 80	24	*Sand (SP):* gray; loose; very moist. @ 80': First "regional" groundwater encountered.	74.0	16		64		
			76.4					
			80.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Drill Method: Hollow-stem auger

Drill Date: 12/14/01

Hole Size: 8 inches to 85'

Datum: mean sea level

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: B-4

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Drill Hole Sealing Details
81		Sand (SP): olive; 100% fine to medium sand; loose; wet.						
82 – 25		@ 82': some fine to medium gravel; angular to subrounded; quartz, metamorphic, and mafic volcanic clasts; trace clay nodules.		17		44	1145	
83								
84								
85		@ 85': Flowing sands encountered.						
– 26			85.0					
86		Drill hole terminated @ 85 feet.						
87		Target depth reached.						
88								
– 27								
89								
90								
91								
92 – 28								
93								
94								
95 – 29								
96								
97								
98 – 30								
99								
100								

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8 inches to 85'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/14/01

Sheet: 5 of 5

Log of Drill Hole: OW-1

State of California
The Resources Agency
Department of Water Resources

Project No.: L 1202/DONJ 422

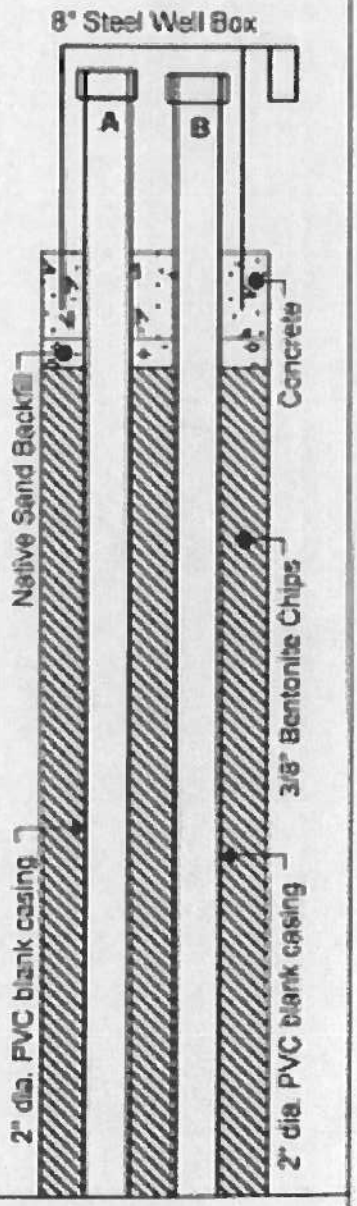
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
		Ground Surface						8" Steel Well Box
		Sand with Silt (SP-SM): olive brown (2.5Y 4/4); 15% non-plastic fines; 85% fine to medium sand; loose; moist; roots common.	0.0	1		52	1345	
		Silty Sand (SM): red-gray (5YR 5/2); 25% non-plastic fines; 75% fine to medium sand; loose; moist.	3.0	2		36	1350	
		Silty Sand (SM): 30% non- to low-plasticity fines; 70% fine to medium sand; compact to loose; very moist.	10.0	3		28		
		Sand (SP): yellowish brown (10YR 5/6); 100% fine to medium sand; loose; moist.	14.0					



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 85' / 10" to 82'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/11/01 - 12/12/01

Well Installation Date: 12/12/01

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-1

Project No.: L 1202 CONJ.#22

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

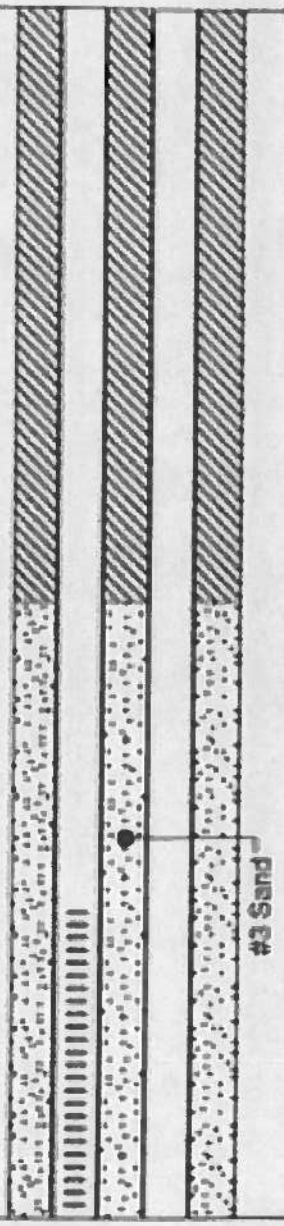
SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation / Depth (ft)
			20.0
		Sand (SP): loose; moist.	21.3
		Silt (ML): yellowish brown (10YR 5/6); 100% non-plastic fines; trace clay; compact; moist; mottled with FeO.	25.0
		Silt with Sand (ML): 75% non-plastic fines; 25% fine sand; loose; moist; cross laminated and FeO stained. @ 27': some interbedded Sand (SP). @ 28': Clayey Silt (ML); 100% low-plasticity fines.	29.0
		Silty Sand (SM).	31.0
		Sandy Silt (ML): some interbedded clay; moist; laminated.	33.0
		Sand (SP): laminated.	34.5
		Silty Sand (SM): 40% non-plastic fines; 60% fine sand; loose; moist.	38.0

SAMPLE

Core Run Number	Type	Recovery (%)	Time
4		30	
5		32	
6		64	
7		66	1430

Well Completion Details



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 85' / 10" to 82'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/11/01 - 12/12/01

Well Installation Date: 12/12/01

Sheet: 2 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-1

Project No.: L 1202 CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Well Completion Details
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56		*Sand (SP):* loose; moist; laminated. @ 36.8': Silt (ML) interbed (0.4' thick).		8		50	1440	2" dia. PVC 20 slot screen (31.24 - 50.13')
		Sand (SP): 100% fine to medium sand; loose; moist; cross laminated; FeO stained.	40.0	9		48	1605	
		Sand (SP): 100% fine to medium sand; loose; moist; laminated.	45.0	10		44		
		Sand (SP): moist to very moist.	50.0					
		Silty Clay (CL): 100% non- to low-plasticity fines; compact; moist; laminated with FeO and MnO staining.	50.6	11		58		3/8" Bent. Chips
		Silt (ML):	52.2					
		Silty Sand (SM): some interbeds of Sandy Silt (ML); loose; moist to very moist; laminated; FeO stained.	54.0					
			55.5					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 85' / 10" to 82'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/11/01 - 12/12/01

Well Installation Date: 12/12/01

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-1

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

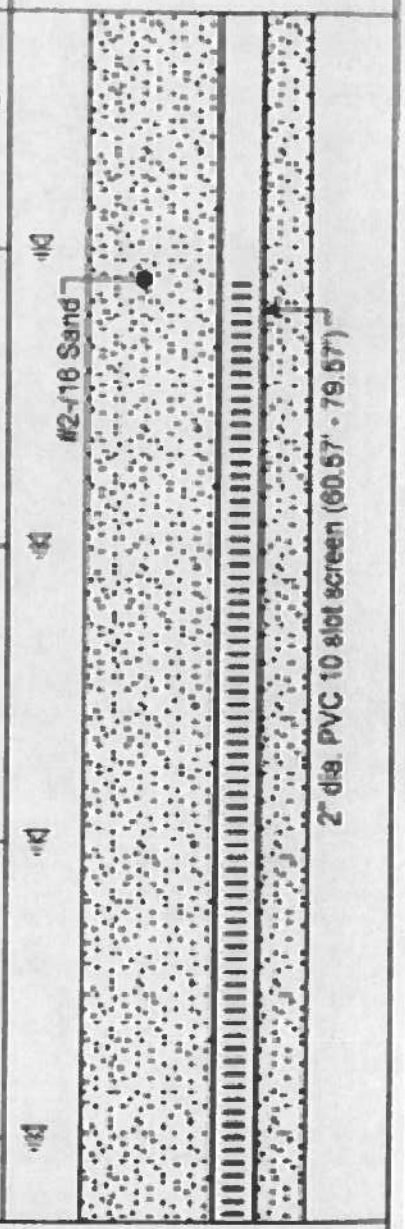
SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation / Depth (ft)
57–58		*Sand (SP):* 100% fine to medium sand; loose; moist to very moist; FeO stained.	
58–61	18	*Sandy Silt (ML):* 70% non-plastic fines; 30% fine sand; loose. @ 60': wet.	58.0
61–64	19	@ 60.5': Clayey Silt (ML); compact; wet. *Silty Clay (CL):* 100% low-plasticity fines; compact; very moist to wet. @ 61.6': moist. @ 62': Silt (ML) interbeds; FeO staining.	61.0
64–66	20	*Sand (SP):* 100% fine to medium sand; loose; wet.	64.0
66–74	21, 22	*Sandy Silt (ML):* 80% non-plastic fines; 20% fine sand; compact to loose; wet. @ 66.2': Clayey Silt (ML); 100% non- to low-plasticity fines; compact; very moist; laminated with FeO. @ 67': Silt (ML); moist. @ 70': Sandy Silt (ML); 80% non-plastic fines; 20% fine sand; compact to loose; wet; laminated with FeO.	65.5
74–76	23	*Silt (ML):* trace clay; wet. @ 75': compact to loose; wet.	74.0

SAMPLE

Core Run Number	Type	Recovery (%)	Time
12		44	1530
13		66	0755
14		50	
15		64	

Well Completion Details



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 85' / 10" to 82'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/11/01 - 12/12/01

Well Installation Date: 12/12/01

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-1

Project No.: L.1202.CONJ.422

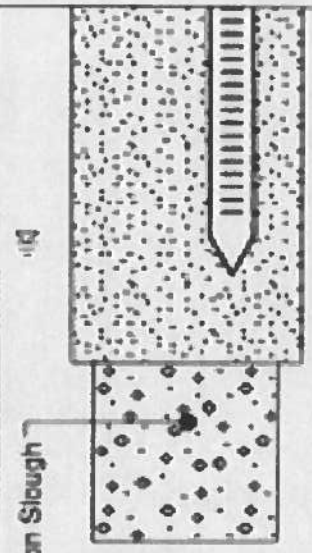
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
77								
78		*Sand (SP):* very moist to wet; FeO stained to 78'; pale yellow (2.5Y 7/3) below 78'.	77.3	16		80		
79 – 24								
80		*Sand (SP):* 100% fine to medium sand; loose; wet; laminated.	80.0					
81								
82 – 25								
83				17		60	0830	
84		@ 85': Driller notes flowing sands.						
85 – 26			85.0					
86		Drill hole terminated @ 85 feet;						
87		Target depth reached.						
88								
89 – 27								
90								
91								
92 – 28								
93								
94								
95 – 29								
96								



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 85' / 10" to 82'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/11/01 - 12/12/01

Well Installation Date: 12/12/01

Sheet: 5 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-2

Project No.: L 1202 CONJ 422

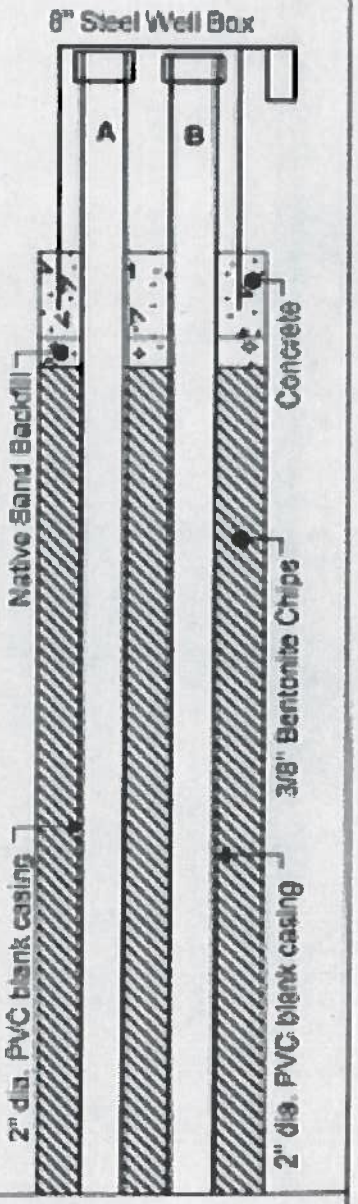
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
		Ground Surface						8" Steel Well Box
		Sand with Silt (SP-SM): red gray (5YR 5/2); 15% non-plastic fines; 85% fine to medium sand; loose; moist; homogeneous. Driller notes hard drilling @ 3'.	0.0	1		60	0834	
		Silty Sand (SM): brown (7.5YR 5/4); 30% non-plastic fines; 70% fine to medium sand; loose; moist; homogeneous. Driller notes hard drilling to 8'.	4.0	2		20	0843	
		Silty Sand (SM). Driller notes hard drilling @ 10-11'.	10.0					
		Sand with Silt (SP-SM): brown (7.5YR 5/4); 10% non-plastic fines; 90% fine to medium sand; loose; moist.	11.0	3		40	0850	
		Sand (SP): yellowish brown (10YR 5/6); 100% fine to medium sand; loose; moist.	14.0					



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 93' / 10" to 93'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/7/01

Well Installation Date: 12/10/01

Sheet: 1 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-2

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
5, 17, 18, 19, 6, 20				4		20	0856	
21, 22, 7, 23, 24		*Sand (SP):* olive brown (2.5Y 4/4); 100% fine to medium sand; loose; moist.	20.0	5		32	0903	
25, 26, 8, 27, 28, 29		*Sand (SP):* white (2.5Y 8/1); 100% fine sand; coarsens to medium sand @ 28'; loose; moist; laminations and FeO stains common. FeO staining pervasive @ 28'.	25.0	6		64	0920	#2-/16 Sand; 2" dia. PVC 10 slot screen (27.3 - 46.18')
9, 30, 31, 32, 10, 33, 34, 35, 36		*Sand (SP):* light gray (2.5Y 7/2); 100% fine to medium sand; loose; moist; laminations common. Drill rig chatter @ 30'. Drill rig chatter @ 35'.	30.0, 34.0	7		54	0926	

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 90' / 10" to 93'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/7/01

Well Installation Date: 12/10/01

Sheet: 2 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-2

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

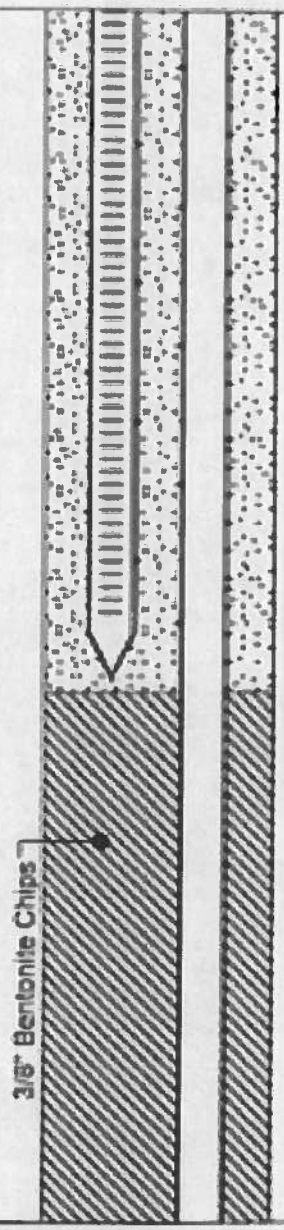
SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation / Depth (ft)
37–38		*Sand (SP):* 100% fine to medium sand; grades to fine sand @ 38.7'; laminations common. Pervasive FeO staining @ 38.5'.	36.7
39–40		*Sandy Silt (ML):* light yellowish brown (2.5Y 6/3); 60% non-plastic fines; 20% fine sand; loose; moist; laminations common.	39.0
41–43		*Silty Sand (SM):* 40% non-plastic fines; 60% fine sand; loose; moist. Interbeds of Silt (ML) and Clay (CL) @ 41-42'. Drill rig chatter @ 42'.	42.3
43–46		*Sand (SP):* 100% fine to medium sand; loose; moist.	
46–47		*Clay (CL):* very moist; laminated.	45.5
48		*Sand (SP).*	47.5
49–52		*Silt (ML):* moist; laminated. @ 51': Sand (SP) interbed (0.2' thick).	48.6
53–56		*Silty Clay (CL):* 100% low-plasticity fines; compact; moist.	52.3

SAMPLE

Core Run Number	Type	Recovery (%)	Time
8		50	0932
9		58	0941
10		92	1000
11		54	1016

Well Completion Details



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 90' / 10" to 93'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/7/01

Well Installation Date: 12/10/01

Sheet: 3 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-2

Project No.: L.1202.CC6U.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

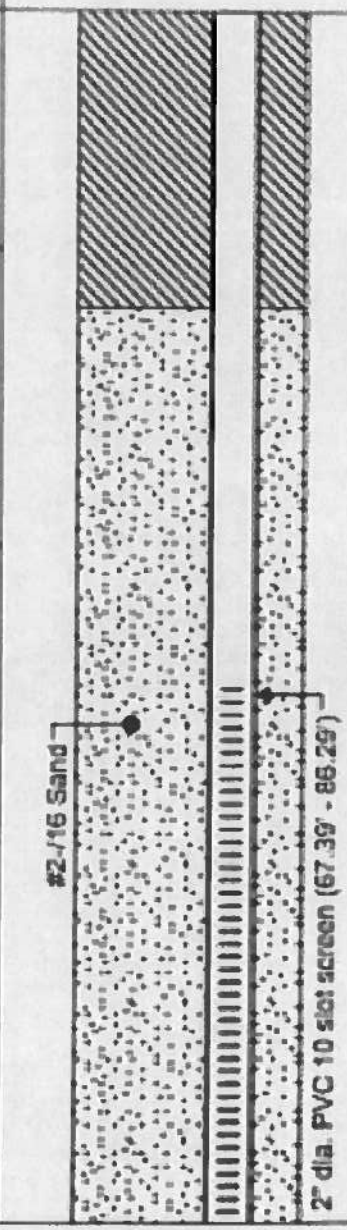
SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation / Depth (ft)
57, 58, 59, 60		*Sand (SP).* @ 57': Silt (ML) interbed. @ 58.2': Silty Sand (SM) to Silt (ML) interbeds. *Silty Clay (CL).*	56.8; 58.5
61, 62, 63, 64, 65, 66, 67, 68, 69, 70		*Silty Sand (SM):* 40% non- to low-plasticity fines; trace clay; 60% fine to medium sand; compact; moist. *Sand with Silt (SP-SM).* *Sand (SP):* 100% fine to medium sand; trace non-plastic fines; loose; moist. @ 65': 100% fine sand. @ 65.5': Grades into 100% fine to medium sand.	60.7; 62.4; 63.0
71, 72, 73, 74, 75, 76		*Clayey Silt (ML):* compact; moist. @ 75': very moist; laminated; occasional Sand (SP) interbeds.	71.0; 76.0

SAMPLE

Core Run Number	Type	Recovery (%)	Time
12		76	
13		74	1025
14		50	1040
15		58	

Well Completion Details



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 90' / 10" to 93'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/7/01

Well Installation Date: 12/10/01

Sheet: 4 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-2

Project No.: L.1202.CONJ.422

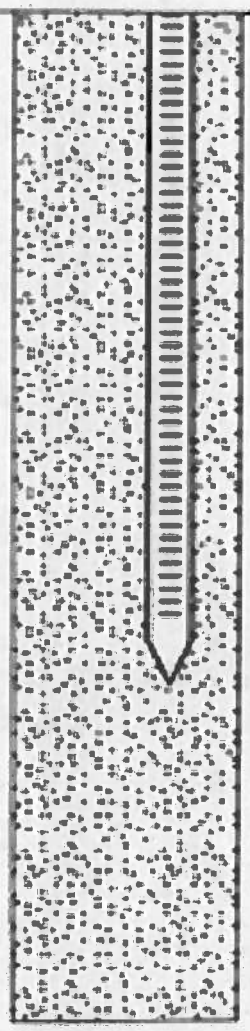
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bond's

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Well Completion Details
77		Silt (ML).						
78		@ 78': First groundwater encountered.		16		80	1050	
79	24	Sand (SP): 100% fine to medium sand; loose; wet; laminated.	78.0					
80		Silty Sand (SM): 40% non-plastic fines; 60% fine sand; loose; wet.	79.0					
81			81.2					
82	25	Sand (SP): 100% fine to medium sand; loose; wet.		17		42	1105	
83								
84		@ 85': Added water to control flowing sands.						
85	26	Sand (SP): 100% fine to medium sand; loose; wet.	85.0					
86								
87		@ 85 - 87': Silty Sand (SM) interbeds.		18		32	1107	
88	27							
89		@ 90': Flowing sands.						
90		Drill hole terminated @ 90 feet;	90.0					
91		Target depth reached;						
92	28	Drill hole reamed to 93' with 10" augers for well installation.						
93								
94								
95	29							
96								



Hole Diameter = 10"

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 90' / 10" to 93'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/7/01

Well Installation Date: 12/10/01

Sheet: 5 of 5

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

Project No.: L.1202.CONJ.422

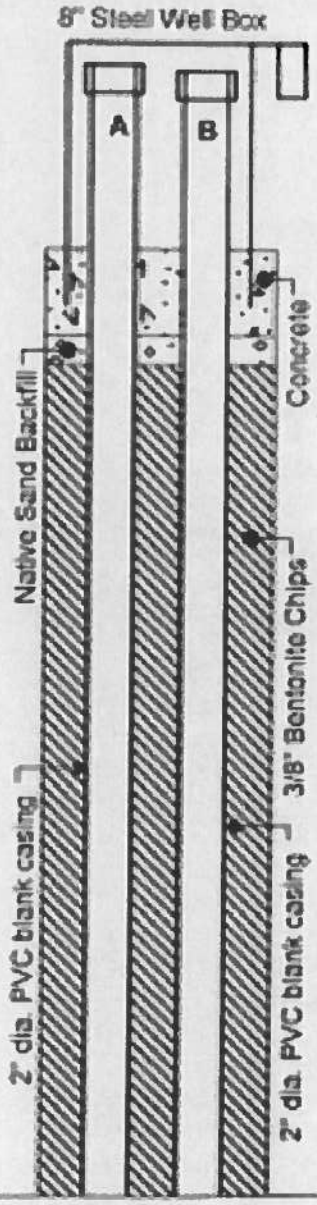
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
		Ground Surface						
		Sand with Silt (SP-SM): olive brown (2.5Y 4/4); 15% non-plastic fines; 85% fine to medium sand; loose; moist.	0.0	1		50	1212	
		Silty Sand (SM): brown (7.5YR 5/4); 30% non-plastic fines; 70% fine to medium sand; loose; moist.	3.0	2		32		
		Silty Sand (SM): 20% non-plastic fines; 80% fine to medium sand; loose; moist. Driller notes hard drilling @ 11 - 14'.	10.0	3		32		
		Sand (SP): light yellowish brown (2.5Y 6/4); trace non-plastic fines; 100% fine to medium sand; loose; moist.	14.0					



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 1 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
5, 17, 18, 19, 6, 20				4		34		
21, 22, 23, 7, 24, 25		*Sand (SP):* trace laminations.	20.0	5		34	1232	
26, 8, 27, 28, 29, 9, 30, 31		*Sand (SP).*	25.0	6		44		#2-/16 Sand; 2" dia. PVC 10 slot screen (28.28 - 45.16')
32, 33, 10, 34, 35, 36		*Silty Clay (CL):* light yellowish brown (2.5Y 6/4); 100% low-plasticity fines; compact; moist; laminated.	26.0					
		Silt (ML): 100% non- to low-plasticity fines; moist; laminated; FeO staining.	27.0					
		Sand (SP): cross laminated.	29.0					
		Sandy Silt (ML): 80% non-plastic fines; 20% fine sand; compact; moist.	31.5	7		48		
		Silty Clay (CL): 100% non- to low-plasticity fines; compact; moist to very moist; laminated.	32.0					
		Sandy Silt (ML).	35.0					
			36.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 2 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
11		*Silty Clay (CL):* 100% non- to low-plasticity fines; compact; moist; laminated and mottled with FeO staining.		8		84	1300	
12		*Clay (CL):* mottled with FeO.	40.0	9		78		
13		*Silt (ML):* laminated. @ 43.1': grades into Sandy Silt. @43.5': very moist. @45-46': Sand (SP) interbeds; very moist.	42.5					
14		*Silty Clay (CL):* blocky structure.	45.2	10		80		
15		*Silt (ML).* very moist.	47.5					
16		@ 52': Silty Clay (CL) interbed.		11		94		3/8" Bentonite Chips
17		*Silty Clay (CL):* some interbedded Silt (ML); compact; very moist; blocky structure.	54.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 3 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

Project No.: L.1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
57, 58, 59	18	*Clay (CL).*	57.0	12		86		
60, 61, 62, 63, 64	19	*Clayey Silt (ML):* 100% low-plasticity fines; trace fine sand; compact; moist. @ 61': Silt; laminated. @ 63': Sandy Silt. @ 64.5': very moist to wet.	59.3	13		96		
65, 66, 67, 68	20	*Silty Sand (SM):* 25% non- to low-plasticity fines; trace clay; 75% fine to medium sand; compact to loose; moist to very moist; FeO staining.	64.5	14		80	1400	
69, 70, 71, 72	21, 22	*Sand (SP):* 100% fine to medium sand; loose; moist; minor laminations with FeO. Driller notes flowing sands @ 70'. @ 71' - 72': Gravelly Sand (SP) interbeds. *Silty Clay (CL):* 100% low-plasticity fines; compact; moist.	67.9; 72.0	15		50	1415	#2-/16 Sand; 2" dia. PVC 10 slot screen (67.28' - 86.18')
73, 74, 75, 76	23	*Silty Sand (SM):* very moist to wet.	74.0; 75.8					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 4 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

Project No.: L.1202.CONJ.422

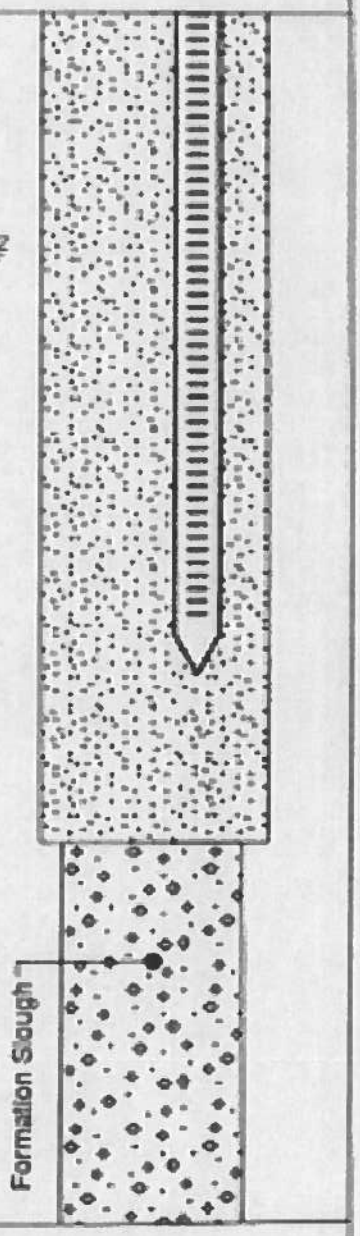
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96								
24		*Sandy Clay (CL).* 70% low-plasticity fines; 30% fine to medium sand; compact; moist.	76.6	16		74	1425	
		@ 80': First groundwater encountered.	79.5					
		Clayey Sand (SC): 30% non- to low-plasticity fines; 70% fine to medium sand; compact; wet.	81.5					
25		*Silty Sand (SM).*		17		92		
		@ 82-83.5': Silty Sand with Gravel (SM); loose; wet.						
26				18		0	1445	
27								
		Silty Sand (SM): some interbedded Silty Clay (CL); compact to loose; wet.	90.0					
28		Driller notes flowing sands @ 90'.		19		100	1458	
		Clayey Sand (SC): very moist.	94.0					
29		*Sand (SP).*	95.0					



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 5 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-3

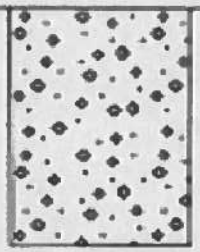
Project No.: L 1202.CONJ.422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	Well Completion Details
97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116								
30		Sand (SP). Driller notes flowing sands @ 100'.	98.5	20		0	1510	 Hole Diameter = 8"
			100.0					
31		Drill hole terminated @ 100 feet. Target depth reached.						
32								
33								
34								
35								

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100'/10" to 90'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/10/01

Well Installation Date: 12/11/01

Sheet: 6 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-4

Project No.: L.1202.CONA422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth (ft / m)	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
		Ground Surface						8" Steel Well Box
		Sand with Silt (SP-SM): red gray (5YR 5/2); 15% non-plastic fines; 85% fine to medium sand; loose; moist.	0.0					
		Silty Sand (SM): 25% non-plastic fines; 75% fine to medium sand; loose; moist. Driller notes hard drilling @ 3.5'.	2.0	1		58	1420	
		Silty Sand (SM): yellowish brown (10YR 5/6); 20% non-plastic fines; 80% fine to medium sand; loose; moist. @ 6': a 5" diameter rounded cobble was excavated during the reaming of drill hole to 10".	5.0	2		20	1429	
		Driller notes hard drilling til 9'. *Silty Sand (SM).* Driller notes hard drilling from 11 - 14'.	10.0	3		14	1435	
		Sand (SP): 100% fine to medium sand; trace mafic igneous gravel clast to 2.25" diam.; rounded; loose; moist.	14.0					

Depth scale: ft -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; m 0, 1, 2, 3, 4

Well completion details: A, B; Concrete; Native Sand Backfill; 3/8" Bentonite Chips; 2" dia. PVC blank casing; 2" dia. PVC blank casing

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 1 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-4

Project No.: L 1202 CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
5, 17, 18, 19, 6, 20				4		54	1443	
21, 22, 23, 7, 24		*Sand (SP):* trace gravel; loose; moist.	20.0	5		40		
25, 26, 8, 27, 28, 29		*Sand (SP):* light yellowish brown (2.5Y 6/3); loose; moist.	25.0	6		38		
9, 30, 31, 32, 10, 33, 34		*Sand (SP).*	30.0	7		44		#2-/15 Sand
35, 36			35.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 2 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-4

Project No.: L.1202 CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
11, 37, 38, 39, 12, 40		*Sand (SP):* 100% fine to medium sand; loose; moist; laminations with FeO common.		8		46		2" dia. PVC 10 slot screen (32.84 - 51.84')
41, 42, 13, 43		*Sandy Silt (ML):* 70% non-plastic fines; 30% fine sand; loose; moist; laminations and FeO staining common; clay nodules common; Silty Sand (SM) interbeds common.	40.7	9		64		
44, 45, 46, 14, 47, 48, 49, 15		*Silty Sand (SM):* some interbedded Silt (ML); loose; moist; laminated; FeO staining common.	44.0	10		60		
50, 51, 52		*Silty Sand (SM):* 45% non-plastic fines; 55% fine sand; compact to loose; moist; laminated.	50.0					
16, 53, 54, 55		*Clayey Silt (ML):* 95% non- to low-plasticity fines; 5% fine sand; compact; moist; laminated; some Sandy Silt interbeds.	52.3	11		82		
17, 56			55.8					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 3 of 6

Log of Drill Hole: OW-4

State of California
The Resources Agency
Department of Water Resources

Project No.: L 1202 CONJ 422

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
57, 58, 59 – 18		*Sand (SP).*		12		80		3/8" Bentonite Chips
60, 61, 62 – 19, 63, 64		*Sand (SP):* 100% fine to medium sand; loose; moist; black silt (heavy mineral) laminations common; FeO staining common.	60.0	13		54	1540	
65, 66 – 20, 67		*Sand (SP):* 100% fine to medium sand; loose; moist; minor laminations.	65.0					
68		*Silty Clay (CL):* pale yellow (2.5Y 7/3); 100% non- to low-plasticity fines; compact; moist.	67.4	14		54	0750	
69 – 21, 70, 71		*Sandy Silt (ML):* some interbedded Silty Sand (SM).	68.6					#2-/16 Sand
72 – 22		*Silty Clay (CL).*	71.5	16		68	0805	
73, 74		*Sand (SP).*	72.9					
75 – 23, 76		*Silty Sand (SM):* some interbedded Silt (ML). @ 76': moist to very moist.	74.5					
			76.2					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 4 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-4

Project No.: L.1202.CONJ.422

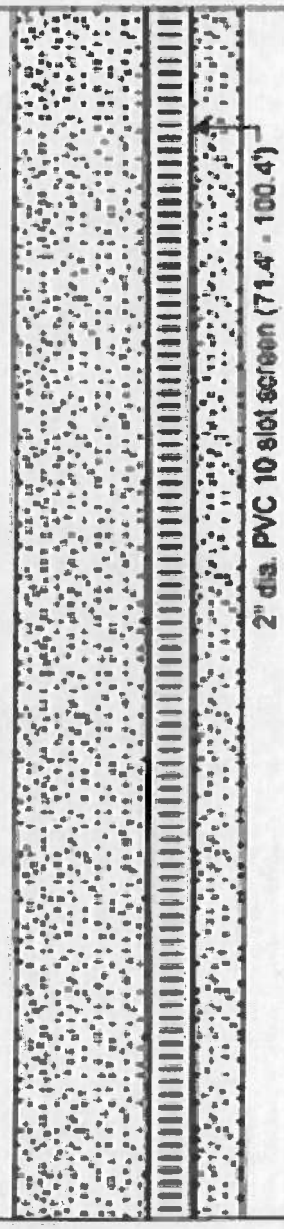
Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
77		*Silty Sand (SM):* @ 76.6': Silty Clay (CL) interbed (0.4' thick).	77.0	16		68		
78		*Sand (SP).*	78.2					
79 – 24		*Sandy Silt (ML).* @ 77.4 - 78': pervasive FeO staining.						
80								
81								
82 – 25		*Silty Clay (CL).* compact; moist. @ 83 - 83.4': Silt (ML) interbed.	82.0	17		78		
83								
84								
85		*Sandy Silt (ML).* First groundwater encountered @ 85'.	84.5					
86 – 26		*Silty Sand (SM):* 40% non-plastic fines; 60% fine sand; loose; wet.	85.5					
87		*Silt (ML):* 90% non-plastic fines; 10% fine sand; loose; wet. @ 90': very moist to wet.	87.0	18		54		
88 – 27								
89								
90								
91		*Silty Sand (SM):* 40% non-plastic fines; 60% fine sand; compact to loose; wet. @ 92': Silt (ML) interbed 0.2' thick.	91.1					
92 – 28			92.2	19		74		
93		*Silty Clay (CL):* compact; moist.						
94		*Sand with Silt (SP-SM):* 15% non-plastic fines; 85% fine to medium sand; loose; wet.	94.0					
95 – 29								
96			95.5					
			96.4					



Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 5 of 6

State of California
The Resources Agency
Department of Water Resources

Log of Drill Hole: OW-4

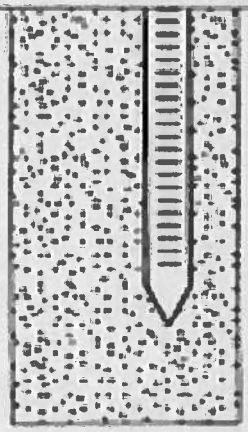
Project No.: L 1202 CONJ A22

Project: Merced Irrigation District

Client: Integrated Storage Investigations Program

Location: Winton, California

Geologist: Chris Bonds

SUBSURFACE PROFILE				SAMPLE				Well Completion Details
Depth	Symbol	Description	Elevation / Depth (ft)	Core Run Number	Type	Recovery (%)	Time	
97, 98, 30, 99, 100, 101, 31, 102, 103		*Sandy Silt (ML):* 60% non-plastic fines; 40% fine to medium sand; loose; wet.		20		58	0855	 Hole Diameter = 10"
		Sand (SP): 100% fine to medium sand; loose; wet.						
104, 105, 32, 106, 107, 108, 33, 109, 110, 111, 34, 112, 113, 114, 115, 35, 116		Drill hole terminated @ 100'; Target depth reached; Drill hole was reamed to 10" diameter to a depth of 103' for well installation.	103.0					

Drilled By: Spectrum Exploration, Inc. with CME 750X all-terrain drilling rig

Hole Size: 8" to 100' / 10" to 103'

Drill Method: Hollow-stem auger

Datum: mean sea level

Drill Date: 12/12/01 - 12/13/01

Well Installation Date: 12/13/01

Sheet: 6 of 6

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-11

Improvement Plans for MID Cressey Groundwater Recharge Basin

IMPROVEMENT PLANS
FOR
MERCED IRRIGATION DISTRICT
CRESSEY GROUNDWATER RECHARGE BASIN
LYING WITHIN
SECTION 14, T.6S., R.12E., M.D.B.& M.

IMPROVEMENT NOTES:

MID NOTES:

1. THE SIGNATURE OF THE MERCED IRRIGATION DISTRICT (MID) ON DRAWINGS CONSTITUTES MID'S APPROVAL OF THE SAME AS TO THE ENGINEERING ASPECTS THEREOF ONLY AND DOES NOT AUTHORIZE, EXPRESSLY OR IMPLICITLY THE CONSTRUCTION OF ANY ASPECT HEREOF OR THE INTERFERENCE WITH ANY PROPERTY, EQUIPMENT, OR INTEREST OF THE MID. NO SUCH CONSTRUCTION OR INTERFERENCE SHALL OCCUR UNTIL THE MID HAS OBTAINED, BY SEPARATE AGREEMENT SUCH AGREEMENTS AS MID DEEMS NECESSARY FOR THE PROTECTION OF ITS FACILITIES.
2. ALL CONSTRUCTION WITHIN THE MID RIGHT-OF-WAY SHALL BE DONE IN ACCORDANCE WITH THE APPROVED DRAWINGS AND THE CURRENT EDITION OF MID STANDARDS AND CALTRANS STANDARD SPECIFICATIONS, AS APPLICABLE.
3. OMITTED
4. CONTRACTOR SHALL PROVIDE AN ALTERNATE STORM WATER REROUTE DURING CONSTRUCTION UNLESS DETERMINED OTHERWISE BY THE MID ENGINEER.
5. WHERE THE PLANS OR SPECIFICATIONS DESCRIBE PORTIONS OF THE WORK IN GENERAL TERMS BUT NOT IN COMPLETE DETAIL, IT IS UNDERSTOOD THAT ONLY THE BEST GENERAL PRACTICE IS TO PREVAIL AND THAT ONLY MATERIALS AND WORKMANSHIP OF THE FIRST QUALITY ARE TO BE USED.
6. MID STANDARD DETAILS MAY REQUIRE MODIFICATIONS BASED ON FOUND FIELD CONDITIONS SUCH MODIFICATIONS SHALL BE REVIEWED AND APPROVED BY THE MID ENGINEER.
7. CONTRACTOR AGREES TO ASSUME SOLE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS.
8. CAL-OSHA SAFETY REQUIREMENTS SHALL BE IN EFFECT DURING ALL CONSTRUCTION. SPECIAL SAFETY PRECAUTIONS SHALL BE TAKEN WHEN WORKING IN THE VICINITY OF GAS, OIL, OR ELECTRICAL LINES.
9. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLY WITH CALIFORNIA GOVERNMENT CODE 4216, AS APPLICABLE. TO OBTAIN A DIG ALERT IDENTIFICATION NUMBER, CALL 800-227-2600 AT LEAST TWO WORKING DAYS BEFORE DIGGING UNDERGROUND.
10. THE MID WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE OBTAINED IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THE PLANS.
11. CONTRACTOR SHALL BE REQUIRED TO HAVE A PRE-CONSTRUCTION CONFERENCE WITH THE MID ENGINEER, PRIOR TO STARTING ANY WORK WITHIN THE MID RIGHT-OF-WAY.
12. EARTHFILL AND SUBGRADES SHALL BE COMPACTED TO A MINIMUM 90% RELATIVE COMPACTION (ASTM D-1557) WITHIN THE MID RIGHT-OF-WAY, UNLESS DETERMINED OTHERWISE BY THE MID ENGINEER.
13. A SET OF APPROVED PLANS SHALL BE ON THE JOB SITE AT ALL TIMES DURING CONSTRUCTION.
14. ANY DAMAGES TO MID FACILITIES DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED IN A MANNER APPROVED BY THE MID ENGINEER AT THE SOLE COST OF THE CONTRACTOR.
15. ANY WORK WITHIN THE MID RIGHT-OF-WAY SHALL NOT BE DEEMED COMPLETE UNTIL THE MID ENGINEERING DEPARTMENT HAS BEEN PROVIDED WITH A SET OF AS-BUILT PLANS IN AUTO CAD R12 AND HARD COPY FORMATS.
16. CONTACT THE MERCED IRRIGATION DISTRICT ENGINEERING DEPARTMENT AT LEAST TWO WORKING DAYS PRIOR TO ANY CONSTRUCTION AND/OR NECESSARY INSPECTIONS. WORK WITHIN THE MID RIGHT-OF-WAY SHALL PROCEED IN A CONTINUOUS MANNER ONCE STARTED. THE MID ENGINEER SHALL BE NOTIFIED OF ANY WORK STOPPAGES. WHENEVER WORK IS TO RESTART, THE MID ENGINEER SHALL REQUIRE AN ADDITIONAL TWO WORKING DAYS NOTICE. THE MID ENGINEER SHALL ALSO BE CONTACTED A MINIMUM OF TWO WORKING DAYS PRIOR TO ALL CONSTRUCTION SCHEDULED ON A HOLIDAY OR WEEKEND. PHONE: 209-722-5761.
17. TRACER WIRE SHALL BE INSTALLED WITH THE PIPELINE AS DIRECTED BY MID ENGINEER.
18. CONTRACTOR SHALL PROVIDE TEMPORARY ACCESS AT EXISTING ACCESSES/CROSSINGS ETC. DURING CONSTRUCTION
19. NOTIFY AFFECTED PARTIES OF INTENTION TO PROVIDE TEMPORARY ACCESS 24 HOURS PRIOR TO CONSTRUCTION.
20. CONTRACTOR SHALL RETURN CONSTRUCTION SITE TO ORIGINAL OR BETTER CONDITION.
21. CONTRACTOR TO COORDINATE WITH APPROPRIATE AGENCY ANY DRY UTILITY TO BE PROTECTED OR RELOCATED.
22. CONTRACTOR IS RESPONSIBLE TO PUMP ANY REMAINING WATER FROM IRRIGATION FACILITIES AS NECESSARY FOR CONSTRUCTION.
23. ALL MATERIALS SPECIFICATIONS, SHOP DRAWINGS AND/OR CUT SHEETS SHALL BE SUPPLIED TO M.I.D. ENGINEER FOR APPROVAL PRIOR TO ORDERING.
24. DIRT PILE TOP ELEVATION OF 191.0 IS ONLY AN ESTIMATE OF QUANTITY OF DIRT TO BE REMOVED FROM BASIN AREA, SHRINKAGE AND MOISTURE CONTENT NOT TAKEN INTO ACCOUNT. NO IMPORT OR EXPORT OF DIRT.
25. CONTRACTOR IS RESPONSIBLE FOR STORM WATER POLLUTION PREVENTION PLAN (S.W.P.P.P.) & DUST CONTROL PLAN

ABBREVIATIONS USED IN THIS WORK

AB	AGGREGATE BASE	EQUIP	EQUIPMENT	OH	OVERHEAD
ACP	ASBESTOS CEMENT PIPE	EW	EACH WAY	PI	POINT OF INTERSECTION
AC	ASPHALT CONCRETE	EXIST	EXISTING	PL	PROPERTY LINE
APPROX	APPROXIMATE (LY)	EASMT	EASEMENT	PP	POWER POLE
AVG	AVERAGE	FG	FINISH GRADE	PVC	POLYVINYL CHLORIDE PIPE
BC	BEGINNING OF CURVE	FH	FIRE HYDRANT	PRC	POINT OF REVERSE CURVE
BLDG	BUILDING	FIN	FINISH (ED)	PCC	PORTLAND CEMENT CONCRETE
BLK	BLOCK	FL	FLOWLINE	PVMNT	PAVEMENT
BO	BLOWOFF	FM	FORCE MAIN	PUE	PUBLIC UTILITY EASEMENT
BVC	BEGIN VERTICAL CURVE	FLG	FLANGE	R	RADIUS
BM	BENCHMARK	FT	FEET OR FOOT	RET	RETURN
CB	CATCH BASIN	FTG	FOOTING	R/W	RIGHT OF WAY
C&G	CURB & GUTTER	FL	FLOW LINE	ROW	RIGHT OF WAY
(C)	CALCULATED	FOC	FACE OF CURB	RCP	REINFORCED CONCRETE PIPE
CIP	CAST IRON PIPE	FF	FINISH FLOOR	REQ'D	REQUIRED
CIPCP	CAST IN PLACE CONCRETE PIPE	GB	GRADE BREAK	SPEC	SPECIFICATIONS
CR	CURB RETURN	GALV	GALVANIZED	SEC	SECTION
CL	CENTER LINE (OR) CLASS	GRND	GROUND	SF	SQUARE FEET
CMP	CORRUGATED METAL PIPE	G.V.E.	GOLDEN VALLEY ENGINEERING & SURVEYING, INC.	SPD	SPREAD
CMU	CONCRETE MASONRY UNIT			STD	STANDARD
CO	CLEANOUT	HOR	HORIZONTAL	S	SOUTH
CONC	CONCRETE	HP	HIGH POINT	STL	STEEL
CYCM	CUBIC YARD COMPACTED MEASUREMENT	HWS	HIGH WATER STAIN	STA	STATION
DBL	DOUBLE	IRR	IRRIGATION	SS	SANITARY SEWER
DET	DETAIL	ID	INSIDE DIAMETER	SHT	SHEET
DWG	DRAWING	INV	INVERT	SD	STORM DRAIN
DIA	DIAMETER	IP	IRON PIPE	SDFM	STORM DRAIN FORCE MAIN
DIP	DUCTILE IRON PIPE	L	LENGTH	TRANS	TRANSFORMER
DW	DRIVEWAY	LF	LINEAR FEET	TYP	TYPICAL
DIM	DIMENSION	MAN	MANUAL	TEMP	TEMPORARY
ELEC	ELECTRIC	MAX	MAXIMUM	TC	TOP OF CURB
ENGR	ENGINEER	Mc	McCOY	TPE	TREE PLANTING EASEMENT
E	EAST	MECH	MECHANICAL	TELE	TELEPHONE
EVC	END VERTICAL CURVE	MET	METAL	UG	UNDERGROUND
EA	EACH	MID	MERCED IRRIGATION DISTRICT	UIP	UTILITY POLE
EC	END OF CURVE			VCP	VITRIFIED CLAY PIPE
EG	EXISTING GROUND	MIN	MINIMUM	VERT	VERTICAL
ELEV	ELEVATION	MISC	MISCELLANEOUS	WV	WATERVALVE
ELL	ELBOW	NA	NOT APPLICABLE	W/	WITH
E/S	EAST SIDE	N	NORTH	W/O	WITHOUT
EMSNS	ELECTROLIER MOUNTED STREET NAME SIGN	NRCP	NON REINFORCED CONCRETE PIPE	W	WEST
		NTS	NOT TO SCALE	W/S	WEST SIDE
EP	EDGE OF PAVEMENT	OC	ON CENTER	±	PLUS OR MINUS (APPROXIMATE)
		OD	OUTSIDE DIAMETER		

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD THE DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PROFESSIONAL.

UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

NOTE TO DEVELOPERS AN CONTRACTORS:

THESE IMPROVEMENT PLANS HAVE BEEN PREPARED WITH THE INTENT THAT THE FIRM OF GOLDEN VALLEY ENGINEERING AND SURVEYING, INC. WILL BE PERFORMING THE CONSTRUCTION STAKING FOR THE COMPLETE PROJECT. IF, HOWEVER, ANOTHER ENGINEERING AND/OR SURVEYING FIRM SHOULD BE EMPLOYED TO USE THESE PLANS FOR THE PURPOSE OF CONSTRUCTION STAKING, NOTICE IS HEREBY GIVEN THAT THE FIRM OF GOLDEN VALLEY ENGINEERING AND SURVEYING, INC. WILL NOT ASSUME ANY RESPONSIBILITY FOR ERRORS OR OMISSIONS, IF ANY, WHICH MIGHT OCCUR AND WHICH COULD HAVE BEEN AVOIDED, CORRECTED OR MITIGATED IF THE FIRM OF GOLDEN VALLEY ENGINEERING AND SURVEYING, INC. HAD PERFORMED THE STAKING WORK.

NOTE:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

CELSOC
CONSULTING ENGINEERS AND LAND SURVEYOR'S OF CALIFORNIA

CELSOC
CONSULTING ENGINEERS AND LAND SURVEYOR'S OF CALIFORNIA

NOTE:

ANY QUANTITIES PROVIDED BY THE ENGINEER ARE ESTIMATES AND APPROXIMATES ONLY AND FURNISHED ONLY TO ASSIST THE CONTRACTOR IN PREPARING HIS PROPOSAL.

THE CONTRACTOR IN PREPARING HIS PROPOSAL SHALL MAKE HIS OWN ESTIMATE OF QUANTITIES BASED ON THE IMPROVEMENT PLANS. ANY DISCREPANCIES BETWEEN THE LISTED QUANTITIES AND THE CONTRACTOR'S QUANTITIES SHALL BROUGHT TO THE ENGINEER'S ATTENTION.

THE OWNER MAY INCREASE OR DECREASE THE AMOUNT OF ANY CLASS OR PORTION OF THE WORK OR OMIT PORTIONS OF THE WORK THAT MAY BE DEEMED NECESSARY OR EXPEDIENT BY THE ENGINEER.

ANY EXISTING UNDERGROUND UTILITIES SHOWN ON THIS DRAWING WERE LOCATED BY VISUAL MEANS OR BY REFERENCE TO RECORD DATA. THE FIRM OF GOLDEN VALLEY ENGINEERING AND SURVEYING, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OR COMPLETENESS OF RECORD DATA.

STAKING NOTE:

ALL IMPROVEMENTS SHALL BE CONSTRUCTED AT THE LOCATIONS SHOWN HEREON BASED ON THE FINAL MAP FOR THIS PROJECT. ALL STATIONING SHOWN HEREON IS FOR REFERENCE ONLY AND IS NOT FOR USE IN LOCATING ANY IMPROVEMENTS FOR CONSTRUCTION.

THE CONTRACTOR SHALL PRESERVE ALL STAKES AND POINTS SET FOR LINES, GRADES, OR MEASUREMENT OF THE WORK IN THEIR PROPER PLACES UNTIL AUTHORIZED TO REMOVE THEM BY THE ENGINEER. MERCED IRRIGATION DISTRICT WILL ONLY PROVIDE ONE SET OF STAKES FOR EACH PHASE OF CONSTRUCTION. ALL EXPENSES INCURRED IN REPLACING STAKES THAT HAVE BEEN REMOVED WITHOUT PROPER AUTHORITY SHALL BE PAID FOR BY THE CONTRACTOR AND MAY BE DEDUCTED FROM PAYMENTS DUE THE CONTRACTOR.

EARTH QUANTITIES:
TOTAL BASIN CUT: 100,148 CUBIC YARDS
TOTAL DIRT PILE FILL: 113,600 CUBIC YARDS
NOTE: DIRT PILE TOP ELEVATION OF 191.0 IS ONLY AN ESTIMATE OF QUANTITY OF DIRT TO BE REMOVED FROM BASIN AREA, SHRINKAGE AND MOISTURE CONTENT NOT TAKEN INTO ACCOUNT. NO IMPORT OR EXPORT OF DIRT.

BENCHMARK
CHISELED SQUARE AT THE NORTHWEST CORNER OF THE CONCRETE WALK OVER SOUTH OF THE WEIR ACROSS CRESSEY LATERAL NORTHWEST OF THE INTERSECTION OF JONES ROAD AND MERCEDES AVENUE.
ELEVATION: 185.00

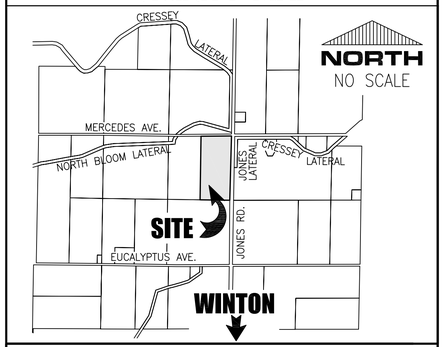
UTILITY COMPANIES

TELEPHONE – PACIFIC BELL	(209) 549-5842
CABLE TELEVISION – AT & T CABLE	(209) 384-1316
ELECTRIC – PACIFIC GAS & ELECTRIC	(209) 726-6337
MERCED ELECTRIC IRRIGATION DISTRICT.	(209) 722-5761
GAS – PACIFIC GAS & ELECTRIC	(209) 726-6337
IRRIGATION– MERCED IRRIGATION DISTRICT	(209) 722-5761

LOCATION AND DEPTH OF EXISTING SUB-SURFACE STRUCTURES ARE NOT GUARANTEED. OTHER SUB-SURFACE STRUCTURES MAY OR MAY NOT EXIST.
DIG WITH CAUTION

CALL BEFORE YOU DIG — USA — UNDERGROUND SERVICE ALERT
CA:800-227-2600

VICINITY MAP



APPROVALS

MERCED IRRIGATION DISTRICT
744 W. 20th. St., Merced, CA 95340 (209)722-5761

HICHAM ELTAL
DEPUTY GENERAL MANAGER, WATER RESOURCES

_____ , 201__
DATE

MERCED IRRIGATION DEPT. NOTES

1 ALL IMPROVEMENTS SHALL BE IN ACCORDANCE WITH MID STANDARD DETAILS AND THESE PLANS IF A CONFLICT BETWEEN MID SPECIFICATIONS AND THESE PLANS EXISTS THE MOST RESTRICTIVE SHALL APPLY.

2 IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO USE RUBBER GASKET JOINTS ON ALL PRECAST PIPES. THE COST FOR RUBBER GASKET RING SHALL BE INCLUDED IN THE UNIT PRICES OF PIPE.

3 AT ALL PIPE ENTRANCES AND EXITS AT CONCRETE STRUCTURES INCLUDING MANHOLES, AN EXPANSIVE WATERSTOP GASKET RING SHALL BE USED AT ALL PIPE TO CONCRETE STRUCTURE CONNECTIONS.

4 ALL REQUIRED AGREEMENTS SHALL BE EXECUTED PRIOR TO COMMENCEMENT OF WORK

REINFORCED CONCRETE PIPE NOTES

SEE M.I.D. DETAIL 593 ON SHEET MID-2

PVC PIPE NOTES

A) PIPELINE 27" AND SMALLER SHALL BE PVC. P.I.P. 51 WITH MINIMUM 48" COVER

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SHEET INDEX

SHEET #	DESCRIPTION
TS	TITLE SHEET
1	OVERALL SITE
2	TOPOGRAPHY, DEMOLITION, GRADING, & DRAINAGE PLAN
3	TOPOGRAPHY, DEMOLITION, GRADING, & DRAINAGE PLAN
4	BASIN SECTIONS
5	DETAILS
MID-1	M.I.D. DETAILS

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SHEET CONTENTS:
TITLESHEET

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MERCED, CA 95340
PHONE: (209) 722-5761
FAX: (209) 722-6421
ATT: BRYAN KELLY

IMPROVEMENT PLANS
FOR
MERCED IRRIGATION DISTRICT
CRESSEY GROUNDWATER RECHARGE BASIN
LYING WITHIN
SECTION 14, T.6S., R.12E., M.D.B.& M.

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DRAWN BY: STAFF
CHECKED: STAFF
DATE: JANUARY 2011
JOB NO.: 11008

SHEET
TS

W:\land projects\11008 CRESSEY BASIN - MID\dwg\11008-BASIN DIRT PILE PLAN.dwg, 3/21/2011 4:20:45 PM, 1:1

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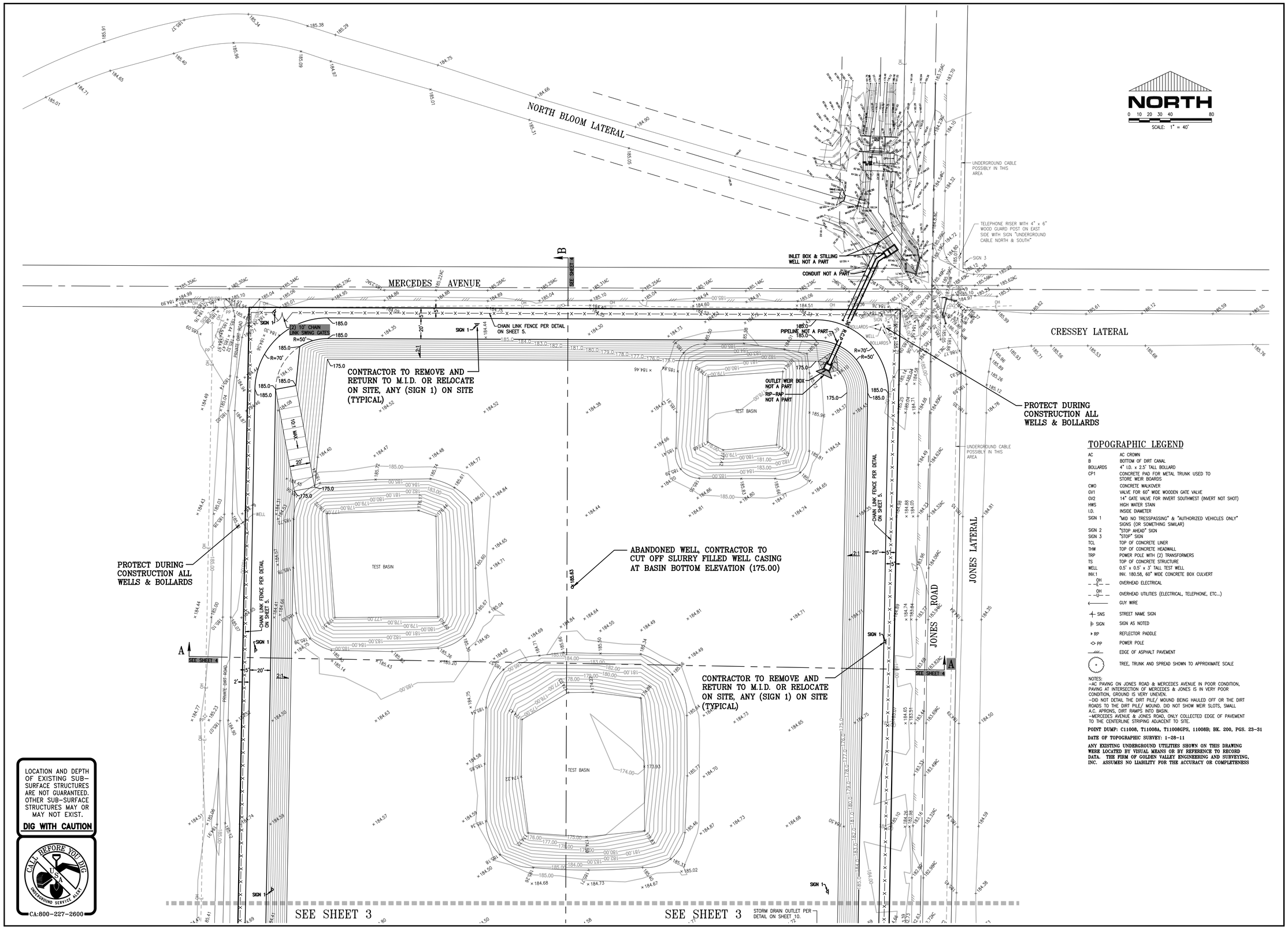
JOB NO.: 11008

SHEET
1



LOCATION AND DEPTH OF EXISTING SUB-SURFACE STRUCTURES ARE NOT GUARANTEED. OTHER SUB-SURFACE STRUCTURES MAY OR MAY NOT EXIST.

DIG WITH CAUTION

CALL BEFORE YOU DIG — USA — UNDERGROUND SERVICE ALERT

CA:800-227-2600

TOPOGRAPHIC LEGEND

AC	AC CROWN
B	BOTTOM OF DIRT CANAL
BOLLARDS	4" I.D. x 2.5' TALL BOLLARD
CP1	CONCRETE PAD FOR METAL TRUNK USED TO STORE WEIR BOARDS
CWO	CONCRETE WALKOVER
GV1	VALVE FOR 60" WIDE WOODEN GATE VALVE
GV2	14" GATE VALVE FOR INVERT SOUTHWEST (INVERT NOT SHOT)
HWS	HIGH WATER STAIN
I.D.	INSIDE DIAMETER
SIGN 1	"MID NO TRESSPASSING" & "AUTHORIZED VEHICLES ONLY" SIGNS (OR SOMETHING SIMILAR)
SIGN 2	"STOP AHEAD" SIGN
SIGN 3	"STOP" SIGN
TCL	TOP OF CONCRETE LINER
THW	TOP OF CONCRETE HEADWALL
TRP	POWER POLE WITH (2) TRANSFORMERS
TS	TOP OF CONCRETE STRUCTURE
WELL	0.5' x 0.5' x 3' TALL TEST WELL
INV.1	INV. 180.58, 60" WIDE CONCRETE BOX CULVERT
OH — E —	OVERHEAD ELECTRICAL
OH — U —	OVERHEAD UTILITIES (ELECTRICAL, TELEPHONE, ETC...)
	GUY WIRE
SNS	STREET NAME SIGN
SIGN	SIGN AS NOTED
RP	REFLECTOR PADDLE
PP	POWER POLE
	EDGE OF ASPHALT PAVEMENT
	TREE, TRUNK AND SPREAD SHOWN TO APPROXIMATE SCALE

NOTES:
-AC PAVING ON JONES ROAD & MERCEDES AVENUE IN POOR CONDITION, PAVING AT INTERSECTION OF MERCEDES & JONES IS IN VERY POOR CONDITION, GROUND IS VERY UNEVEN.
-DID NOT DETAIL THE DIRT PILE/ MOUND BEING HAULED OFF OR THE DIRT ROADS TO THE DIRT PILE/ MOUND. DID NOT SHOW WEIR SLOTS, SMALL A.C. APRONS, DIRT RAMPS INTO BASIN.
-MERCEDES AVENUE & JONES ROAD, ONLY COLLECTED EDGE OF PAVEMENT TO THE CENTERLINE STRIPING ADJACENT TO SITE.

POINT DUMP: C11008, T11008A, T11008GPS, 11008B; BK. 200, PGS. 23-31

DATE OF TOPOGRAPHIC SURVEY: 1-28-11

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IMPROVEMENT PLANS FOR

MERCED IRRIGATION DISTRICT CRESSEY GROUNDWATER RECHARGE BASIN

LYING WITHIN SECTION 14, T.6S., R.12E., M.D.B.& M.

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FAX: (209) 722-6421
ATT: BRYAN KELLY

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CHECKED: STAFF
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JOB NO.: 11008

SHEET
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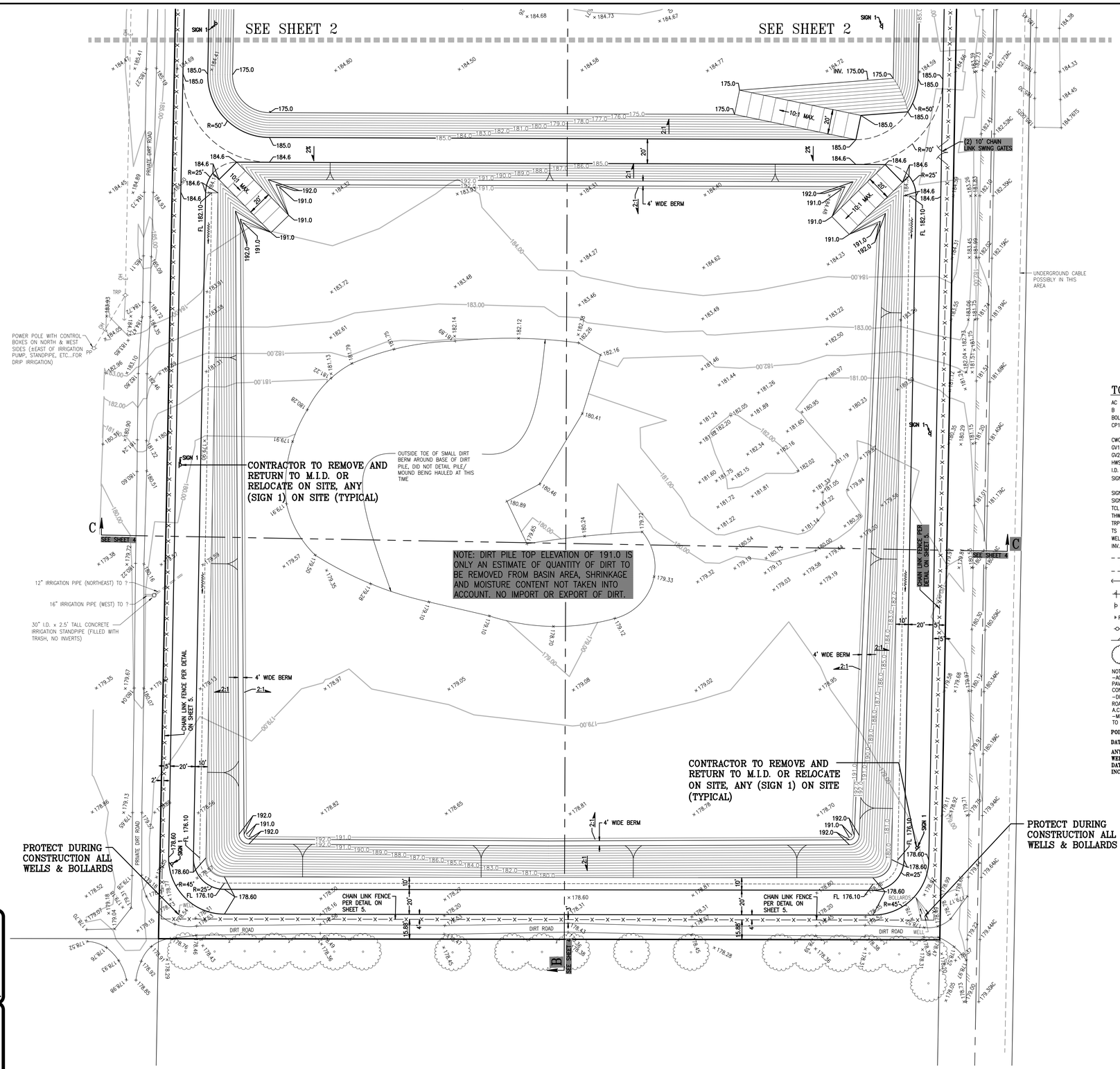

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CA:800-227-2600

NORTH

0 10 20 30 40 80

SCALE: 1" = 40'

TOPOGRAPHIC LEGEND

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POINT DUMP: C11008, T11008A, T11008GFS, 11008B; BK. 200, PGS. 23-31

DATE OF TOPOGRAPHIC SURVEY: 1-28-11

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IMPROVEMENT PLANS FOR MERCED IRRIGATION DISTRICT CRESSEY GROUNDWATER RECHARGE BASIN

LYING WITHIN SECTION 14, T.6S., R.12E., M.D.B.& M.

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CHECKED: STAFF
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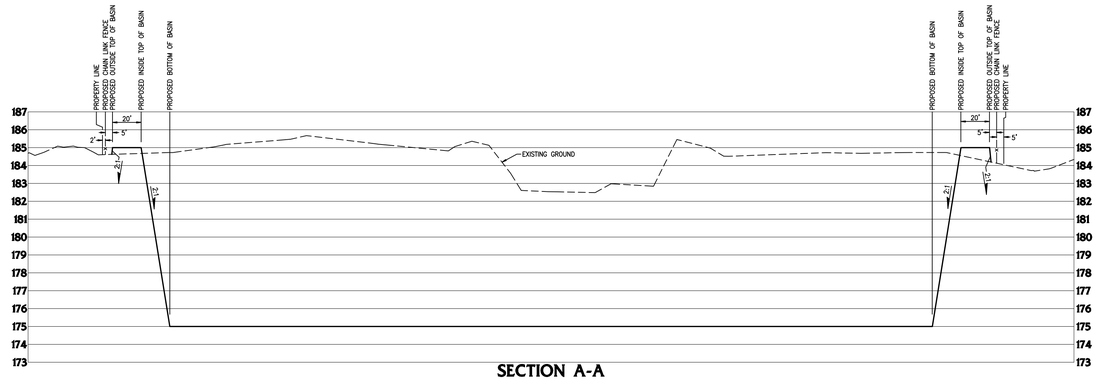
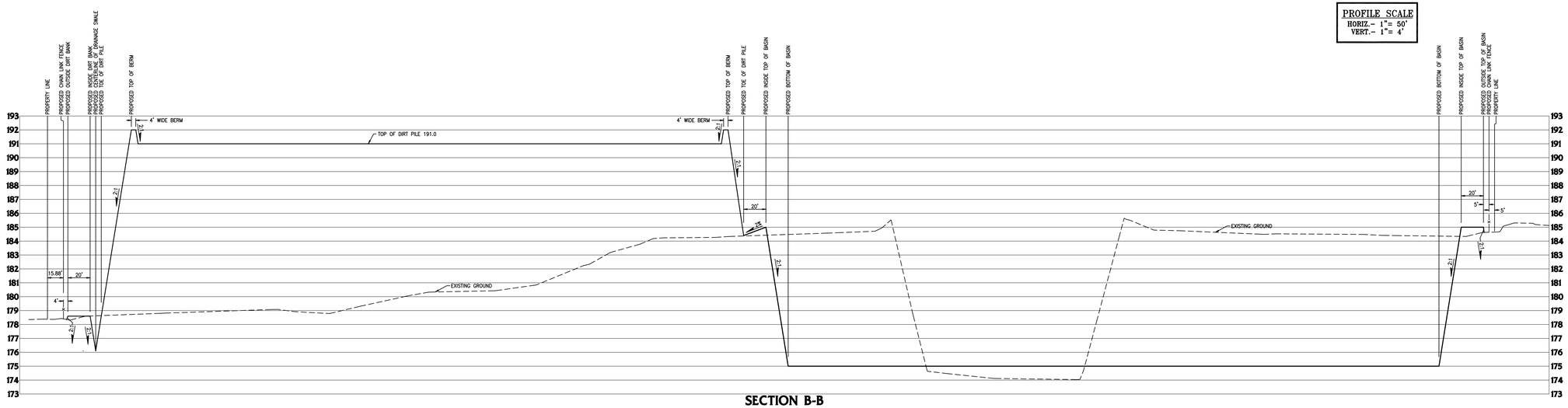


SECTION A-A

PROFILE SCALE
HORIZ.- 1"= 50'
VERT.- 1"= 4'



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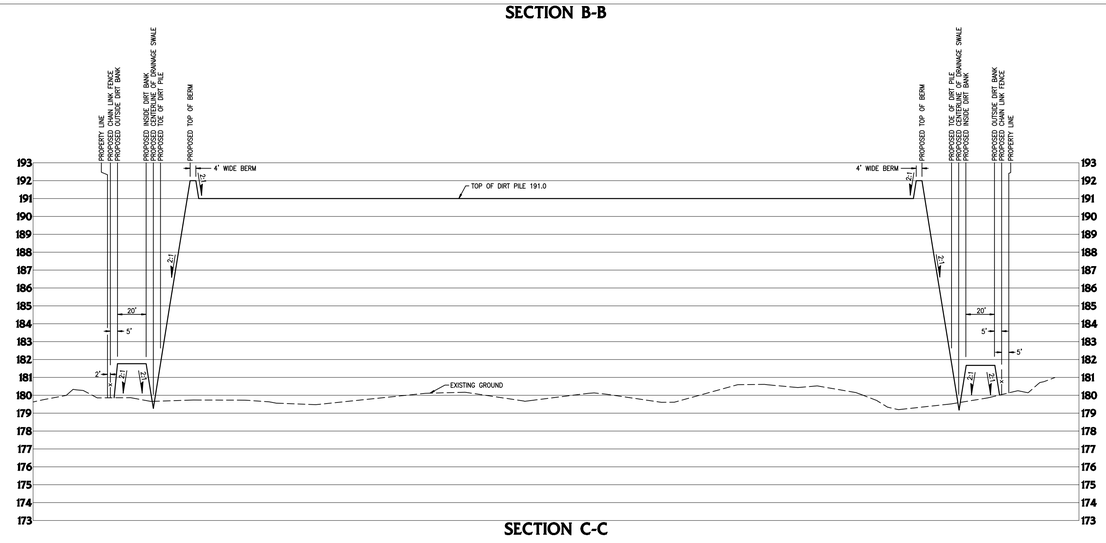

SECTION C-C

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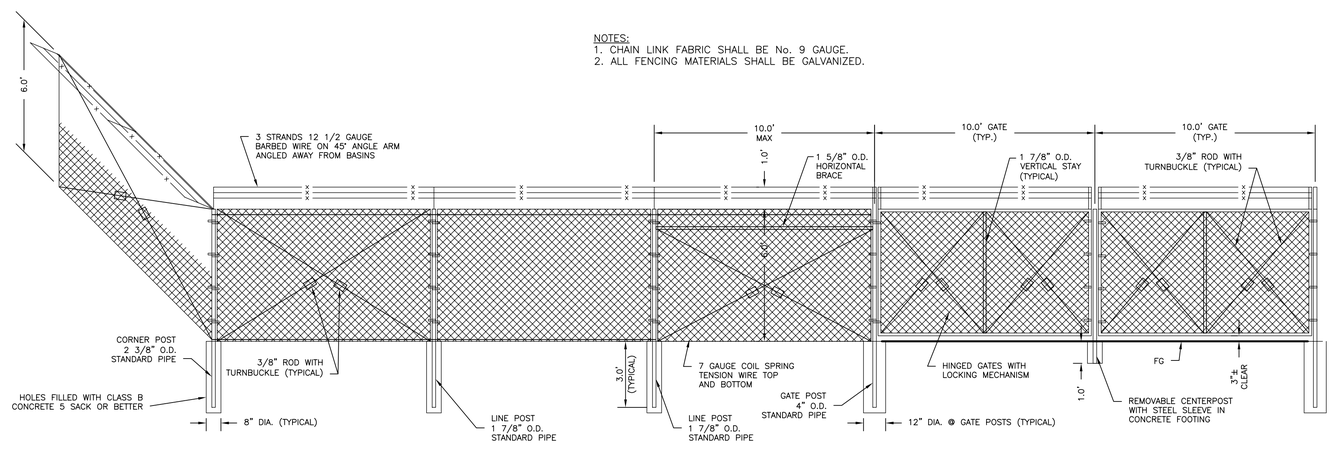

CHAIN LINK FENCE & GATE

NOT TO SCALE

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DETAILS

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DATE: JANUARY 2011
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5

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Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-12

MID Cressey Recharge Basin Initial Study/Proposed Negative Declaration

Merced Irrigation District

Cressey Recharge Basin

Initial Study / Proposed Negative Declaration

Prepared by:
Fremming, Parson & Pecchenino
2816 Park Avenue
Merced, CA 95348
(209) 723-2066
March 31, 2010

z:\job\m009-2009B\ceqa\cressey recharge basin initial study.docx

Table of Contents

References and Resources 2
Project Information 3
Proposed Findings 5
Figure 1 - Project Vicinity Map 6
Figure 2 – Proposed Cressey Pilot Recharge Basin Site Layout 7
Issues 8
I. AESTHETICS 8
II. AGRICULTURAL RESOURCES 9
III. AIR QUALITY 10
IV. BIOLOGICAL RESOURCES 12
V. CULTURAL RESOURCES 15
VI. GEOLOGY AND SOILS 17
VII. HAZARDS AND HAZARDOUS MATERIALS 19
VIII. HYDROLOGY AND WATER QUALITY 22
IX. LAND USE AND PLANNING 25
Figure 3 – General Plan 27
Figure 4 – Zoning 28
X. MINERAL RESOURCES 29
XI. NOISE 30
XII. POPULATION AND HOUSING 32
XIII. PUBLIC SERVICES 33
XIV. RECREATION 34
XV. TRANSPORTATION/TRAFFIC 35
XVI. UTILITIES AND SERVICE SYSTEMS 37
XVII. MANDATORY FINDINGS OF SIGNIFICANCE 40

References and Resources

The United States of America will hereinafter be referred to as "U.S."

California will hereinafter be referred to as the "State."

Merced County will hereinafter be referred to as the "County," unless otherwise noted.

California Environmental Quality Act will hereinafter be referred to as "CEQA."

Merced Irrigation District will hereinafter be referred to as "M.I.D." or "the District."

The San Joaquin Valley Air Pollution Control District is also referred to as "SJVAPCD".

The Merced County Association of Governments is also referred to as "MCAG".

Specific Urban Development Plan will hereinafter be referred to as "SUDP."

The Merced County General Plan, 2000, is available from the Merced County office at 2222 M. St., Merced, CA, or can be viewed on-line at http://www.co.merced.ca.us/index.asp?nid=436.

The most recent published copy of the *Merced County General Plan Map* can be found at http://www.mcaggis.com/gallery/County/county_gp.pdf. Information used in this Initial Study may not reflect changes made to the General Plan since the publication of this document.

An on-line copy of the *California Agricultural Land Evaluation and Site Assessment Model (1997)* can be found at http://www.consrv.ca.gov/dlrp/LESA/Documents/lesamodl.pdf.

Maps prepared pursuant to the *Farmland Mapping and Monitoring Program of the California Resources Agency* can be found at ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/2006/.

Federally protected wetlands (Sec. 404, CWA) are identified via Google Earth utilizing WetlandsData.KMZ available at http://www.fws.gov/wetlands/data/GoogleEarth.html.

A list of cleanup sites and hazardous waste permitted facilities can be found at http://www.envirostor.dtsc.ca.gov/public/.

Project Information

1. **Project Title**

   Cressey Recharge Basin

2. **Lead Agency Name and Address**

   Merced Irrigation District
   744 W. 20th Street
   Merced, CA 95340

3. **Contact Person and Phone Number**

   Bryan Kelly, P.E.
   Senior Engineer, Water Resources
   (209) 722-5761

4. **Project Location**

   The project lies on a 18+ acre parcel on the Southwest corner of Mercedes Avenue and Jones Road north of the community of Winton in Merced County, California.

5. **Project Sponsor's Name and Address**

   Merced Irrigation District
   744 W. 20th Street
   Merced, CA 95340

6. **General Plan Designation**

   General Agriculture

7. **Zoning**

   Agricultural (A-1)

8. **Description of Project**

   The Merced Irrigation District (MID) previously initiated the construction of a pilot groundwater recharge basin to evaluate the suitability for the installation of a full scale recharge basin. Based on successful pilot testing data, a 10+ acre ground water recharge basin will be constructed on the 18 acre site, with the remaining acreage used to stockpile the material from construction of the basin. This recharge basin will be used for recharging the Merced Groundwater Basin, as described in the California Department of Water Resources Bulletin 118-80, with Merced River surface water.

The project is the construction and operation of the complete recharge facility at this location.

9. Surrounding Land Uses and Setting

The project site is situated in an agricultural area. North, south and east properties are tree farms (almonds) and row crops are to the west of the property

10. Other Agencies

The Merced Irrigation District is the lead agency with ultimate responsibility for project approval, which will be in the form of a Board resolution. Other public agencies whose secondary approvals may be required (e.g., permits, financing approval, or participation agreement) are:

Agency	Type of Approval
County of Merced Public Works Pipeline Crossing	Encroachment permit

Proposed Findings

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards & Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	☐ None

DETERMINATION: On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

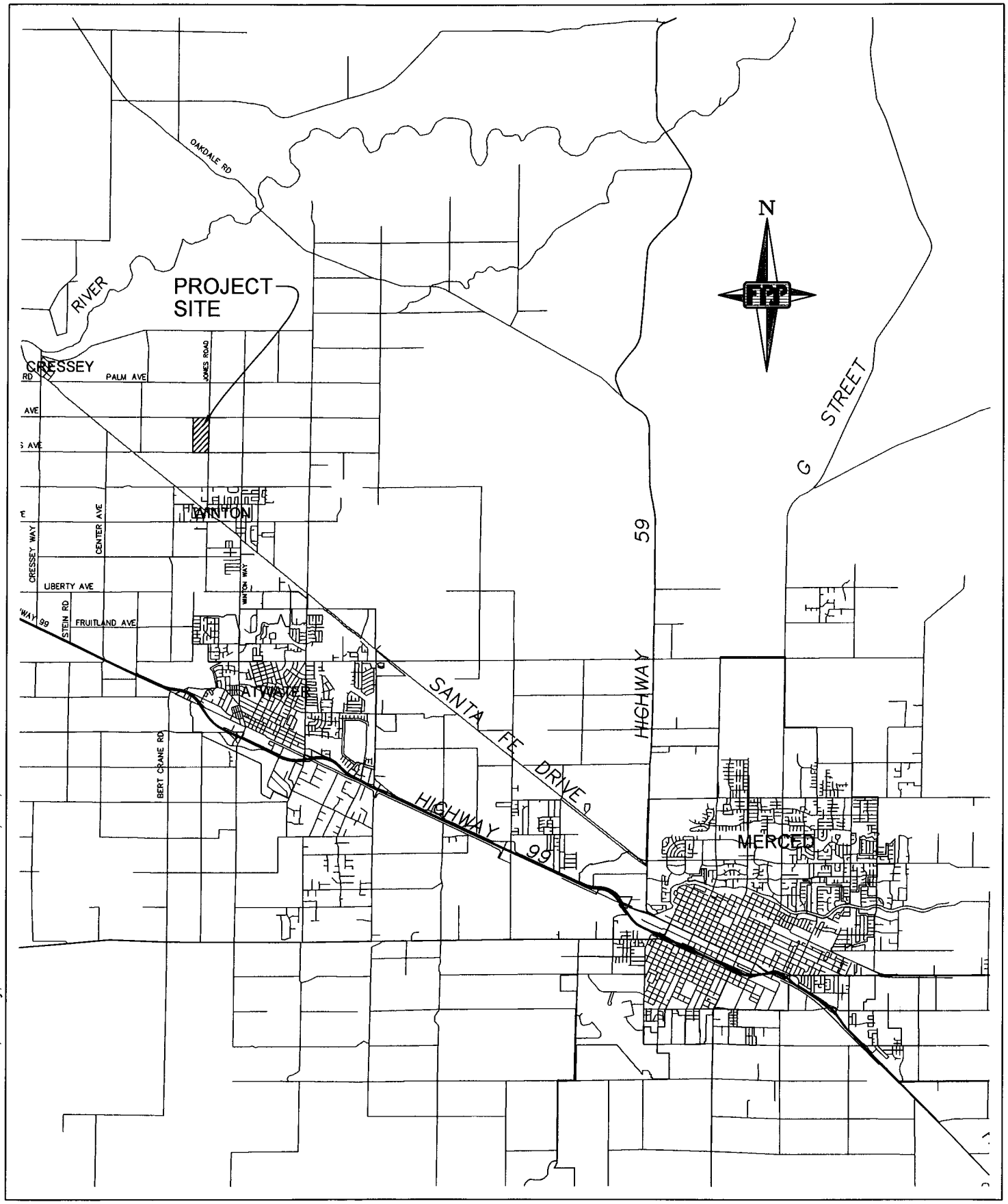
☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project might have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze on the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Printed Name	For



Merced County

Figure 1: Vicinity Map

Source: Merced County Planning Dept., MCAG, 2007

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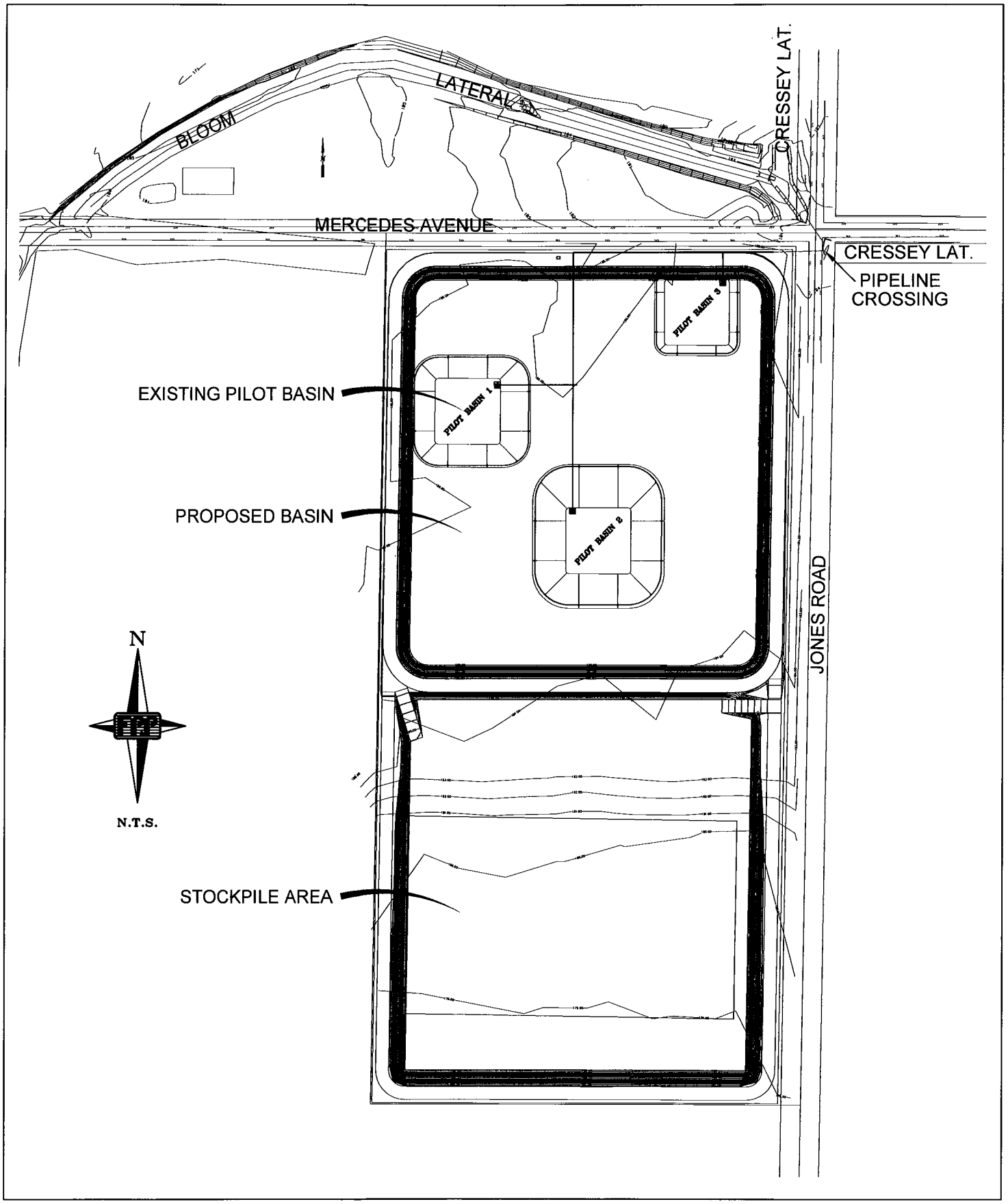

Merced County

Merced Irrigation District
Cressey Pilot Recharge Basin

Figure 2: Site Plan
Source: Fremming, Parson & Pecchenino

Z:\Job\M009-2009B\dwg\M00909BCEQAb.DWG, Site Plan, 3/31/2010 1:11:27 PM, rich, 1:1

Issues

I. AESTHETICS

DISCUSSION

This environmental issue focuses on the impacts of a project on scenic vistas and the overall appearance of the project in the community context. Issues of light and glare, community view-sheds, architectural compatibility with existing development or a specific site or setting are all part of the issue of "Aesthetics" as addressed within the framework of CEQA.

SETTING

The project site is situated in an agricultural area. North, south and east properties are tree farms (almonds) and row crops are to the west of the property

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒

The project site is not located in or near any designated scenic vistas and therefore would not have a substantial effect on a scenic vista (Merced County General Plan, 2000).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historical buildings within a state scenic highway?	☐	☐	☐	☒

The project site is not located near or within a state scenic highway and therefore would not result in damaging scenic resources (Merced County General Plan 2000).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒

The project site currently contains three pilot groundwater recharge basins; and is surrounded by agricultural land. Prior to the installation of the pilot basins the project site was farmed for strawberry production. The proposed project will not substantially degrade the existing visual character or quality of the site or its surroundings.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

The project may include short-term construction lighting. The proposed project will not create a new source of substantial light or glare.

II. AGRICULTURAL RESOURCES

DISCUSSION

This environmental issue focuses on the impact of a project on farmland and agricultural productivity. Environmental concerns focus on the loss of agricultural cropland as inventoried by the Farmland Mapping and Monitoring Program (FMMP) of the California Resources Agency as well as agricultural zoning and Williamson Act Contract lands. An additional area of concern is the potential changes resulting from a project that could lead to future conversion of agricultural lands to non-agricultural uses.

SETTING

According to the Farmland Mapping and Monitoring Program of the California Resources Agency, the site is designated as "Prime Farmland."

EVALUATION

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒

The project site lies within an area that is designated as "Prime Farmland" according to the Farmland Mapping and Monitoring Program, but the existing use is that of recharge basins and the prior use was for strawberry production. The project will not convert prime farmland to non-agricultural use.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒

The project site is not under Williamson Act control.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project involve other changes in the existing environment which, due to their location and nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

The project site is adjacent to farmland, but will not have an effect that would result in the conversion of Farmland to non-agricultural use.

III. AIR QUALITY

DISCUSSION

This environmental issue focuses on the impacts of a project on air quality. Issues over project consistency with applicable air quality plans, policies and regulations, increases of any pollutant for which the area has been designated as a "non-attainment" area. Additional concerns are over the exposure of sensitive receptors, such as people, to high levels of air pollution or odors.

SETTING

The proposed site is located in Merced County, which is designated a part of the San Joaquin Valley Air Pollution Control District (SJVAPCD).

EVALUATION

Where applicable, the significant criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐

The only potential for conflict with the air quality plan of the SJVAPCD is during the construction phase.

The San Joaquin Valley Air Basin is classified as non-attainment for Ozone and particulate matter (PM_{10}). Any increase in these pollutants is considered to be substantial. Air emissions resulting from trenching and excavation include the use of internal combustion engines and the generation of dust. These emissions would have a less than significant impact on overall air quality.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐

The only conflict with air quality standards will occur during the construction phase as vehicles and equipment generate PM_{10}, i.e. dust. Though temporary and less than significant, standard dust suppression measures will be implemented. The proposed project is not growth inducing and does not signify a prolonged or substantial violation of air quality standards.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors?	☐	☐	☐	☒

The reduction of dust during construction of the basin will be handled through the use of water trucks. This will reduce the construction dust to a level deemed to be less than significant.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐

The proposed project will not expose sensitive receptors to substantial pollutant concentrations. Any emissions of PM_{10} during construction, though temporary and less than significant, will be reduced by standard practices to suppress dust and other air-borne particulate matter.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the project create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

The propose basin is situated in an agricultural area, will not generate ordors and will not affect a substantial number of people.

IV. Biological Resources

Discussion

This environmental issue focuses on the impacts of a project on biological resources such as sensitive plant or animal species or their habitat, or riparian habitat or interference with the normal movements of wildlife species in the vicinity of a project. Additional concerns focus on

consistency of a project with adopted plans, policies and regulations regarding wildlife, habitat conservation planning, local wildlife preservation plans and policies or wetlands.

A *"baseline biological resource assessment"* was conducted by Moore Biological Consultants on December 3. The full report (dated January 9, 2010) is attached at the end of this document.

SETTING

The project site is situated in an agricultural area. North, south and east properties are tree farms (almonds) and row crops are to the west of the property.
The proposed site is not within a Resource Conservation Area or Resource Management Area (Merced County General Plan, 2000).

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project have substantial adverse effect, either directly or indirectly or through habitat modifications, on any species indentified as a candidate, sensitive, or special status species in local or regional plans, policies or regulations, or by the California Departments of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒

The project involves the construction of a basin on a site that already contains three pilot basins and the prior use was for strawberry production.
Moore's report reveals that "due to lack of suitable habitat, no special-status plant species are expected to occur at the site" and "The potential for intensive use of habitats at the site by special-status wildlife species is considered extremely low." Additionally, "Swainson's hawk could be disturbed by construction if they nested near the project area during construction" and "burrowing owl could potentially occur in the area"; however, "[the project] would not result in a loss of potential or actual Swainson's hawk foraging habitat or burrowing owl nesting or foraging habitat." (Items in quotations are from Moore's report).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact

b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒

The site and area of the proposed project contains no important riparian habitat or any sensitive natural community as identified by any federal, state or regional agency.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

The project site does not contain wetlands.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐

"With the exception of Swainson's hawk and burrowing owl, no special-status wildlife species are expected to occur in or near the site on more than a very occasional or transitory basis." (Moore)

Moore recommends:

IV-1 Pre-construction surveys for nesting Swainson's hawks in the project area should be conducted if construction commences between March 1 and September 15. The survey should include all large trees visible from the site. If active nests are found, a qualified biologist should determine the need (if any) for temporal restrictions on construction.

IV-2 Pre-construction surveys for burrowing owls in the project area should be conducted if construction commences between February 1 and August 31. The survey should include the ruderal areas at the site. If occupied burrows are found, a qualified biologist should determine the need (if any) for temporal restrictions on construction."

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the project conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance?	☐	☐	☐	☒

The project site is not within a Resource Conservation Area or Resource Management Area (Merced County General Plan, 2000), nor would it conflict with any known policies protecting biological resources.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

There is no adopted Habitat Conservation Plan or Natural Community Conservation Plan or other approved local, regional, or State habitat conservation plan on or around the proposed development site (Merced County General Plan, 2000). The project would have no effect upon fish or wildlife resources.

V. Cultural Resources

Discussion

This environmental issue focuses on the impacts of a project on cultural resources including, but not limited to, the adverse change to a significant historical or archaeological resource. Other areas of concern include the potential for a project to adversely impact a unique paleontological resource or geologic feature or disturb any human remains.

Setting

The project site is situated in an agricultural area. North, south and east properties are tree farms (almonds) and row crops are to the west of the property

Evaluation

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒

The project area and adjacent areas are not known to contain any historical resource as defined in §15064.5 of the CEQA Guidelines.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒

There is no evidence of potential archaeological resources at the proposed site or in the vicinity. The project would not cause a substantial adverse change pursuant to CEQA guidelines.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

The site and area is not known to contain any known unique paleontological resource or site, or a unique geologic feature.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

The construction proposed as part of the project is not expected to impact any human remains, including those interred outside of formal cemeteries. Any deep trenching or excavation is subject to state rules and regulations concerning the uncovering of cultural resource materials.

VI. GEOLOGY AND SOILS

DISCUSSION

This environmental issue focuses on the impacts of natural geologic or soil conditions on a project as well as the impacts of a project on soil erosion.

SETTING

The project site has little topographic relief and will not involve construction activities that will have any impact on the geologic stability of the area.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Will the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslide?	☐	☐	☐	☒

The project site is not located within an area delineated on the Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist. The Merced County General Plan contains a geologic study that shows the project site is located in an area with relatively low exposure to seismic risk. Since the site is flat, there is no danger of landslides (Merced County General Plan, 2000).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐

The project area will be managed with the growth of native grasses and weeds, the stock pile area will be maintained with BMP's for erosion control.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒

The site is not located on a geological unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse as identified in the county general plan (Merced County General Plan, 2000).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (2001), creating substantial risks to life or property?	☐	☐	☐	☒

The proposed site does not contain expansive soil as defined in Table 18-1-B of the Uniform Building Code (2001).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

The use of septic tanks or alternative wastewater disposal systems are not a part of this project.

VII. HAZARDS AND HAZARDOUS MATERIALS

DISCUSSION

This environmental issue focuses on the impacts of a project with respect to hazards. The creation of new hazardous conditions or activities that will result in people or property being exposed to existing hazards is the primary area of focus under this environmental issue. Hazards include, but are not limited to, hazardous materials, hazards associated with aircraft and airports or wild land fires. An additional concern is the consistency of a project with emergency response plans or emergency evacuation plans.

SETTING

The project site does not have a history of hazardous materials being present or a history of land uses that would involve the use or storage of hazardous materials. The Hazardous Waste site inventory of Merced County and the State Department of Health Services did not reveal the existence of any hazardous conditions on the project site.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒

The project will not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒

The project will not create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒

The project will not emit hazardous emissions of any kind.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

The project is not located on a site that is included on a list of hazardous waste sites compiled pursuant to Government Code Section 65962.5. The project site is not on the Hazardous Waste and Substances Site List (Cortese List) (California Environmental Protection Agency, 2007).

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

The project is not located in the vicinity of any airport land use plan.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

The project is not located within the vicinity of a private airstrip.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
g) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

The project does not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan within the county.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
h) Would the project expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

The proposed site is not susceptible to wild land fires.

VIII. HYDROLOGY AND WATER QUALITY

DISCUSSION

This environmental issue focuses on the impacts of a project on surface and groundwater, including compliance with water quality standards and regulation, depletion of groundwater supplies, pollution or degrading of water quality. Additional concerns include water-related hazards such as flooding, mudflows and similar hazards. This area of environmental concern also addresses potential project impacts on area drainage, including storm water runoff.

SETTING

The project site is situated in an agricultural area. North, south and east properties are tree farms (almonds) and row crops are to the west of the property. The function of the proposed basin is to recharge the ground water.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒

The proposed project will not violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒

The proposed project is designed to recharge the local groundwater table.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒

The proposed project will not alter drainage patterns of the area, including through the alteration of the course of a stream or river, which would result in substantial erosion or siltation on- or off-site.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒

The project would not substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the site create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒

The project would not create nor contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional resources of polluted runoff.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) Would the project otherwise substantially degrade water quality?	☐	☐	☐	☒

The project would not violate water quality standards.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
g) Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

The project does not call for the construction of any housing.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
h) Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒

The project does not propose any structures that would impede or redirect flood flows.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
i) Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒

The project would not expose people or structures to flooding.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
j) Would the project be subject to inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

The project area is not susceptible to seiches, tsunamis, or mudflows.

IX. Land Use and Planning

Discussion

This environmental issue focuses on the impacts of a project on adopted land use, habitat conservation or natural community conservation plans. The specific focus of this area of environmental concern is potential conflicts with established plans and policies or the potential for the project to physically divide a community.

Setting

The project site is within Merced County and is designated Agricultural by the General Plan (see Figure 3, page 27). There are no established communities within the vicinity of the project site that would be divided as a result of the project. The project lies adjacent to areas that are zoned Agricultural (see Figure 4, page 28).

Evaluation

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project physically divide an established community?	☐	☐	☐	☒

No change in surrounding land uses will occur as a result of the project.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal programs, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

The project does not involve any change to, or conflict with, applicable land use plans, policies or regulations.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

There are no habitat conservations plans within the general vicinity of the project.

Merced County

- A - Agriculture
- A-R - Agricultural Residential
- CPF - Future Community Park
- NP/NPF - Neighborhood Park/Future Neighborhood Park
- LD - Low Density Residential
- MD - Medium Density Residential
- HD - High Density Residential
- ES/ESF - Elementary School/Future Elementary School
- HS/MSF - High School/Future Middle School
- GC - General Commercial
- NC - Neighborhood Commercial
- IND - Industrial
- MU - Mixed Use
- BP - Business Park
- UR - Urban Reserve

Figure 3: General Plan

Source: Merced County Planning Dept., MCAG, 2007

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Merced County

A-1	- General Agriculture	R-1	- Single-Family Residential
A-R	- Agricultural Residential	R-1-5000	- Single-Family Residential
C-1	- Neighborhood Commercial	R-2	- Two-Family Residential
C-2	- General Commercial	R-3	- Multi-Family Residential
C-3	- Heavy Commercial	R-4	- Multi-Family Residential
M-1	- Light Manufacturing		

Figure 4: Zoning

Source: Merced County Planning Dept., MCAG, 2007

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X. MINERAL RESOURCES

DISCUSSION

This environmental issue focuses on the impacts of a project on known mineral resources of commercial or otherwise documented economic value.

SETTING

The project site is located on land that is listed as having the potential for mineral resources in the area as shown on the maps in the California Department of Conversation Division of Mines and Geology Mineral Land Classification of Merced County, California. The site is located in an area that is not listed as having the potential for sand or gravel resources on Map 21 of the county's General Plan.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?	☐	☐	☐	☒

There are no known mineral resources at the site of the proposed project.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

The project is not located in an area designated on the County General Plan, or by any plan, as a locally important mineral resource recovery site.

XI. NOISE

DISCUSSION

This environmental issue focuses on the impacts of a project with respect to noise or ground-borne vibration. The creation of new noise or ground-borne vibration conditions or activities that will result in people or property being exposed to existing noise or vibrations is the primary area of focus under this environmental issue.

SETTING

The proposed recharge basin facility will not have any equipment that would provide a continues noise at the site. The normal operations at the site would involve the use of farm type equipment to control weeds and rake the bottom of the basin.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐

The Merced County General Plan sets a maximum exterior noise level standard for residences of 65 dBA and an interior noise level standard of 45 dBA.

Noise will be produced during the construction phase of the basin excavation. The short-term nature of the construction noise is not seen as significant and adverse.

Construction activities will be temporary in nature and will only occur during the daytime hours. Construction noise impacts could result in annoyance or sleep disruption for nearby residents if nighttime operations were to occur or if equipment is not properly muffled or maintained. Construction noise will be temporary and will have a less than significant impact.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project result in exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?	☐	☐	☐	☒

The basin will not produce vibration or noise.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.	☐	☐	☐	☒

There will be no substantial permanent increase in ambient noise levels.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐

The project will result in the periodic noise increase during construction. The ambient noise generated by the project will not contribute substantially to the noise levels from the adjacent farmlands.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

The project site is not located within two miles of a public airport or public use airport.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

The project site is not located within two miles of a private airstrip.

XII. POPULATION AND HOUSING

DISCUSSION

This environmental issue focuses on the impacts of a project on population and housing including population growth or displacement of human population and housing. Assumptions regarding population growth, housing demand and employment are the primary driving force for local governmental land use decision-making.

SETTING

The proposed recharge basin facility will not have an impact on population or housing through the recharge of the ground water in the area of the basin.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒

The proposed project will not induce substantial unplanned population growth in the area either directly or indirectly.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

The proposed project does not include the development or removal of any residential structures.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

The proposed project does not result in the need to construct housing.

XIII. PUBLIC SERVICES

DISCUSSION

This environmental issue focuses on the impacts of a project on public service facility needs and the potential environmental impacts of developing and/or expanding these facilities. Facility needs can be defined by the need to maintain acceptable levels of service such as response times, or such other community service standard as may apply.

SETTING

The project lies within and is surrounded by agricultural areas.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒

Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

The project would not increase the demand for fire and police protection, schools, parks, or other public facilities.

XIV. RECREATION

DISCUSSION

This environmental issue focuses on the impacts of a project on public recreation and facility needs and the potential environmental impacts of developing and/or expanding recreation facilities. Facility needs can be defined by the need to maintain acceptable levels of community recreation service in the area and region.

SETTING

The project lies within and is surrounded by agricultural areas.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

The proposed project will not contribute to the increase use of existing parks or recreational facilities.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

The proposed project does not include recreational facilities nor will it increase demand for recreational facilities.

XV. TRANSPORTATION/TRAFFIC

DISCUSSION

This environmental issue focuses on the impacts of a project on transportation systems including roads and highways, public transportation systems, pedestrian circulation and access, parking, and emergency access. Impacts can be in the form of new hazardous circulation or traffic conditions, conflict with existing plans or policies or creation of an unacceptable traffic level on a transportation system or facility.

SETTING

The proposed project lies in a rural and agricultural area and will not increase the existing traffic level or alter circulation patterns.

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ration on roads, or congestion at intersection)?	☐	☐	☒	☐

The project will generate a temporary and slight increase in traffic during construction.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒

The project has no potential to exceed a level of service standard established by the Merced County Association of Governments (MCAG), the County Congestion Management Agency, for designated roads or highways.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project result in change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒

The project will not affect air traffic patterns.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒

The project will neither create nor alter roadways in a manner that would increase hazards or result in an incompatible use.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the project result in inadequate emergency access?	☐	☐	☐	☒

The project will conform to all applicable County emergency access standards.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) Would the project result in inadequate parking capacity?	☐	☐	☐	☒

Parking will not be necessary for the project after construction is complete.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
g) Would the project conflict with adopted policies, plans or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

No traffic will be generated by the project once it becomes operational, traffic patterns will remain similar to or less than the levels for the prior farming operation. The project would not conflict with adopted policies, plans or programs supporting alternative transportation.

XVI. Utilities and Service Systems

Discussion

This environmental issue focuses on the impacts of a project on public utility systems or facilities such as water, wastewater, storm water drainage or other utility or service systems.

Setting

The proposed basin is designed to recharge the ground water. The project will have no direct impact on wastewater treatment facilities or storm drainage systems.

Evaluation

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒

The proposed project has no wastewater treatment requirements.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

The proposed project will not require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities that would cause significant environmental effects.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Would the project require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

The project will not result in the construction of new storm water drainage facilities.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
d) Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒

The proposed project has sufficient water supplies available and would not require new or expanded entitlements.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
e) Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒

The proposed project will not generate additional demands for wastewater.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
f) Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒

Any disposal of solid waste, such as construction material or removed asphalt, will be minor and short-term.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
h) Would the project comply with federal, state and local statutes and regulations related to solid waste?	☐	☐	☐	☒

The proposed project will comply with all relevant federal, state and local statutes and regulations related to solid waste.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

EVALUATION

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restricts the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒

The project will not have any impacts on wildlife species, rare or endangered plant species or eliminate major periods of California history or prehistory.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, and the effects of probable future projects)?	☐	☐	☐	☒

On the basis of the analysis of the project and its potential adverse physical environmental impacts, it has been determined that the project does not have impacts that are individually limited but cumulatively considerable.

	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporation	Less than Significant Impact	No Impact
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

A review of the potential environmental effects of the proposed recharge basin facility have resulted in the determination that the project design, location or general characteristics will not result in any substantial adverse effects on human beings either directly or indirectly.

MOORE BIOLOGICAL CONSULTANTS

January 9, 2010

Mr. Garth Pecchenino
Fremming, Parson & Pecchenino, Inc.
2816 Park Avenue
Merced, CA 95348-3375

Subject: MERCED IRRIGATION DISTRICT'S "CRESSEY BASIN PROJECT", MERCED COUNTY, CALIFORNIA: BIOLOGICAL ASSESSMENT

Dear Garth:

Thank you for asking Moore Biological Consultants to conduct a baseline biological resources assessment of the Merced Irrigation District's (MID) Cressey Basin Project (Figures 1, 2 and 3). The focus of our work was to document existing biological resources at the site, conduct a survey to determine presence or absence of waters of the U.S. and wetlands, and search for suitable habitat for or presence of special-status species. This letter report details the methodology and results of our investigation.

Methods:

Prior to the field survey, we conducted a search of California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB, 2009). This information was used to identify special-status species that have been previously documented in the greater project vicinity or have the potential to occur based on presence of suitable habitat and geographical distribution. Since the site is in the west part of the USGS 7.5-minute Winton topographic quadrangle, the CNDDB

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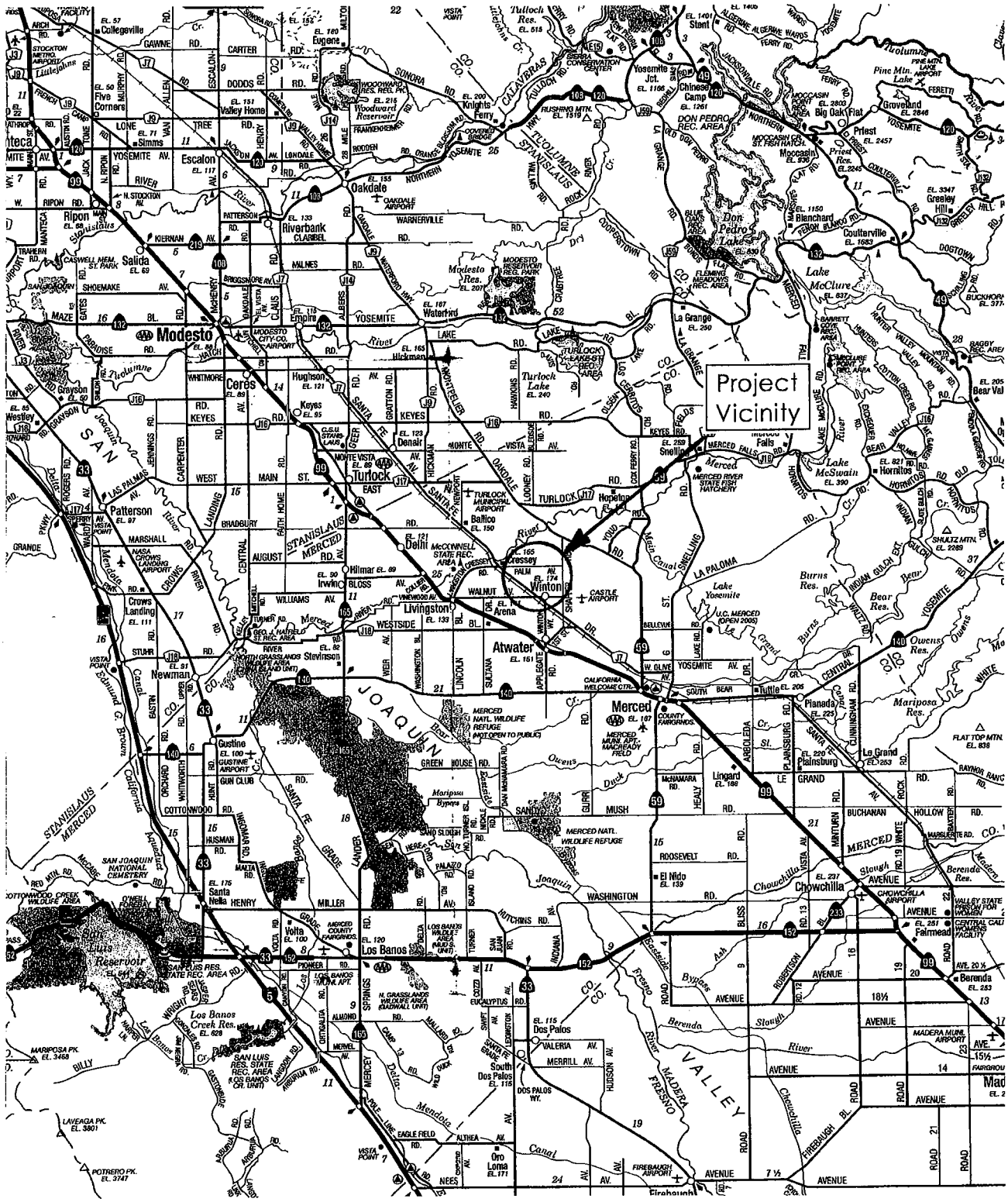

Scale: 1 inch = 9 miles
Source: Calif. State Automobile Association

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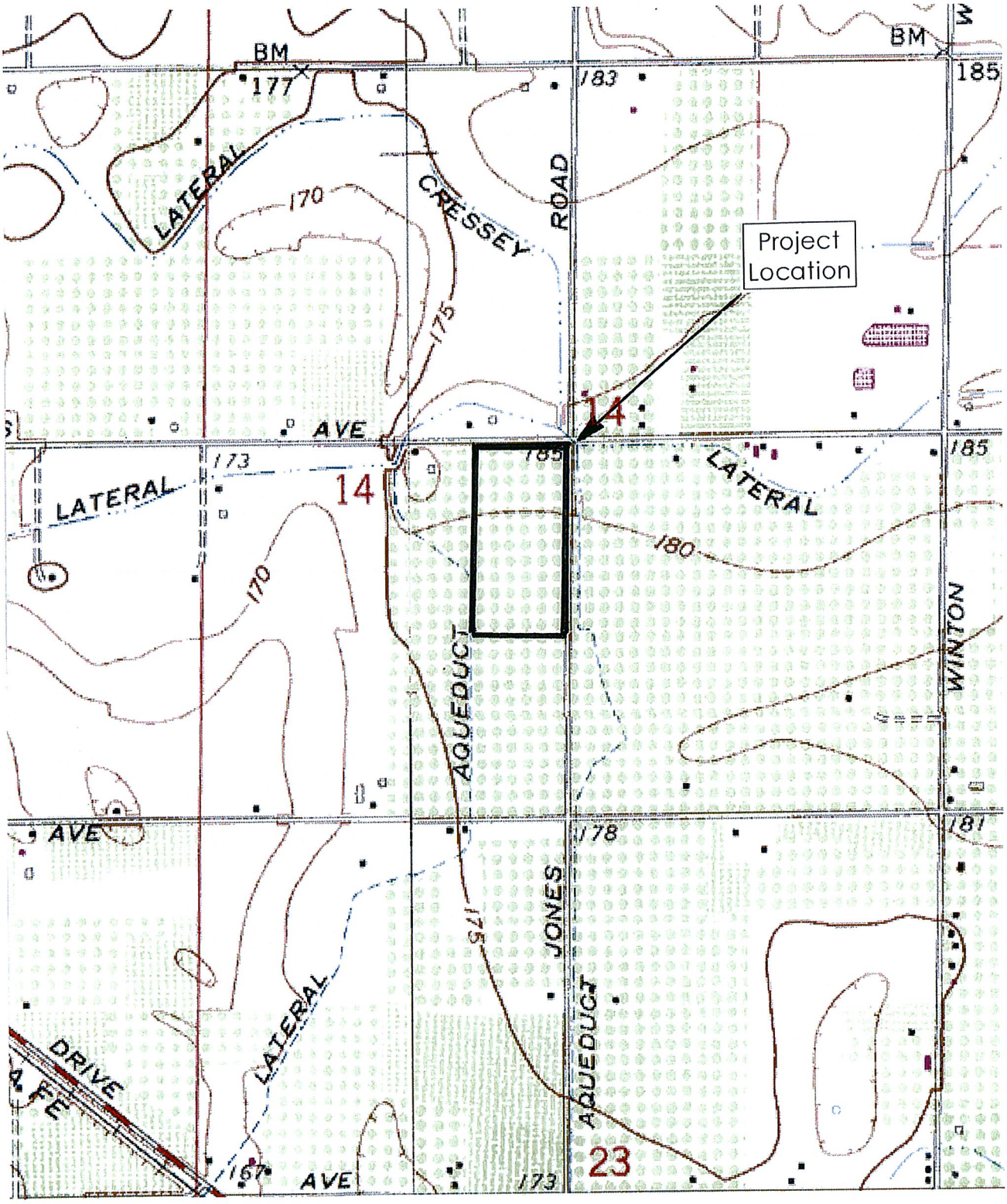
FIGURE 1
PROJECT VICINITY



Scale: 1 inch = 1,000 feet

Source: USGS 7.5-minute Cressey and Winton topographic quadrangles

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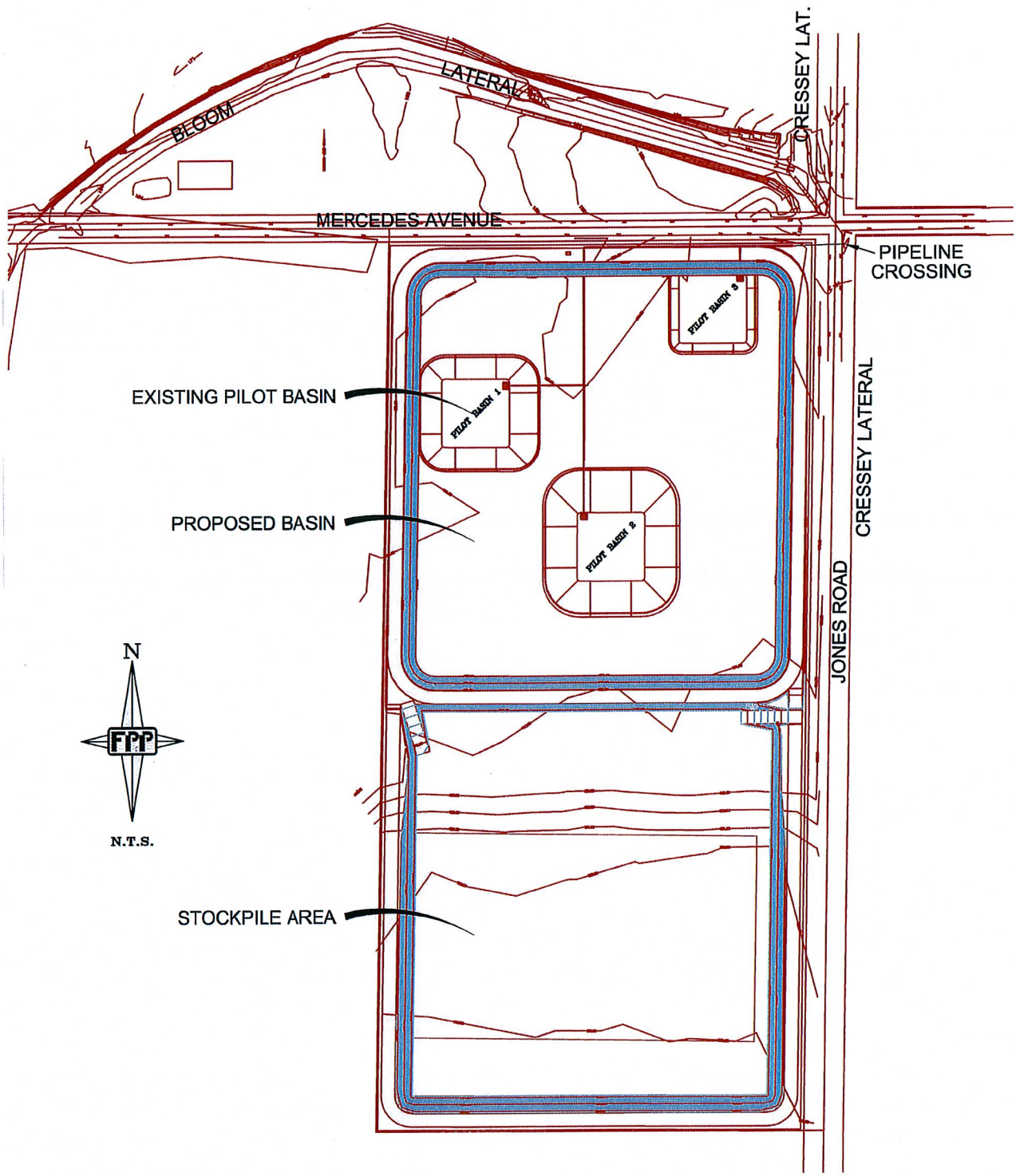
FIGURE 2
PROJECT LOCATION



Scale: 1 inch = 225+/- feet

Source: Fremming, Parson & Pecchenino

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FIGURE 3
SITE LAYOUT

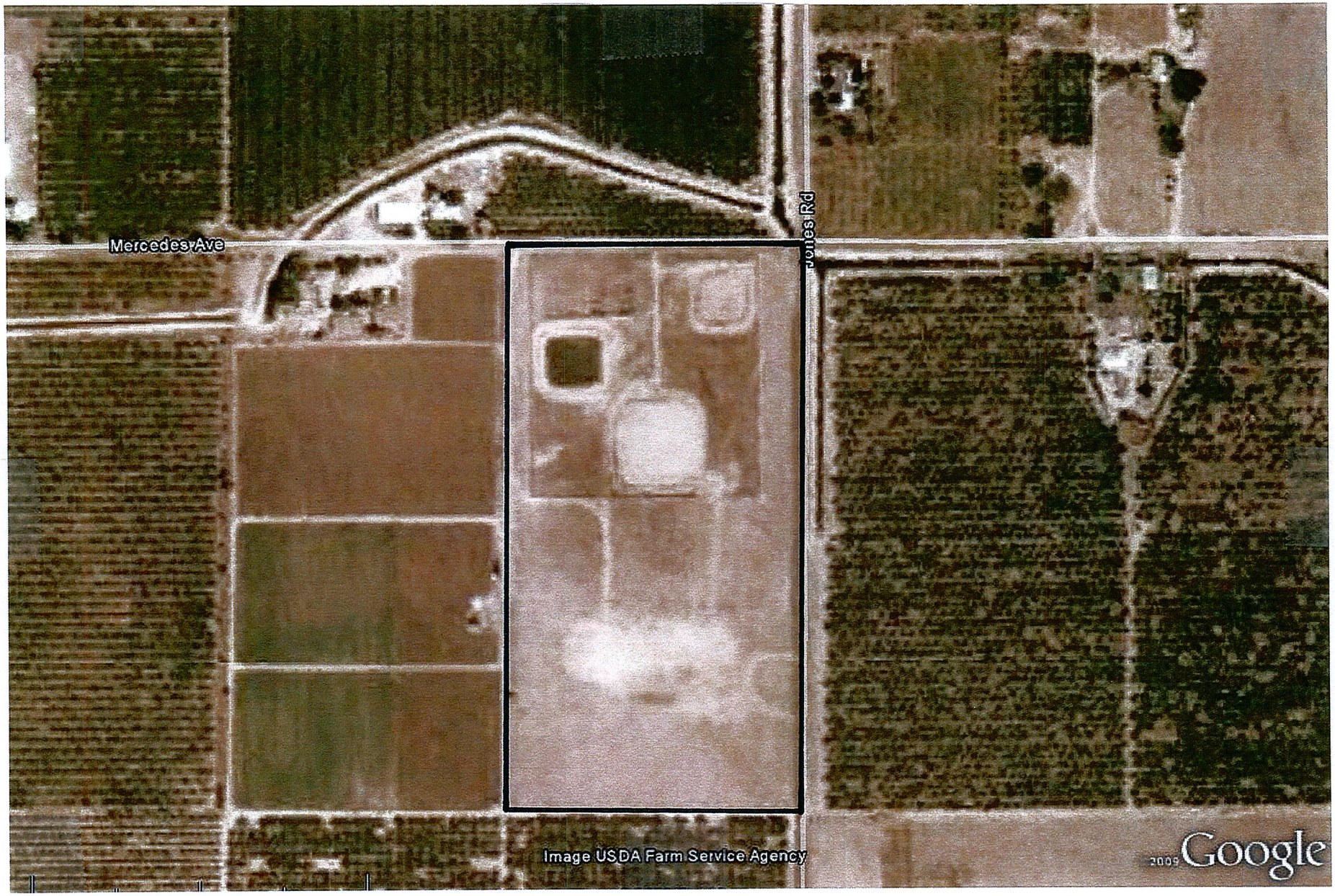
search area encompassed this quadrangle, and the Cressey quadrangle, which are situated to the west of the site. This CNDDB search area is approximately 120 square miles surrounding the site.

A field survey was conducted on December 3, 2009. The survey consisted of driving and walking around the site, making observations and noting habitat conditions, surrounding land uses, and plant and wildlife species. We conducted an assessment of potentially jurisdictional Waters of the U.S. and wetlands as defined by the U.S. Army Corps of Engineers (ACOE, 1987; 2008), and a search for sensitive species, and suitable habitat for sensitive species (e.g., blue elderberry shrubs, vernal pools). Additionally, trees near the site were assessed for potential use by nesting raptors, especially Swainson's hawk (*Buteo swainsoni*). The site and adjacent areas were also searched for burrowing owl (*Athene cunicularia*) or burrows that could be used by burrowing owls.

Results:

GENERAL SETTING: The project site is located just northwest of Winton, in Merced County, California (Figure 1). The site is located in Section 36, in Township 6 South, Range 12 East of the USGS 7.5-minute Winton topographic quadrangle (Figure 2). The site is relatively flat and is at an elevation of approximately 180 feet above mean sea level. Lands surrounding the site are primarily orchards and fields farmed in alfalfa and other grain crops (Figure 4).

VEGETATION: Habitats in the site are highly disturbed by past grading related to the construction and operation of a few pilot recharge basin. The sandy on-site soils are sparsely vegetated with various annual grass and weed species. Filaree (*Erodium* spp.), common mallow (*Malva neglecta*), black mustard (*Brassica nigra*), telegraph weed (*Heterotheca grandiflora*), citronmelon (*Citrullus lanatus*), prickly lettuce (*Lactuca serriola*), pigweed (*Amaranthus albus*), and Bermuda grass (*Cynodon dactylon*) are dominant species in the ruderal habitats at the site.



Source: Google Earth

Scale: 1 inch = 300 feet

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FIGURE 4

8/29/06 AERIAL PHOTOGRAPH

There are no trees or shrubs of any kind at the site. No blue elderberry (*Sambucus mexicana*) shrubs were observed within or adjacent to the site.

WILDLIFE: A limited number of wildlife species were observed at the site. Some of the more common birds observed include mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), and house finch (*Carpodacus mexicanus*). All of these are species commonly found in agricultural areas in the project vicinity.

There are very few large trees near the site that are suitable for nesting raptors and other protected migratory birds, including Swainson's hawk. The only trees beyond small orchard trees near the site are ornamentals associated with residences northwest and northeast of the site. These trees are likely used by nesting songbirds and possibly raptors during some years.

A limited number of mammals common to agricultural and semi-rural areas are expected to use habitats at the site. However, no mammals or sign of mammals (i.e., tracks, scat) was detected in the area during the recent survey. Coyote (*Canis latrans*), raccoon (*Procyon lotor*), black-tailed hare (*Lepus californicus*), striped skunk (*Mephitis mephitis*) and Virginia opossum (*Didelphis virginiana*) are expected to occur in the area on occasion. A number of species of small rodents including mice (*Mus musculus, Reithrodontomys megalotis,* and *Peromyscus maniculatus*) and voles (*Microtus californicus*) also likely occur. No California ground squirrels (*Spermophilus beecheyi*) or ground squirrel burrows were observed in the site.

Based on habitat types present a very limited variety of amphibians and reptiles are expected to use habitats at the site. No reptiles or amphibians were observed during the 2009 survey. Although none were observed, lands in and adjacent to the site provide suitable habitat for species including western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), western toad

(*Bufo boreas*), coast horned lizard (*Phrynosoma coronatum*), gopher snake (*Pituophis melanoleucus*), and common garter snake (*Thamnophis sirtalis*).

WATERS OF THE U.S. AND WETLANDS: Waters of the U.S., including wetlands, are broadly defined under 33 Code of Federal Regulations (CFR) 328 to include navigable waterways, many of their tributaries, and adjacent wetlands. State and federal agencies including CDFG and ACOE, and California Regional Water Quality Control Board have jurisdiction over these habitats Jurisdictional wetlands are vegetated areas that meet specific vegetation, soil, and hydrologic criteria defined by the ACOE *Wetlands Delineation Manual* and Regional Supplement (ACOE, 1987; 2008). Waters of the U.S. are drainage features or water bodies as described in 33 CFR 328.4.

No potentially jurisdictional waters of the U.S. or wetlands of any type were observed at the site. There are no areas at the site that appear to have any potential to fall under the jurisdiction of ACOE and/or CDFG. Specifically, no vernal pools, seasonal wetlands, marshes, ponds, or lakes of any type were observed.

The only potentially jurisdictional waters of the U.S. observed on lands adjacent to the site are MID's Bloom Lateral and Cressey Lateral. These laterals derive water from the Merced River to the north of the site and return excess water back to the Merced River several miles west of the site. These laterals have potential to fall under ACOE jurisdiction due to this hydrological connectivity with jurisdictional waters.

SPECIAL-STATUS SPECIES: Special-status species are plants and animals that are legally protected under the state and/or federal Endangered Species Act or other regulations. The Federal Endangered Species Act (FESA) of 1973 declares that all federal departments and agencies shall utilize their authority to conserve endangered and threatened plant and animal species. The California Endangered Species Act (CESA) of 1984 parallels the policies of FESA and

pertains to native California species. Both FESA and CESA prohibit unauthorized "take" (i.e., killing) of listed species, with take broadly defined in both acts to include activities such as harassment, pursuit and possession.

Special-status wildlife species also includes species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or denning locations, communal roosts, and other essential habitat. The federal Migratory Bird Treaty Act and Fish and Game Code of California protect special-status bird species year-round, as well as their eggs and nests during the nesting season. Fish and Game Code of California also provides protection for mammals and fish.

Special-status plants include species that are designated rare, threatened, or endangered and candidate species for listing by the U.S. Fish and Wildlife Service (USFWS). Special-status plants also include species considered rare or endangered under the conditions of Section 15380 of the California Environmental Quality Act (CEQA) Guidelines, such as those plant species identified on Lists 1A, 1B and 2 in the Inventory of Rare and Endangered Vascular Plants of California by the California Native Plant Society (CNPS, 2001). Finally, sensitive plants may include other species that are considered sensitive or of special concern due to limited distribution or lack of adequate information to permit listing or rejection for state or federal status, such as those included on List 3 in the CNPS Inventory.

Table 1 provides a summary of the listing status and habitat requirements of special-status plant and wildlife species that have been documented in the greater project vicinity or for which there is potentially suitable habitat in the project area. This table also includes an assessment of the likelihood of occurrence of each of these species at the site. The evaluation of the potential for occurrence of each species is based on the distribution of regional occurrences (if any), habitat suitability, and field observations.

TABLE 1

SENSITIVE PLANT AND WILDLIFE SPECIES DOCUMENTED OR POTENTIALLY OCCURRING IN THE PROJECT VICINITY

Common Name	Scientific Name	Federal Status[1]	State Status[2]	CNPS List[3]	Habitat	Potential for Occurrence in the Site
Plants						
Succulent owl's clover	*Castilleja campestris ssp. succulenta*	T	E	1B	Vernal pools within the Central Valley	Extremely low: there are no vernal pools or seasonal wetlands in the site. The nearest occurrence of succulent owl's clover in the CNDDB (2009) is located approximately 4 miles southeast of the site.
San Joaquin Valley orcutt grass	*Orcuttia inaequalis*	T	E	1B	Vernal pools within the Central Valley.	Extremely low: there are no vernal pools or seasonal wetlands in the site. There are three occurrences of San Joaquin Valley orcutt grass in the CNDDB (2009) approximately 4 to 6 miles north and northwest of the site.
Wildlife						
Mammals						
Western mastiff bat	*Eumops perotis californicus*	None	SC	N/A	Open, dry habitats with crevices in cliff faces, high buildings, trees and tunnels for roosting.	Very low: there is no suitable habitat in the site for this species. The nearest occurrence of western mastiff bat in the CNDDB (2009) is at a bridge over the Merced River approximately 7 miles northeast of the site.
Pallid bat	*Antrozous pallidus*	None	SC	N/A	Open, dry habitats with rocky areas for roosting.	Very low: there are no rocky areas within the site. The nearest occurrence of pallid bat in the CNDDB (2009) is at a bridge over the Merced River bridge approximately 7 miles northeast of the site.
Western red bat	*Lasiurus blossvelli*	None	SC	N/A	Roosts in trees in forests and woodlands from sea level up through the mixed conifer forests of the Sierra Nevada	Very low: there is no suitable habitat in the site for this species. The nearest occurrence of western red bat in the CNDDB (2008) is at a bridge over the Merced River approximately 7 miles northeast of the site.

TABLE 1

SENSITIVE PLANT AND WILDLIFE SPECIES DOCUMENTED OR POTENTIALLY OCCURRING IN THE PROJECT VICINITY

Common Name	Scientific Name	Federal Status[1]	State Status[2]	CNPS List[3]	Habitat	Potential for Occurrence in the Site
Birds						
Swainson's hawk	*Buteo swainsoni*	None	T	N/A	Nests in tall trees associated with agricultural and riparian habitats. Forages for small mammals in agricultural fields or grassland habitats.	Very low: there are only a few potential nest trees near the site and the ruderal habitats in the site are very marginal, yet potentially suitable Swainson's hawk foraging habitat. The CNDDB (2009) contains only 2 records of nesting Swainson's hawks within the 120 square miles search area; the nearest occurrence is approximately 3.5 miles northeast of the site.
Burrowing owl	*Athene cunicularia*	None	SC	N/A	Annual or perennial grasslands, deserts and scrublands, nests in the burrows of small mammals.	Very low: no burrowing owls, ground squirrels, or ground squirrel burrows were observed in or adjacent to the site. Burrowing owls are not documented in the Winton or Cressey topographic quadrangles (CNDDB, 2009).
Reptiles						
Western pond turtle	*Actinemys marmorata*	None	SC	N/A	Permanent or semi-permanent bodies of water in a variety of habitats; require basking sites such as logs.	Very low: there is no suitable habitat for western pond turtle in the site. The nearest occurrence of this species in the CNDDB (2009) is at a waste water treatment plant approximately 6 miles west of the site.
Invertebrates						
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	None	N/A	Vernal pools and seasonally wet depressions within the Central Valley.	Extremely low: there are no vernal pools or seasonal wetlands in the project site. The site is not within an area designated by the U.S. Fish & Wildlife Service as critical habitat for vernal pool species (USFWS, 2005). The closest record of vernal pool fairy shrimp in the CNDDB (2009) is approximately 5.5 miles east of the site.

TABLE 1

SENSITIVE PLANT AND WILDLIFE SPECIES DOCUMENTED OR POTENTIALLY OCCURRING IN THE PROJECT VICINITY

Common Name	Scientific Name	Federal Status[1]	State Status[2]	CNPS List[3]	Habitat	Potential for Occurrence in the Site
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	None	N/A	Elderberry shrubs, usually in Central Valley riparian habitats.	Extremely low: there are no blue elderberry shrubs within or adjacent to the site. The CNDDB (2009) lists the closest occurrences of valley elderberry longhorn beetle on the north side of the Merced River, approximately 3 miles northwest of the site There are two other records of valley elderberry longhorn beetle along the Merced River, a few miles further downstream of the first.
Fish						
Hardhead	*Mylopharodon conocephalus*	None	SC	N/A	Clear and deep pools with sand and gravel bottoms with slow water velocity within the San Joaquin/Sacramento River tributaries.	None: the site contains no suitable aquatic habitat for this species. The nearest occurrence within the CNDDB (2009) is located in the Merced River approximately 7 miles northeast of the site.

1 T= Threatened.

2 T = Threatened; E = Endangered; SC=State of California Species of Special Concern.

3 CNPS List 1B species includes plants that are rare, threatened, or endangered in California and elsewhere.

SPECIAL-STATUS PLANTS: Special-status plants generally occur in relatively undisturbed areas within vegetation communities such as vernal pools, seasonal wetlands, marshes, swamps, riparian scrub, and areas with unique soils. Succulent owl's clover (*Castilleja campestris ssp. succulenta*) and San Joaquin Valley orcutt grass (*Orcuttia inaequalis*) are the only special-status plant species recorded in project area in the CNDDB (2009) query. Both of these species occur in vernal pool habitats, which are not present in the site. The ruderal habitats in the site are highly disturbed and are not suitable habitat for special-status plants. Due to lack of suitable habitat, no special-status plant species are expected to occur at the site.

SPECIAL-STATUS WILDLIFE: The potential for intensive use of habitats at the site by special-status wildlife species is considered extremely low. Special-status wildlife species recorded in project area in the CNDDB (2009) query include western mastiff bat (*Eumops perotis californicus*), pallid bat (*Antrozous pallidus*), western red bat (*Lasiurus blossvelli*), Swainson's hawk, western pond turtle (*Actinemys marmorata*), vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and hardhead (*Mylopharodon conocephalus*). Burrowing owl was added to Table 1 because it is widespread in Central Valley agricultural and ruderal habitats.

While the project area may have provided habitat for some of the special-status wildlife species listed in Table 1 at some time in the past, farming and development in surrounding parcels, and construction and maintenance of the pilot recharge basins at the site and have substantially modified natural habitats. Of the wildlife species identified in the CNDDB, Swainson's hawk is the only species that has potential to occur at the site on more than a transitory or very occasional basis. Swainson's hawk could be disturbed by construction if they nested near the project area during construction. Other special-status birds may fly over the area on occasion, but would not be expected to nest at the site. There is no habitat in the project area for the remaining species in Table 1. Finally, although not recorded in the CNDDB within the search area, burrowing

owl is discussed below as it could potentially occur in the area could be disturbed by construction if they nested in or near the project area during construction.

SWAINSON'S HAWK: The Swainson's hawk is a migratory hawk listed by the State of California as a Threatened species. The Migratory Bird Treaty Act and Fish and Game Code of California protect Swainson's hawks year-round, as well as their nests during the nesting season (March 1 through September 15). Swainson's hawk are found in the Central Valley primarily during their breeding season, a population is known to winter in the San Joaquin Valley.

Swainson's hawks prefer nesting sites that provide sweeping views of nearby foraging grounds consisting of grasslands, irrigated pasture, hay, and wheat crops. Most Swainson's hawks are migratory, wintering in Mexico and breeding in California and elsewhere in the western United States. This raptor generally arrives in the Central Valley in mid-March, and begins courtship and nest construction immediately upon arrival at the breeding sites. The young fledge in early July, and most Swainson's hawks leave their breeding territories by late August.

The CNDDB (2009) contains only two records of nesting Swainson's hawk in the 120+/- square mile search area. The ruderal habitats in the site are very marginal, yet potentially suitable Swainson's hawk foraging habitat. There are areas of open grassland and croplands near the site that are more likely to be used by foraging Swainson's hawks. There are no trees in the site, but a few of the relatively larger trees in the overall project area may be used during some years by nesting Swainson's hawks.

BURROWING OWL: The Migratory Bird Treaty Act and Fish and Game Code of California protect burrowing owls year-round, as well as their nests during the nesting season (February 1 through August 31). Burrowing owls are a year-long resident in a variety of grasslands as well as scrub lands that have a low density

of trees and shrubs with low growing vegetation; burrowing owls that nest in the Central Valley may winter elsewhere.

The primary habitat requirement of the burrowing owl is small mammal burrows for nesting. The owl usually nests in abandoned ground squirrel burrows, although they have been known to dig their own burrows in softer soils. In urban areas, burrowing owls often utilize artificial burrows including pipes, culverts, and piles of concrete pieces. This semi-colonial owl breeds from March through August, and is most active while hunting during dawn and dusk. Burrowing owls are not documented in the Winton or Cressey topographic quadrangles (CNDDB, 2009.

No burrowing owls, ground squirrels, or ground squirrel burrows were observed in the site during the recent survey. There is open grassland and cropland to the west to site that could be used by foraging burrowing owls. Although it is considered unlikely, burrowing owls could nest in the project area the future.

Conclusions and Recommendations:

- The site is highly disturbed and sparsely vegtated ruderal habitats that are biologically unremarkable.

- No ditches, wetlands, vernal pools, stock ponds, streams, lakes, or other potentially jurisdictional waters of the U.S. or wetlands of any kind were observed at the site.

- The only potentially jurisdictional waters of the U.S. observed near the site are MID's Bloom Lateral and Cressey Lateral. If the project involves modification to the bank of the Cressey Lateral (i.e., at the tie-in point to pipe water to the new basin), this activity would appear to qualify as an exempt activity under

ACOE's Regulatory Guidance Letter 07-02, which outlines activities in irrigation and drainage ditches that are exempt from Clean Water Act permitting requirements.

- Due to a lack of suitable habitat, the likelihood of occurrence of special-status plants at the site is considered very low.

- With the exception of Swainson's hawk and burrowing owl, no special-status wildlife species are expected to occur in or near the site on more than a very occasional or transitory basis.

- The project involves constructing a single large basin where several small basins now exist. This activity would not result in a loss of potential or actual Swainson's hawk foraging habitat or burrowing owl nesting or foraging habitat.

- Pre-construction surveys for nesting Swainson's hawks in the project area should be conducted if construction commences between March 1 and September 15. The survey should include all large trees visible from the site. If active nests are found, a qualified biologist should determine the need (if any) for temporal restrictions on construction.

- Pre-construction surveys for burrowing owls in the project area should be conducted if construction commences between February 1 and August 31. The survey should include the ruderal areas at the site, and all areas of open grassland visible from the site. If occupied burrows are found, a qualified biologist should determine the need (if any) for temporal restrictions on construction.

Thank you, again, for asking Moore Biological Consultants to assist with the project. Please feel free to call me at (209) 745-1159 with any questions.

Sincerely,

Diane S. Moore, M.S.
Principal Biologist

References and Literature Consulted

ACOE (U.S. Army Corps of Engineers). 1987. Technical Report Y87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MI.

ACOE. 2007. Regulatory Guidance Letter No. 07-02. Exemptions for Construction or Maintenance or Irrigation Ditches and Maintenance of Drainage Ditches Under Section 404 of Clean Water Act.

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CNPS (California Native Plant Society). 2001. Inventory of Rare and Endangered Vascular Plants of California. California Native Plant Society, Sacramento, California.

Sawyer, J.O. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento. California.

USFWS (United States Fish and Wildlife Service). 2005. Part II, Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17: Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Evaluation and Economic Exclusions from August 2003 Final Designation, Final Rule. Federal Register Vol. 70, No. 154, August 11.

Stockpiled soil in the south part of the site, looking west; 12/03/09.

Existing recharge basin in the northeast part of the site, looking southwest; 12/03/09.

Existing recharge basin in the northwest part of the site, looking east; 12/03/09.

Stockpiled soil in the south part of the site, looking east; 12/03/09.

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-13

Description of Cressey Recharge Basin Enlargement Project

Cressey Recharge Basin Enlargement Project

The existing Cressey Groundwater Recharge Basin includes is approximately 8 acres in size, and sits on an 18.8 acre parcel. The extension will add approximately 5 acres to the footprint of the existing basin. The site is located at the southwest corner of Mercedes Avenue and Jones Road, north of the town of Winton, in the unincorporated area of Merced County.

The work includes basin excavation, site grading and stockpiling of excess material on site or off haul of excess material. The SCADA system will be upgraded to allow MID to track percolation/groundwater recharge rates in real time. The expected percolation rate is 2.6 AF/Day/AC. This number is based off the observed percolation rate for the basin currently in existence.

The design drawings for the original Cressey Basin provides details of what could be expected for the design of the enlargement project.

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-14

Cressey Existing Basin Infiltration Rate

Cressey Recharge Basin - Existing Basin Recharge Rate

Applied Area 8 acres

Field	CFS	TransactionDate	Previous Date	Time (days)	AF	Rate (AF/Day)
RB-Cressey	1.89	07/21/2011 16:15	07/21/2011 12:00	0.18	0.499	2.82
RB-Cressey	1.10	07/21/2011 18:15	07/21/2011 16:15	0.08	0.312	3.75
RB-Cressey	9.61	07/22/2011 12:00	07/21/2011 18:15	0.74	1.614	2.18
RB-Cressey	9.61	07/23/2011 06:30	07/22/2011 12:00	0.77	14.692	19.06
RB-Cressey	1.58	07/23/2011 17:00	07/23/2011 06:30	0.44	8.339	19.06
RB-Cressey	9.45	07/24/2011 07:00	07/23/2011 17:00	0.58	1.828	3.13
RB-Cressey	14.49	07/24/2011 16:00	07/24/2011 07:00	0.38	7.029	18.74
RB-Cressey	14.49	07/25/2011 23:59	07/24/2011 16:00	1.33	38.319	28.74
RB-Cressey	0.00	07/26/2011 06:00	07/25/2011 23:59	0.25	7.185	28.74
RB-Cressey	13.86	07/27/2011 12:00	07/26/2011 06:00	1.25	0.000	0.00
RB-Cressey	19.68	07/28/2011 15:00	07/27/2011 12:00	1.13	30.926	27.49
RB-Cressey	25.96	07/29/2011 15:00	07/28/2011 15:00	1.00	39.033	39.03
RB-Cressey	13.20	07/30/2011 11:00	07/29/2011 15:00	0.83	42.908	51.49
RB-Cressey	21.00	07/31/2011 06:00	07/30/2011 11:00	0.79	20.727	26.18
RB-Cressey	12.00	08/01/2011 01:00	07/31/2011 06:00	0.79	32.974	41.65
RB-Cressey	20.88	08/02/2011 00:00	08/01/2011 01:00	0.96	22.809	23.80
RB-Cressey	13.00	08/03/2011 00:31	08/02/2011 00:00	1.02	42.305	41.41
RB-Cressey	8.04	08/03/2011 07:00	08/03/2011 00:31	0.27	6.965	25.78
RB-Cressey	0.30	08/04/2011 06:00	08/03/2011 07:00	0.96	15.282	15.95
RB-Cressey	8.40	08/05/2011 07:00	08/04/2011 06:00	1.04	0.620	0.60
RB-Cressey	13.20	08/06/2011 15:30	08/05/2011 07:00	1.35	22.561	16.66
RB-Cressey	17.16	08/07/2011 00:00	08/06/2011 15:30	0.35	9.272	26.18
RB-Cressey	13.56	08/07/2011 16:00	08/07/2011 00:00	0.67	22.690	34.04
RB-Cressey	13.20	08/08/2011 02:20	08/07/2011 16:00	0.43	11.580	26.89
RB-Cressey	11.40	08/09/2011 15:00	08/08/2011 02:20	1.53	39.999	26.18
RB-Cressey	0.00	08/10/2011 15:00	08/09/2011 15:00	1.00	22.611	22.61
RB-Cressey	17.40	08/11/2011 15:00	08/10/2011 15:00	1.00	0.000	0.00
RB-Cressey	16.80	08/12/2011 14:00	08/11/2011 15:00	0.96	33.073	34.51
RB-Cressey	3.00	08/12/2011 23:00	08/12/2011 14:00	0.38	12.495	33.32
RB-Cressey	10.56	08/13/2011 15:00	08/12/2011 23:00	0.67	3.967	5.95
RB-Cressey	18.10	08/14/2011 12:00	08/13/2011 15:00	0.88	18.327	20.94
RB-Cressey	27.00	08/15/2011 03:00	08/14/2011 12:00	0.63	22.437	35.90
RB-Cressey	4.00	08/15/2011 10:00	08/15/2011 03:00	0.29	15.619	53.55
RB-Cressey	8.70	08/16/2011 13:00	08/15/2011 10:00	1.13	8.925	7.93
RB-Cressey	10.10	08/17/2011 00:30	08/16/2011 13:00	0.48	8.268	17.26
RB-Cressey	9.20	08/18/2011 13:24	08/17/2011 00:30	1.54	30.800	20.03
RB-Cressey	12.40	08/19/2011 15:00	08/18/2011 13:24	1.07	19.464	18.25
RB-Cressey	0.00	08/20/2011 16:00	08/19/2011 15:00	1.04	25.619	24.59
RB-Cressey	11.40	08/21/2011 11:45	08/20/2011 16:00	0.82	0.000	0.00
RB-Cressey	11.40	08/21/2011 15:00	08/21/2011 11:45	0.14	3.062	22.61
RB-Cressey	15.20	08/22/2011 15:00	08/21/2011 15:00	1.00	22.611	22.61
RB-Cressey	11.76	08/23/2011 09:00	08/22/2011 15:00	0.75	22.611	30.15
RB-Cressey	10.10	08/24/2011 11:00	08/23/2011 09:00	1.08	25.269	23.32
RB-Cressey	6.00	08/24/2011 21:00	08/24/2011 11:00	0.42	8.347	20.03
RB-Cressey	12.60	08/25/2011 16:00	08/24/2011 21:00	0.79	9.421	11.90
RB-Cressey	6.50	08/26/2011 14:00	08/25/2011 16:00	0.92	22.908	24.99
RB-Cressey	15.00	08/27/2011 16:00	08/26/2011 14:00	1.08	13.966	12.89
RB-Cressey	6.00	08/28/2011 09:00	08/27/2011 16:00	0.71	21.074	29.75
RB-Cressey	0.00	08/28/2011 23:59	08/28/2011 09:00	0.62	7.429	11.90
RB-Cressey	7.80	08/29/2011 15:00	08/28/2011 23:59	0.63	0.000	0.00
RB-Cressey	7.20	08/30/2011 14:30	08/29/2011 15:00	0.98	15.148	15.47
RB-Cressey	7.20	08/31/2011 14:30	08/30/2011 14:30	1.00	14.280	14.28
RB-Cressey	8.40	09/01/2011 15:30	08/31/2011 14:30	1.04	14.876	14.28
RB-Cressey	8.20	09/02/2011 13:30	09/01/2011 15:30	0.92	15.272	16.66
RB-Cressey	13.60	09/03/2011 14:30	09/02/2011 13:30	1.04	16.942	16.26
RB-Cressey	14.50	09/04/2011 15:30	09/03/2011 14:30	1.04	28.098	26.97
RB-Cressey	14.50	09/05/2011 23:59	09/04/2011 15:30	1.35	38.945	28.76
RB-Cressey	14.50	09/06/2011 23:59	09/05/2011 23:59	1.00	28.759	28.76
RB-Cressey	14.50	09/07/2011 23:59	09/06/2011 23:59	1.00	28.759	28.76
RB-Cressey	0.00	09/08/2011 21:00	09/07/2011 23:59	0.88	25.165	28.76
RB-Cressey	11.80	10/05/2011 16:00	09/08/2011 21:00	26.79	0.000	0.00
RB-Cressey	11.80	10/06/2011 23:59	10/05/2011 16:00	1.33	31.205	23.40
RB-Cressey	11.80	10/07/2011 23:59	10/06/2011 23:59	1.00	23.404	23.40
RB-Cressey	22.01	10/08/2011 22:49	10/07/2011 23:59	0.95	22.250	23.40
RB-Cressey	17.40	10/09/2011 13:30	10/08/2011 22:49	0.61	26.708	43.65
RB-Cressey	16.80	10/10/2011 07:38	10/09/2011 13:30	0.76	26.075	34.51
RB-Cressey	7.68	10/10/2011 11:25	10/10/2011 07:38	0.16	5.253	33.32
RB-Cressey	17.28	10/11/2011 05:00	10/10/2011 11:25	0.73	11.160	15.23
RB-Cressey	7.92	10/11/2011 20:10	10/11/2011 05:00	0.63	21.659	34.27
RB-Cressey	7.92	10/12/2011 23:59	10/11/2011 20:10	1.16	18.217	15.71
RB-Cressey	7.92	10/13/2011 23:59	10/12/2011 23:59	1.00	15.709	15.71
RB-Cressey	7.92	10/14/2011 04:30	10/13/2011 23:59	0.19	2.946	15.71
RB-Cressey	7.44	10/14/2011 11:45	10/14/2011 04:30	0.30	4.745	15.71
RB-Cressey	18.48	10/14/2011 21:00	10/14/2011 11:45	0.39	5.687	14.76
RB-Cressey	18.48	10/15/2011 05:18	10/14/2011 21:00	0.35	12.676	36.65
RB-Cressey	18.00	10/15/2011 13:22	10/15/2011 05:18	0.34	12.320	36.65
RB-Cressey	12.36	10/15/2011 19:00	10/15/2011 13:22	0.23	8.380	35.70
RB-Cressey	12.36	10/16/2011 05:31	10/15/2011 19:00	0.44	10.742	24.51
RB-Cressey	11.76	10/16/2011 16:00	10/16/2011 05:31	0.44	10.708	24.51
RB-Cressey	10.92	10/17/2011 05:40	10/16/2011 16:00	0.57	13.282	23.32
RB-Cressey	11.81	10/17/2011 14:30	10/17/2011 05:40	0.37	7.972	21.66
RB-Cressey	7.80	10/18/2011 05:30	10/17/2011 14:30	0.63	14.640	23.42
RB-Cressey	9.72	10/18/2011 14:00	10/18/2011 05:30	0.35	5.479	15.47
RB-Cressey	9.72	10/19/2011 23:59	10/18/2011 14:00	1.42	27.311	19.28
RB-Cressey	0.00	10/20/2011 12:00	10/19/2011 23:59	0.50	9.640	19.28

Summary

23.29 acre-feet/day ** Average not including 0 inflow time periods
2.91 feet/day

21.92 acre-feet/day ** Average including 0 inflow time periods
2.74 feet/day

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-15

Cressey Length of Irrigation Season Based on Historical Record

Cressey Basin Enlargement Project - Water Supply Benefits

Maximum Infiltration Rate	2.74	ft/day
Current Basin Size	8	acres
Proposed Basin Increase	5	acres

Water Year	Water Year for X-Axis	Available Recharge Index	MID Season Start Date	MID Season End Date	Annual Data: Current Basin Recharge	Annual Data: Proposed Increase	Annual Data: Proposed Total Recharge
1970	1970	1			0	0	0
1971		1			0	0	0
1972		1			0	0	0
1973		1			0	0	0
1974		1			0	0	0
1975	1975	1			0	0	0
1976		0			0	0	0
1977		0			0	0	0
1978		1			0	0	0
1979		1			0	0	0
1980	1980	1			0	0	0
1981		1			0	0	0
1982		1			0	0	0
1983		1			0	0	0
1984		1			0	0	0
1985	1985	1			0	0	0
1986		1			0	0	0
1987		1			0	0	0
1988		0			0	0	0
1989		0			0	0	0
1990	1990	0	3/26/1990	9/5/1990	0	0	0
1991		0	4/22/1991	10/31/1991	0	0	0
1992		0	4/10/1992	9/22/1992	0	0	0
1993		1	3/29/1993	10/31/1993	4,735	2,959	7,694
1994		1	3/1/1994	10/31/1994	5,348	3,343	8,691
1995	1995	1	3/13/1995	10/31/1995	5,085	3,178	8,264
1996		1	3/15/1996	10/31/1996	5,042	3,151	8,193
1997		1	3/4/1997	10/31/1997	5,283	3,302	8,584
1998		1	3/19/1998	10/31/1998	4,954	3,096	8,050
1999		1	3/2/1999	10/31/1999	5,327	3,329	8,656
2000	2000	1	3/27/2000	10/31/2000	4,779	2,987	7,765
2001		1	3/26/2001	10/15/2001	4,450	2,781	7,231
2002		1	3/18/2002	10/31/2002	4,976	3,110	8,086
2003		1	3/10/2003	10/31/2003	5,151	3,220	8,371
2004		1	3/22/2004	10/15/2004	4,537	2,836	7,373
2005	2005	1	3/21/2005	10/31/2005	4,910	3,069	7,979
2006		1	3/1/2006	10/31/2006	5,348	3,343	8,691
2007		1	3/21/2007	9/30/2007	4,231	2,644	6,875
2008		0	3/24/2008	9/30/2008	0	0	0
2009		1	3/23/2009	10/31/2009	4,866	3,041	7,908
2010	2010	1	3/29/2010	10/30/2010	4,713	2,946	7,658
2011		1	3/14/2011	10/31/2011	5,064	3,165	8,228
2012		1	3/5/2012	10/31/2012	5,261	3,288	8,549
2013		0	3/11/2013	10/31/2013	0	0	0
2014		0	4/18/2014		0	0	0
Average Recharged in Non-critical Year					**4,950**	**3,094**	**8,044**
							8,044

Merced Integrated Regional Water Management
Drought Grant Proposal

Appendices 3-16 to 3-21

App. #	Document Title	File Name
App. 3-1	Highlands Groundwater Conservation Project - Conceptual Design	Att3_DG_ProJust_2of4
App. 3-2	Highlands Groundwater Conservation Project - Property Information and Acreage of Land on Surface and Groundwater Supply	
App. 3-3	Highlands Groundwater Conservation Project – Water Supply Benefits Analysis	
App. 3-4	Highlands Groundwater Conservation Project – Energy and GHG Emissions Benefits	
App. 3-5	Merced IRWM Plan Ground Recharge Feasibility Study	
App. 3-6	Terms and Conditions of License for Unconstructed Major Project Affecting Lands of the United States	
	United States of America Federal Energy Regulatory Commission Notice of Authorization for Continued Project Operation (pages	
	US Fish and Wildlife Letter Requesting During Drought That Ecosystem Demand Requirements May Not Be Met	
App. 3-7	MID Production Wells Rendered Inoperable During the 2014 Irrigation Season Due To The Drought	
App. 3-8	MID and El Nido Groundwater Level Data	
App. 3-9	Technical Memorandum On Pilot Project Work Plan For Cressey Recharge Basin Assessment Project	
App. 3-10	Hydrogeological Investigation of the Cressey Pilot Project Site	Att3_DG_ProJust_3of4
App. 3-11	Improvement Plans for MID Cressey Groundwater Recharge Basin	
App. 3-12	MID Cressey Recharge Basin Initial Study/Proposed Negative Declaration	
App. 3-13	Description of Cressey Recharge Basin Enlargement Project	
App. 3-14	Cressey Existing Basin Infiltration Rate	
App. 3-15	Cressey Length of Irrigation Season Based on Historical Record	

App. #	Document Title	File Name
App. 3-16	Le Grand CSD Final Design Drawings	Att3_DG_ProJust_4of4
App. 3-17	Groundwater Level Changes in Le Grand	
App. 3-18	Merced IRWM Salt and Nutrient Study (excerpt)	
App. 3-19	LGCSD Water Meter Conservation Project Water Supply Benefits	
App. 3-20	LGCSD Water Meter Conservation Project Energy Usage from 2013-2014 and Reduction in Energy Usage Benefits	
App. 3-21	LGCSD Water Meter Conservation Project Chemical Usage in 2013 and Reduction in Chemical Usage Benefits	

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-16

Le Grand CSD Final Design Drawings

IMPROVEMENT PLAN FOR

LE GRAND COMMUNITY SERVICE DISTRICT WATER METER PROJECT

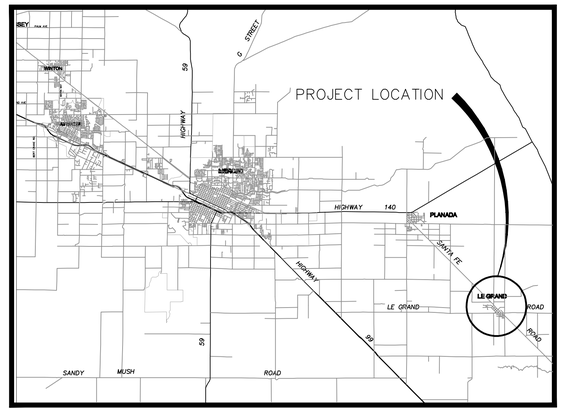
MERCED COUNTY, CALIFORNIA

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
T1	TITLE SHEET
C1	SITE PLAN INDEX SHEET
C2-C4	SITE PLAN SHEETS
C5-C6	METER SUMMARY
C7	AS BUILT INDEX SHEET
C8-C14	AS-BUILT PLANS
C15	DETAILS

ABBREVIATIONS

&	AND
@	AT
A.B.	AGGREGATE BASE OR ANCHOR BOLT
A.C.	ASPHALT CONCRETE
A.S.B.	AGGREGATE SUB-BASE
COMP.	COMPACTION
CONC.	CONCRETE
CONST.	CONSTRUCTION
DIA.	DIAMETER
EXIST.	EXISTING
F.H.	FIRE HYDRANT
R.C.	RELATIVE COMPACTION
STA.	STATION
TYP.	TYPICAL



VICINTY MAP

GENERAL NOTES

1. CONTRACTOR TO OBTAIN ENCROACHMENT PERMIT FROM MERCED COUNTY DEPT. OF PUBLIC WORKS.
2. INFORMATION ON EXISTING UTILITIES WAS TAKEN FROM THE DATA AVAILABLE. THE ENGINEER AND DISTRICT ASSUME NO LIABILITY FOR THE ACCURACY OR COMPLETENESS OF SUCH RECORD DATA. THERE MAY BE EXISTING UTILITIES WHICH ARE NOT SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL KNOWN OR SUSPECTED UTILITY LOCATIONS IN THE FIELD BEFORE EXCAVATING TRENCHES. CONTRACTOR SHALL NOTIFY "UNDERGROUND SERVICES ALERT" FOR LOCATIONS OF UNDERGROUND UTILITIES TWO WORKING DAYS PRIOR TO EXCAVATING. (CALL TOLL FREE 800-642-2444). GAS LINES, ETC. ARE NOT SHOWN IN THE PROFILE BECAUSE THEIR DEPTH IS UNKNOWN.
3. CONTRACTOR SHALL CAREFULLY EXPOSE BY HAND EXCAVATION ANY INTERFERING EXISTING UTILITIES AND SHALL PROVIDE PROTECTION FOR THESE UTILITIES DURING NEW CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ARRANGING THE REPAIR OF DAMAGED UTILITIES, TO THE SATISFACTION OF THE APPLICABLE UTILITY COMPANY, AT HIS SOLE EXPENSE.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY REMOVAL OR BRACING, IF NECESSARY, OF ALL TELEPHONE OR POWER POLES IN THE VICINITY OF CONSTRUCTION.
5. CONTRACTOR SHALL CAREFULLY PROTECT EXISTING PAVEMENT SO THAT THE LEAST POSSIBLE AMOUNT OF PAVEMENT IS REMOVED OR DAMAGED.
6. CONSTRUCTION AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION, (E.G. REPLACE PAVEMENT, RESEED GRASS AREAS, REPAIR DRIVEWAYS AND FENCES, REESTABLISH DRAINAGE DITCHES AND DRAINAGE PATTERNS, REINSTATE OR REPLACE CULVERTS & SIGNS, REPAIR LANDSCAPING, SPRINKLERS, ETC.) CONTRACTOR SHALL COOPERATE WITH INSPECTOR TO DETERMINE THE EXACT PLACEMENT OF NEW VALVES, FITTINGS, ETC.
7. THE CONTRACTOR SHOULD TAKE ADEQUATE STEPS TO ENSURE THAT FOREIGN MATTER DOES NOT ENTER THE PIPELINES. PIPELINES WILL NOT BE ACCEPTED UNTIL ALL FOREIGN MATTER IS REMOVED (I. E. SAND, DIRT, ETC.), TO THE SATISFACTION OF ENGINEER. PIPE CONTAMINATED WITH SEWAGE SHALL BE REJECTED AND REMOVED FROM SITE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIALS, LABOR, ETC., NECESSARY TO KEEP THE EXISTING LINES IN SERVICE AND FREE FROM CONTAMINATION. LINES TO BE ABANDONED SHALL BE KEPT IN SERVICE UNTIL ABANDONMENT IS APPROVED BY THE ENGINEER. CONTRACTOR SHALL SUBMIT PLAN FOR APPROVAL DETAILING HOW ABANDONMENT AND TRANSFERS WILL BE ACCOMPLISHED.
9. CONTRACTOR SHALL MEET ALL THE REQUIREMENTS OF APPLICABLE GOVERNMENT AGENCIES, INCLUDING, BUT NOT LIMITED TO: STATE AND COUNTY HEALTH DEPTS., MERCED CO. DEPT. OF PUBLIC WORKS, ETC. ALL WATER / SEWER AND STORM DRAIN LINE CROSSINGS SHALL CONFORM TO DETAIL
10. ALL VALVES, HYDRANTS, FITTINGS, ETC. CALLED OUT TO BE REMOVED ARE PROPERTY OF THE DISTRICT AND SHALL BE DELIVERED TO A LOCATION IN LE GRAND SELECTED BY THE ENGINEER.
11. STATIONING IS APPROXIMATE AND IS FOR REFERENCE ONLY. ACTUAL DIMENSIONS SHALL TAKE PRECEDENCE OVER STATIONING. ACTUAL STATIONING MAY VARY FROM THE STATIONING SHOWN ON THE PLANS.
12. WORK IS TO OCCUR WITHIN THE RIGHT-OF-WAYS AND EASEMENTS.
13. WHERE THE PLANS OR SPECIFICATIONS DESCRIBE PORTIONS OF THE WORK IN GENERAL TERMS, BUT NOT IN COMPLETE DETAIL, IT IS UNDERSTOOD THAT ONLY THE BEST GENERAL PRACTICE IS TO PREVAIL, AND THAT ONLY MATERIALS AND WORKMANSHIP OF THE FIRST QUALITY ARE TO BE USED.
14. COMPACTION TESTS: THE CONTRACTOR IS TO ARRANGE FOR ALL COMPACTION TESTS IN STREETS AND EASEMENTS AS REQUIRED BY THE COUNTY OF MERCED.
15. DUST CONTROL: APPROPRIATE DUST CONTROL TO BE PROVIDED, FOR THE ALLEVIATION OR PREVENTION OF DUST NUISANCE, AT THE CONTRACTOR'S EXPENSE AND SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
16. CONTRACTORS SHALL GIVE 48 HOURS ADVANCE NOTIFICATION FOR INSPECTIONS UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE.
17. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB-SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.
18. ALL WORK SHALL BE IN COMPLIANCE WITH CAL-OSHA CODES WITH ATTENTION DIRECTED TOWARDS SECTION 1541 DEALING WITH SLOPING AND SHORING TRENCH WALLS.
19. A TRENCHING PERMIT WILL BE REQUIRED PER CALIFORNIA LABOR CODE, SECTION 6424, FOR ANY TRENCHING DEEPER THAN FIVE FEET.
20. THESE IMPROVEMENT PLANS HAVE BEEN PREPARED WITH THE INTENT THAT FREMMING, PARSON & PECCHENINO WILL BE PERFORMING THE CONSTRUCTION STAKING FOR THE ENTIRE PROJECT. IF, HOWEVER, THE CONSTRUCTION STAKING IS PERFORMED BY ANOTHER ENGINEERING OR SURVEYING FIRM, NOTICE IS HEREBY GIVEN THAT THE FIRM OF FREMMING, PARSON & PECCHENINO WILL NOT ASSUME ANY RESPONSIBILITY FOR ERRORS OF OMISSIONS, IF ANY, WHICH MIGHT OCCUR IF ANOTHER FIRM DOES THE CONSTRUCTION STAKING, AND WHICH COULD HAVE BEEN AVOIDED, CORRECTED OR MINIMIZED IF FREMMING, PARSON & PECCHENINO HAD PERFORMED THE STAKING WORK.

APPROVALS

LE GRAND COMMUNITY SERVICES DISTRICT

BY: _____ DATE: _____
DISTRICT MANAGER

FREMMING, PARSON & PECCENINO

BY: _____ DATE: _____
GARTH A. PECCHENINO

BEFORE YOU DIG
CALL TOLL FREE 800-642-2444
"UNDERGROUND SERVICE ALERT"
(Minimum Advance Notification of 48 Hours Required)

Construction contractor agrees that in accordance with generally accepted construction practices, construction contractor will be required to assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made to apply continuously and not be limited to normal working hours, and construction contractor further agrees to defend, indemnify and hold design professional harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design professional.

California Council of Civil Engineers & Land Surveyors

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TITLE SHEET

FREMMING, PARSON & PECCHENINO
2816 PARK AVENUE
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TEL: (209) 723-2066
www.fpparson.com
CONSULTING CIVIL ENGINEERS – LAND SURVEYORS

LE GRAND COMMUNITY SERVICES DISTRICT
LE GRAND, CALIFORNIA

DR. BY SAS
APPR. BY
DATE 7-28-11
FILE L002-2011C

L002-2011A
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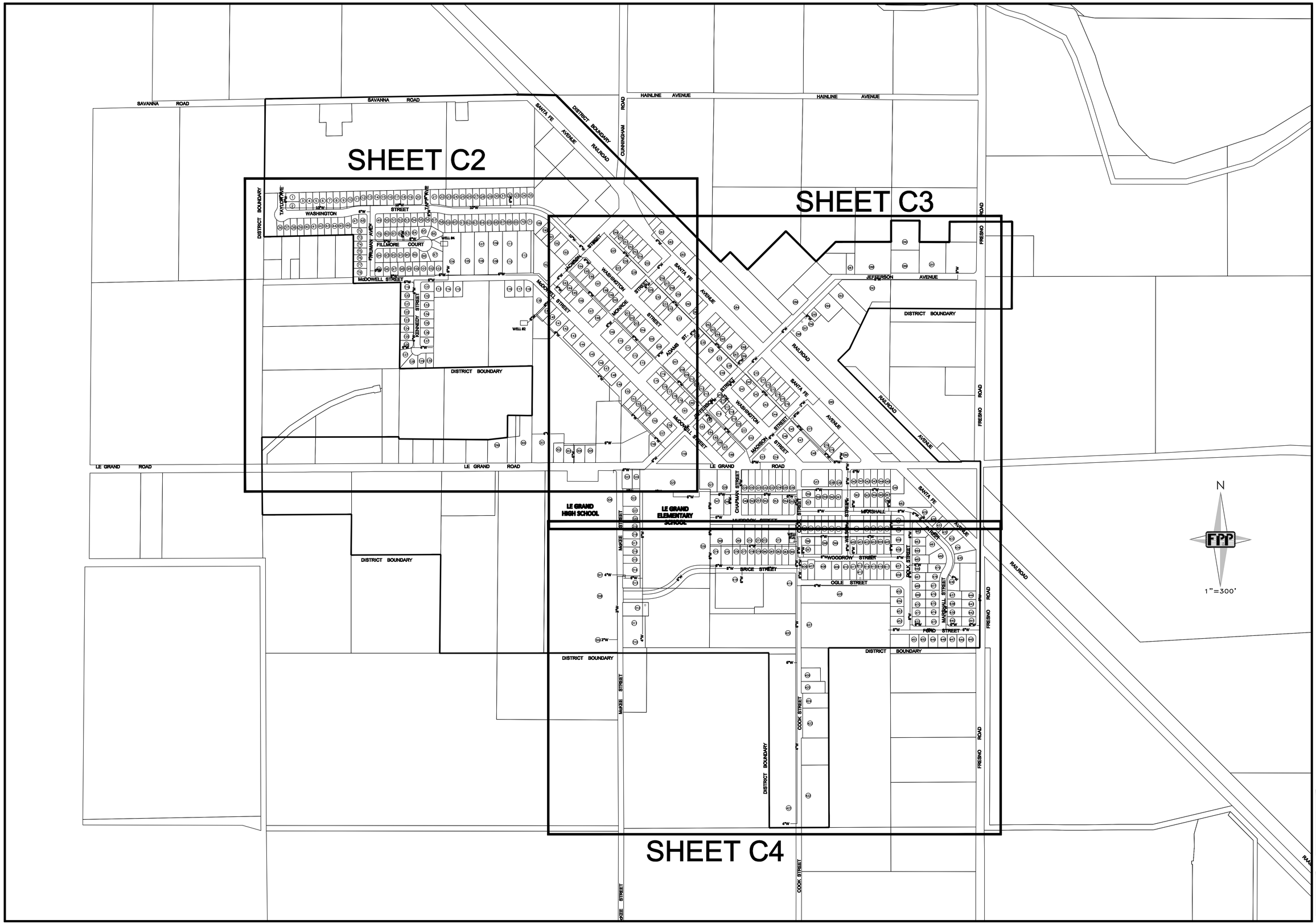

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1			
2			
3			
4			
5			

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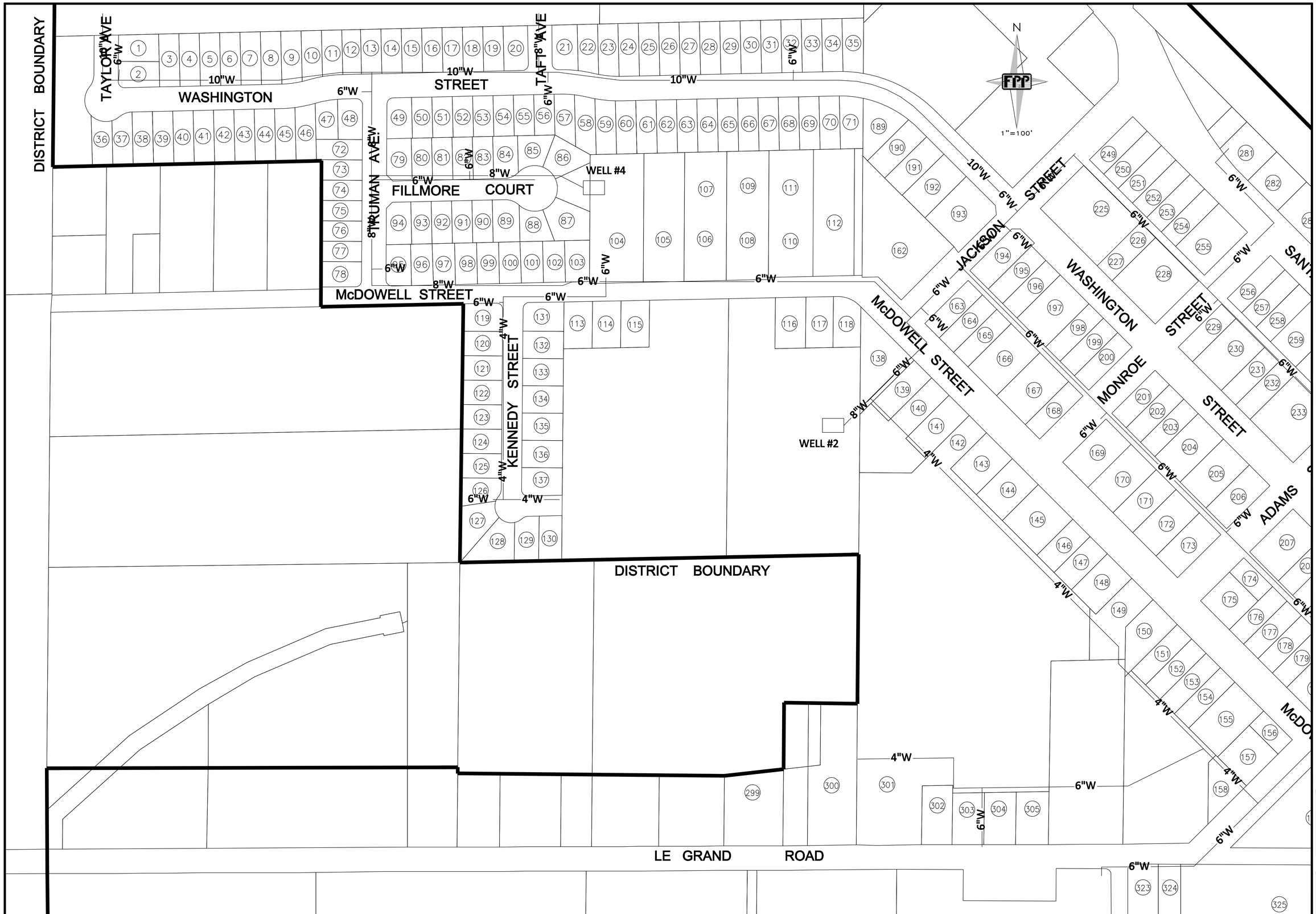

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SHEET
C2
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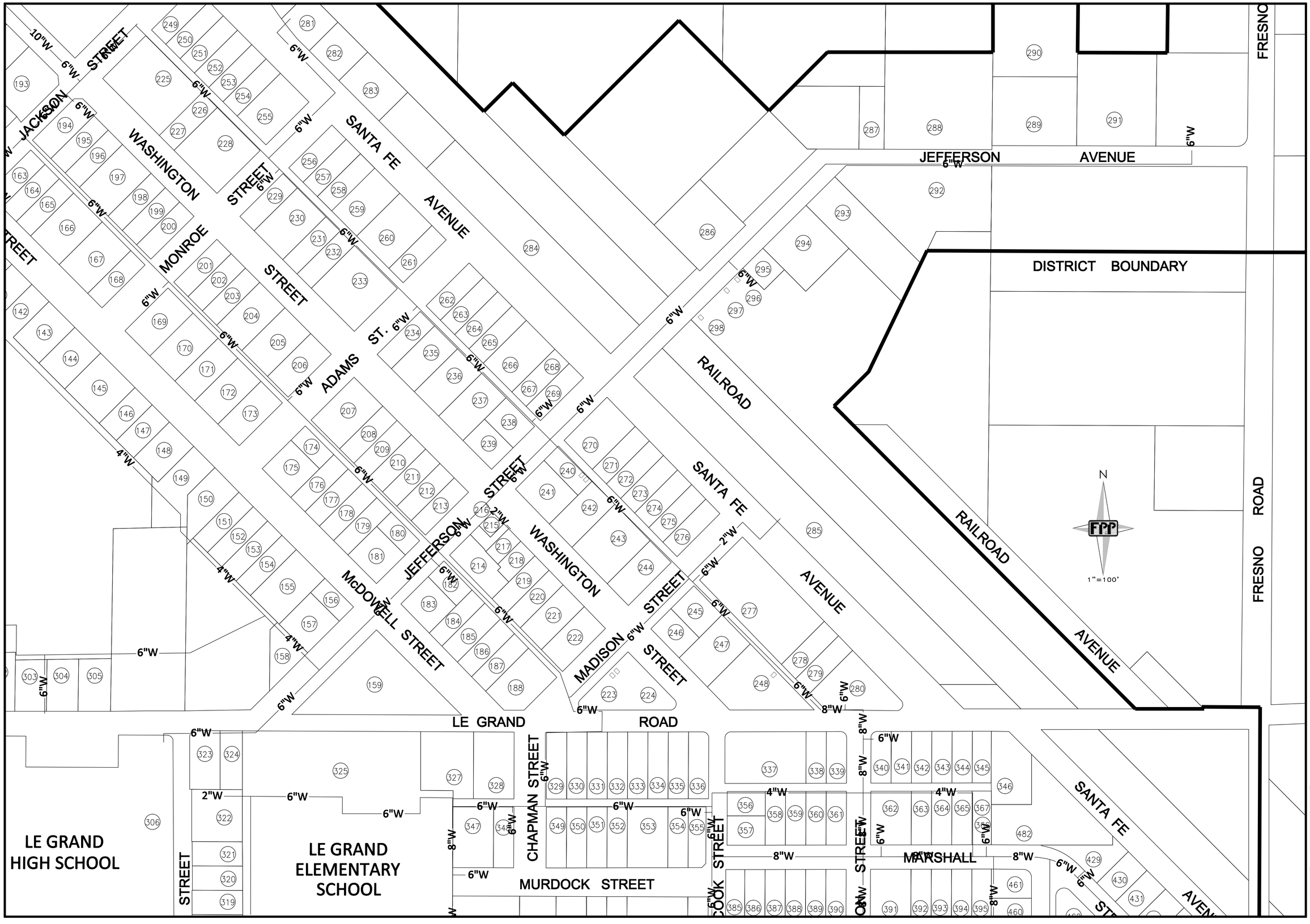

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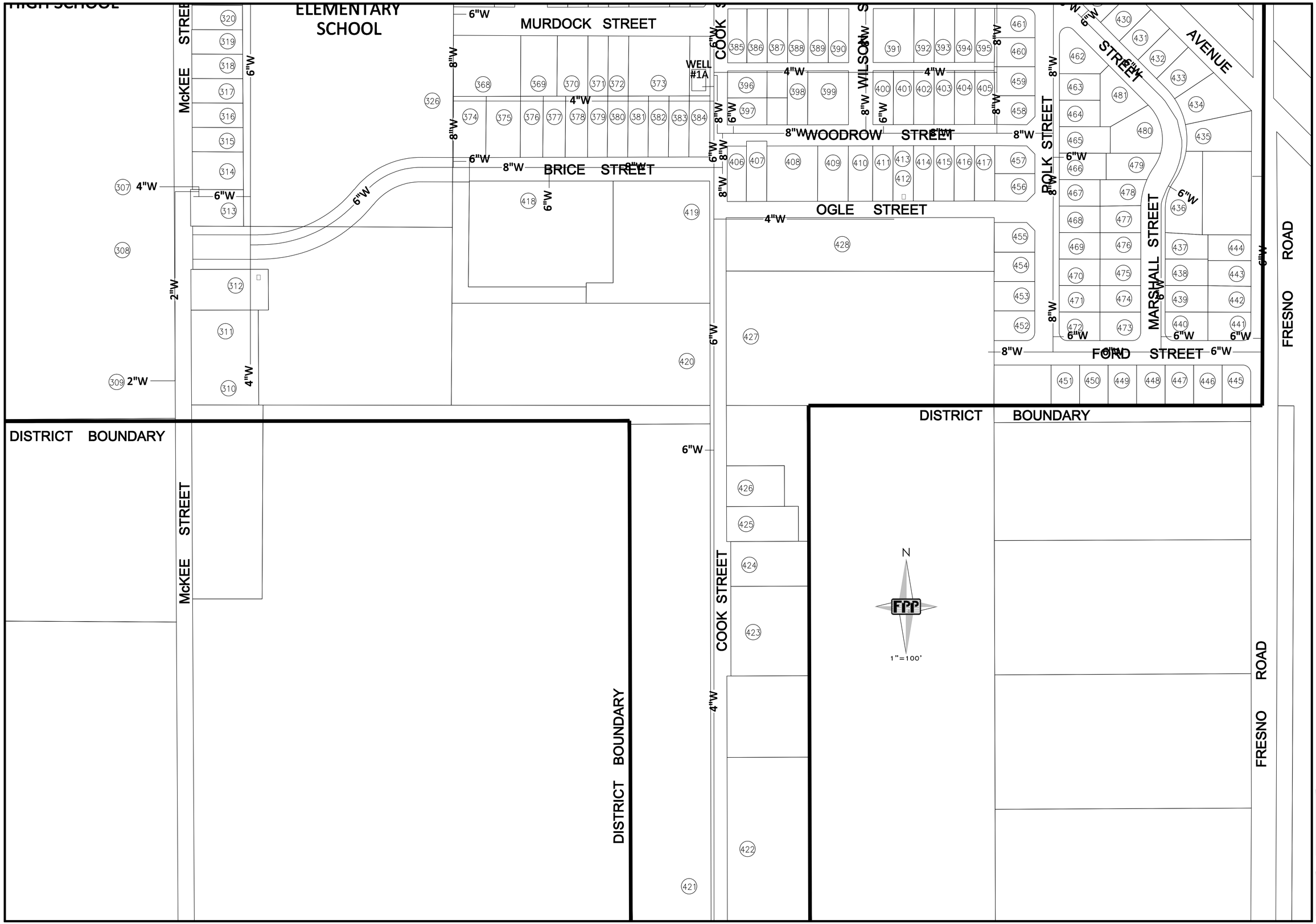

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C4
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16

ID NUMBER	STREET NAME	ADDRESS	METER	METER SIZE/NOTES
241	ALLEY		B	
242	ALLEY	APARTMENTS	O	ROUND BOX - 1" METER
243	ALLEY		B	
244	ALLEY		-	
245	ALLEY		-	IF SEPERATE BOXES ARE FOUND, INSTALL SEPERATE METERS
246	ALLEY		-	
247	ALLEY		-	
248	ALLEY		R	
249	ALLEY		-	
250	ALLEY		-	
251	ALLEY		B	
252	ALLEY		R	
253	ALLEY		-	
254	ALLEY		R	
255	ALLEY		-	
256	ALLEY		O	
257	ALLEY		-	
258	ALLEY		-	WANTS NEW SERVICE
259	ALLEY		S	
260	ALLEY		-	
261	ALLEY		R	
262	ALLEY		O	
263	ALLEY		-	
264	ALLEY		O	
265	ALLEY		O	
266	ALLEY		-	
267	ALLEY	HOUSE	R	ONE R AND ONE S - WHICH SERVICE TO WHICH?
268	ALLEY	BUSINESS	S	
269	ALLEY		R	
270	ALLEY		R	
271	ALLEY		B	
272	ALLEY		S	
273	ALLEY		S	
274	ALLEY		B	
275	ALLEY		B	
276	ALLEY		R	
277	ALLEY		S	
278	ALLEY		-	
279	ALLEY		-	WANT SERVICE
280	ALLEY		-	WANT SERVICE
281	SANTA FE AVENUE		S	
282	SANTA FE AVENUE		R	
283	SANTA FE AVENUE		R	
284	SANTA FE AVENUE	RAILROAD	-	INSTALL 2" METER ON 2" SERVICE
285	SANTA FE AVENUE	TRUCKING AREA	-	
286	JEFFERSON AVENUE	13400	S	
287	JEFFERSON AVENUE	13464	-	
288	JEFFERSON AVENUE	13472	-	
289	JEFFERSON AVENUE	13384	O	MUELLER
290	JEFFERSON AVENUE	13482	-	
291	JEFFERSON AVENUE	13434	-	
292	JEFFERSON AVENUE		-	
293	JEFFERSON AVENUE		O	NEEDS NEW BOX
294	JEFFERSON AVENUE		-	IF NO METER -DON'T INSTALL
295	JEFFERSON AVENUE		O	NEEDS NEW BOX
296	JEFFERSON AVENUE	LIVE OAK FARMS	S	HOUSE
297	JEFFERSON AVENUE	LIVE OAK FARMS	O	SHED AREA - 1-1/2" KENT METER - 3/4" BYPASS
298	JEFFERSON AVENUE	LIVE OAK FARMS	O	STOREFRONT - 2" KENT METER - 3/4" BYPASS
299	LE GRAND ROAD		O	PIPE MARKER
300	LE GRAND ROAD		R	
301	LE GRAND ROAD		-	
302	LE GRAND ROAD		O	PLASTIC BOX
303	LE GRAND ROAD		-	
304	LE GRAND ROAD		R	
305	LE GRAND ROAD		-	
306	MCKEE STREET	HIGH SCHOOL	R	4" METER
307	MCKEE STREET	HIGH SCHOOL	R	4" METER
308	MCKEE STREET	HIGH SCHOOL	R	8" METER
309	MCKEE STREET	LIFT STATION	R	2" METER
310	MCKEE STREET		-	
311	MCKEE STREET		-	
312	BRICE STREET	BUS YARD	R	2" METER
313	BEHIND HOUSE		O	SMALL BOX
314	BEHIND HOUSE		-	
315	BEHIND HOUSE		-	
316	BEHIND HOUSE		-	
317	BEHIND HOUSE		-	
318	BEHIND HOUSE		-	
319	BEHIND HOUSE		-	
320	BEHIND HOUSE		-	

ID NUMBER	STREET NAME	ADDRESS	METER	METER SIZE/NOTES
321	BEHIND HOUSE		S	
322	BEHIND HOUSE	4066	-	
323	BEHIND HOUSE		-	
324	BEHIND HOUSE		-	
325	MCKEE STREET	ELEMENTARY	R	3" METER
326	BRICE STREET	HEAD START	R	4" METER (3/4" BYPASS)
327	ALLEY		S	
328	ALLEY	CHURCH	R	
329	ALLEY		O	NEW BOX
330	ALLEY		S	
331	ALLEY		S	
332	ALLEY		-	
333	ALLEY		R	
334	ALLEY		R	
335	ALLEY		R	
336	ALLEY		-	
337	ALLEY		-	
338	ALLEY		-	
339	ALLEY		-	WANT SERVICE
340	ALLEY		-	
341	ALLEY		-	
342	ALLEY		-	
343	ALLEY		-	
344	ALLEY		-	
345	ALLEY		-	
346	ALLEY		-	
347	ALLEY		-	6 DWELLINGS
348	ALLEY		-	NO SERVICE-FRONTAGE TO 347
349	ALLEY		O	NEEDS NEW BOX
350	ALLEY		R	
351	ALLEY		-	
352	ALLEY		-	
353	ALLEY		-	
354	ALLEY		R	
355	ALLEY		O	ROUND BOX
356	ALLEY		-	
357	ALLEY		O	PIPE
358	ALLEY		R	
359	ALLEY		-	
360	ALLEY		-	
361	ALLEY		O	MUELLER
362	ALLEY		-	
363	ALLEY		-	
364	ALLEY		R	
365	ALLEY		R	
366	ALLEY		B -	ONE BOX, OTHER? MOVE BOX OUTSIDE FENCE
367	ALLEY			
368	BACKYARDS		-	
369	BACKYARDS		-	
370	BACKYARDS		-	
371	BACKYARDS		-	
372	BACKYARDS		-	
373	BACKYARDS		-	
374	BACKYARDS		-	
375	BACKYARDS		-	
376	BACKYARDS		-	
377	BACKYARDS		-	
378	BACKYARDS		S	
379	BACKYARDS		R	
380	BACKYARDS		R	
381	BACKYARDS		-	
382	BACKYARDS		-	
383	BACKYARDS		-	
384	BACKYARDS		-	
385	ALLEY		R	NEW BOX
386	ALLEY		-	
387	ALLEY		-	
388	ALLEY		S	
389	ALLEY		B	
390	ALLEY		-	
391	ALLEY		-	
392	ALLEY		R	SHOULD BE TWO METERS
393	ALLEY		R	SHOULD BE TWO METERS
394	ALLEY		R	METER SET DEEP-RAISE METER-NEEDS NEW BOX
395	ALLEY		R	METER SET DEEP-RAISE METER-NEEDS NEW BOX
396	ALLEY		-	
397	ALLEY		S	
398	ALLEY		R	
399	ALLEY		-	
400	ALLEY	CHURCH	S	

ID NUMBER	STREET NAME	ADDRESS	METER	METER SIZE/NOTES
401	ALLEY		-	
402	ALLEY		O	MUELLER
403	ALLEY		-	
404	ALLEY		-	
405	ALLEY		-	
406	WOODROW STREET		O	ROUND BOX
407	WOODROW STREET		-	
408	WOODROW STREET		-	
409	WOODROW STREET		O	ROUND BOX
410	WOODROW STREET	13315	-	
411	WOODROW STREET	13325	O	
412	OGLE STREET		B	BOX OK-INSTALL ONE METER FOR EACH HOUSE RELOCATE TO BEHIND CURB
413	OGLE STREET			
414	WOODROW STREET		-	
415	WOODROW STREET		R	
416	WOODROW STREET		O	
417	WOODROW STREET		O	SMALL BOX
418	BRICE STREET	APARTMENTS	R	METER SIZE? 3/4" BYPASS
419	COOK STREET		R	1" METER
420	COOK STREET	4235	R	
421	COOK STREET	4421	-	
422	COOK STREET	4494	S	
423	COOK STREET	4364	R	
424	COOK STREET		-	
425	COOK STREET	4324	S	
426	COOK STREET	4308	-	
427	COOK STREET	WHEREHOUSE	O	MUELLER
428	OGLE STREET		-	
429	MARSHALL STREET		-	
430	MARSHALL STREET		R	
431	MARSHALL STREET		O	
432	MARSHALL STREET		O	
433	MARSHALL STREET		O	
434	MARSHALL STREET		O	
435	MARSHALL STREET		O	
436	MARSHALL STREET	4170	R	
437	MARSHALL STREET		B	
438	MARSHALL STREET	4214	R	
439	MARSHALL STREET	4226	B	
440	MARSHALL STREET	4238	R	
441	FRESNO STREET	4237	B	
442	FRESNO STREET		B	
443	FRESNO STREET		B	
444	FRESNO STREET		R	
445	FORD STREET	13489	R	
446	FORD STREET	13477	O	CLAY/BRICK COVER
447	FORD STREET	13461	B	
448	FORD STREET		B	
449	FORD STREET	13435	B	SHIFT BOX
450	FORD STREET		B	
451	FORD STREET	13409	B	
452	POLK STREET	4237	R	
453	POLK STREET	4223	B	
454	POLK STREET	4211	B	
455	POLK STREET	4177	B	
456	POLK STREET	4173	B	
457	POLK STREET	4161	B	
458	POLK STREET	4137	S	
459	POLK STREET	4123	B	
460	POLK STREET	4111	B	
461	POLK STREET	4099	B	
462	POLK STREET		B	
463	POLK STREET		B	
464	POLK STREET		B	
465	POLK STREET	4154	B	
466	POLK STREET	4166	B	
467	POLK STREET		B	
468	POLK STREET	4180	B	
469	POLK STREET		B	
470	POLK STREET	4214	-	
471	POLK STREET	4226	S	
472	POLK STREET		R	
473	MARSHALL STREET	4237	B	
474	MARSHALL STREET	4225	B	
475	MARSHALL STREET	4213	B	
476	MARSHALL STREET	4201	R	
477	MARSHALL STREET	4179	-	
478	MARSHALL STREET	4171	B	
479	MARSHALL STREET	4165	O	PLASTIC
480	MARSHALL STREET	4147	R	
481	MARSHALL STREET	4119	O	PLASTIC
482	MARSHALL STREET	MAINT. YARD	-	

-	SERVICE/METER/BOX NOT LOCATED - CONTRACTOR TO LOCATE AND ASSESS CONDITION OF SERVICE/METER/BOX
O	FOUND PLASTIC BOX, ROUND BOX, MUELLER, OR OTHER - CONTRACTOR TO INSTALL NEW BOX AND METER
R	FOUND BOX WITH METER - CONTRACTOR TO REPLACE EXISTING METER WITH NEW METER IN EXISTING BOX
B	FOUND BOX WITHOUT METER - CONTRACTOR TO INSTALL NEW METER IN EXISTING BOX
S	SENSUS METER ALREADY IN PLACE - CONTRACTOR TO INSTALL COMPATABLE RADIO READ EQUIPMENT

NO.	DATE	BY	REVISION MADE
1			
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METER SUMMARY

FREMMING, PARSON & PECCHENINO
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CONSULTING CIVIL ENGINEERS — LAND SURVEYORS

LE GRAND COMMUNITY SERVICES DISTRICT

LE GRAND, CALIFORNIA

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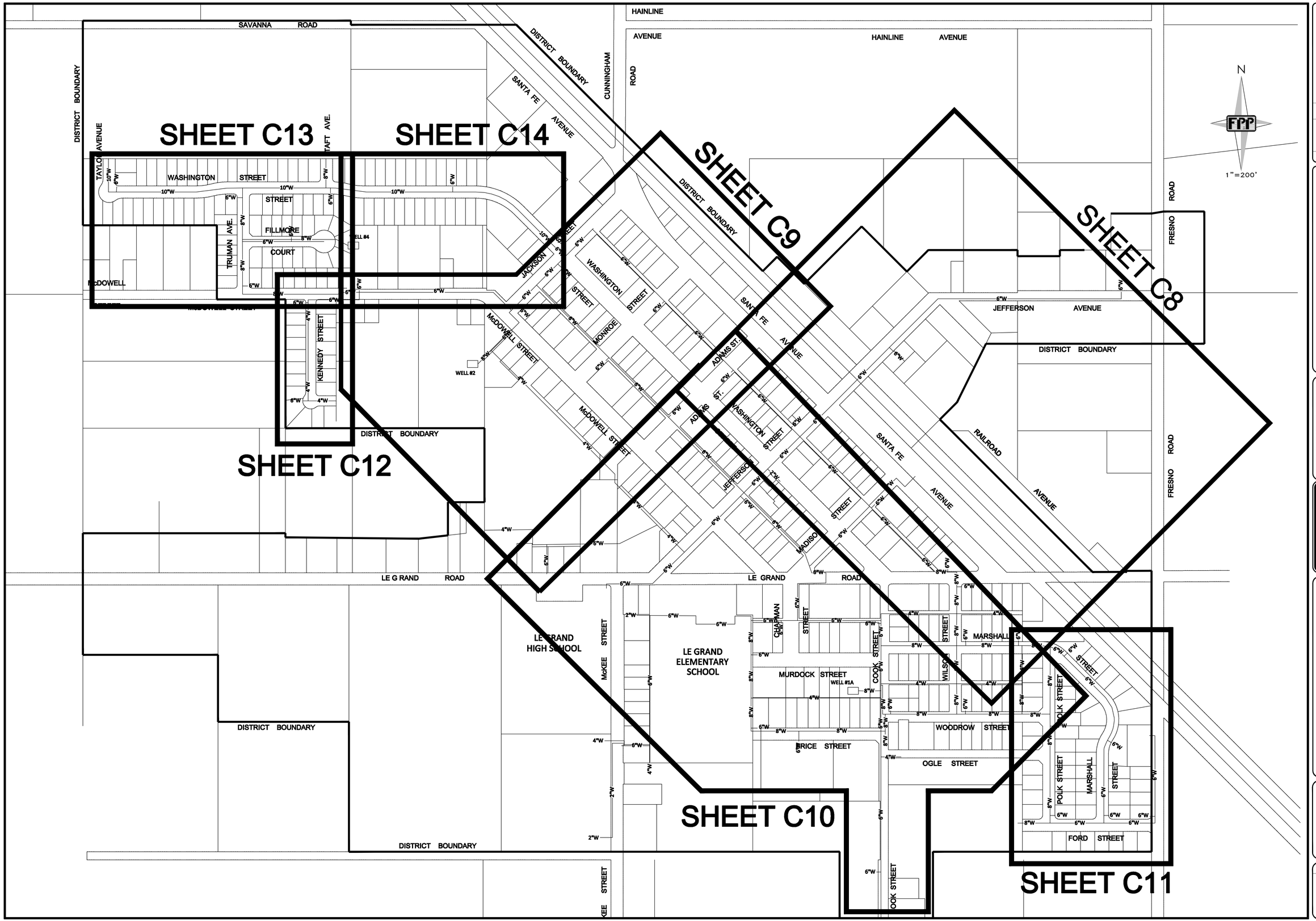
SHEET C6 OF 16



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1			
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4			
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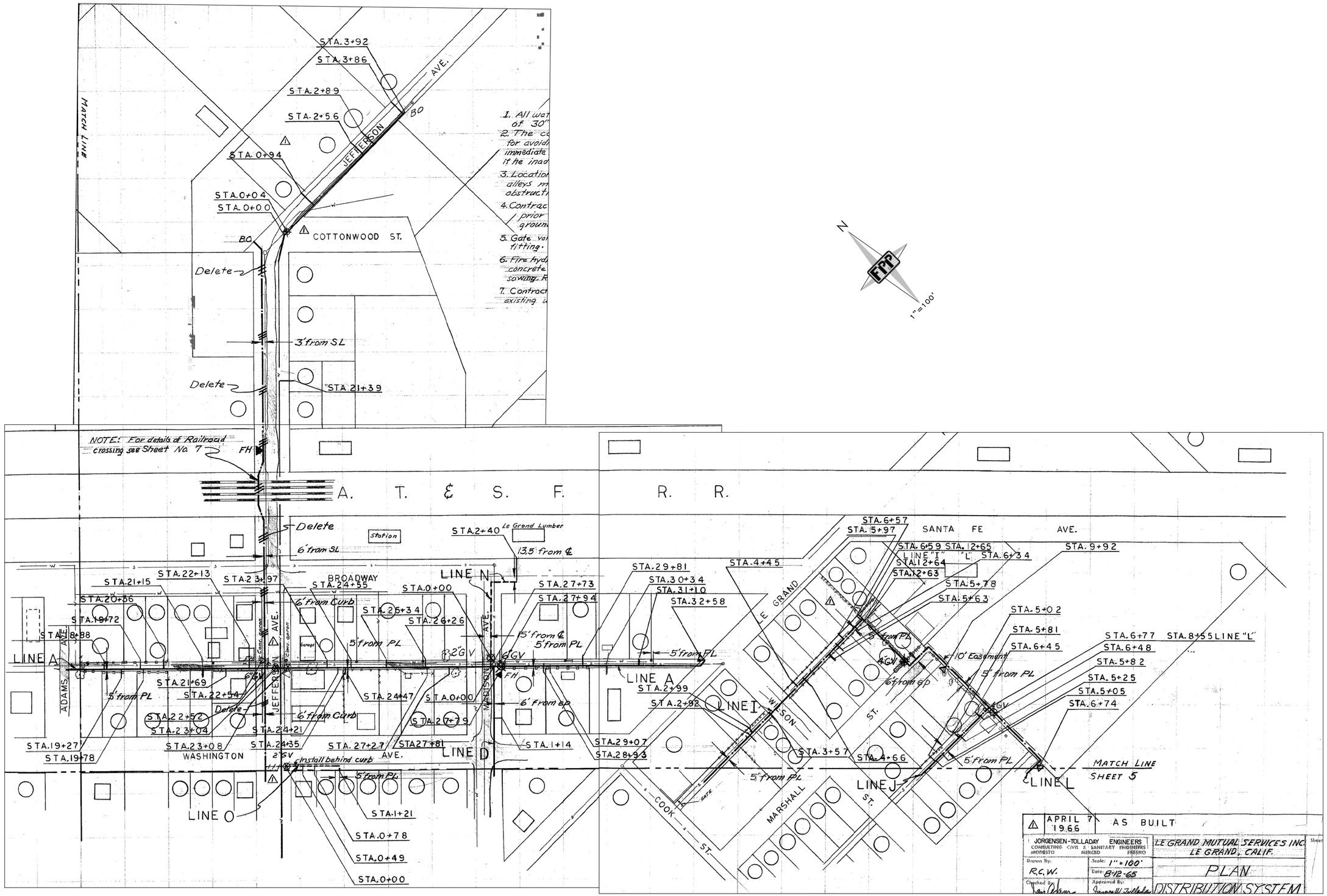
SHEET C7 OF 16



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C8
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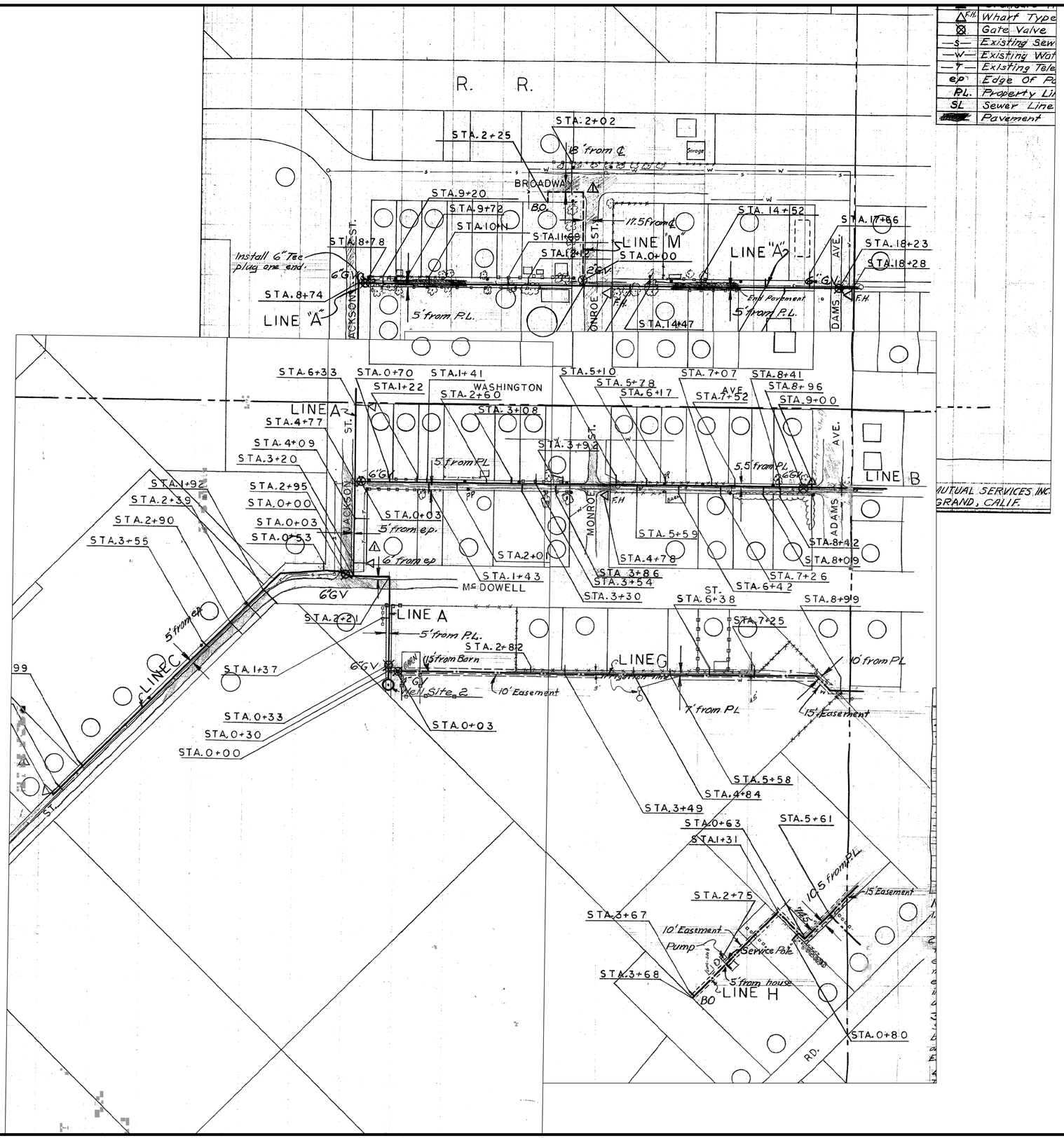

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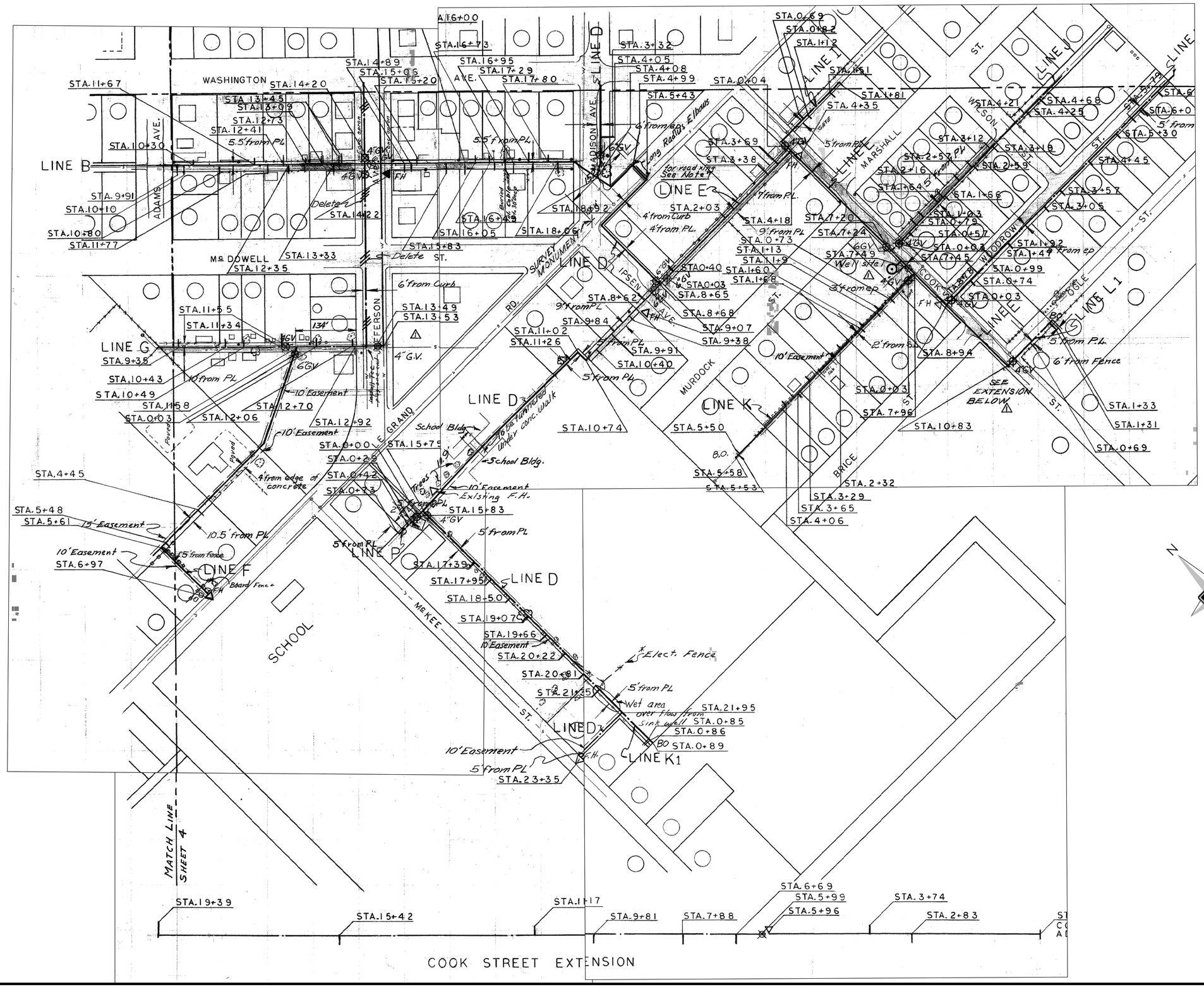
SHEET **C9** OF 16



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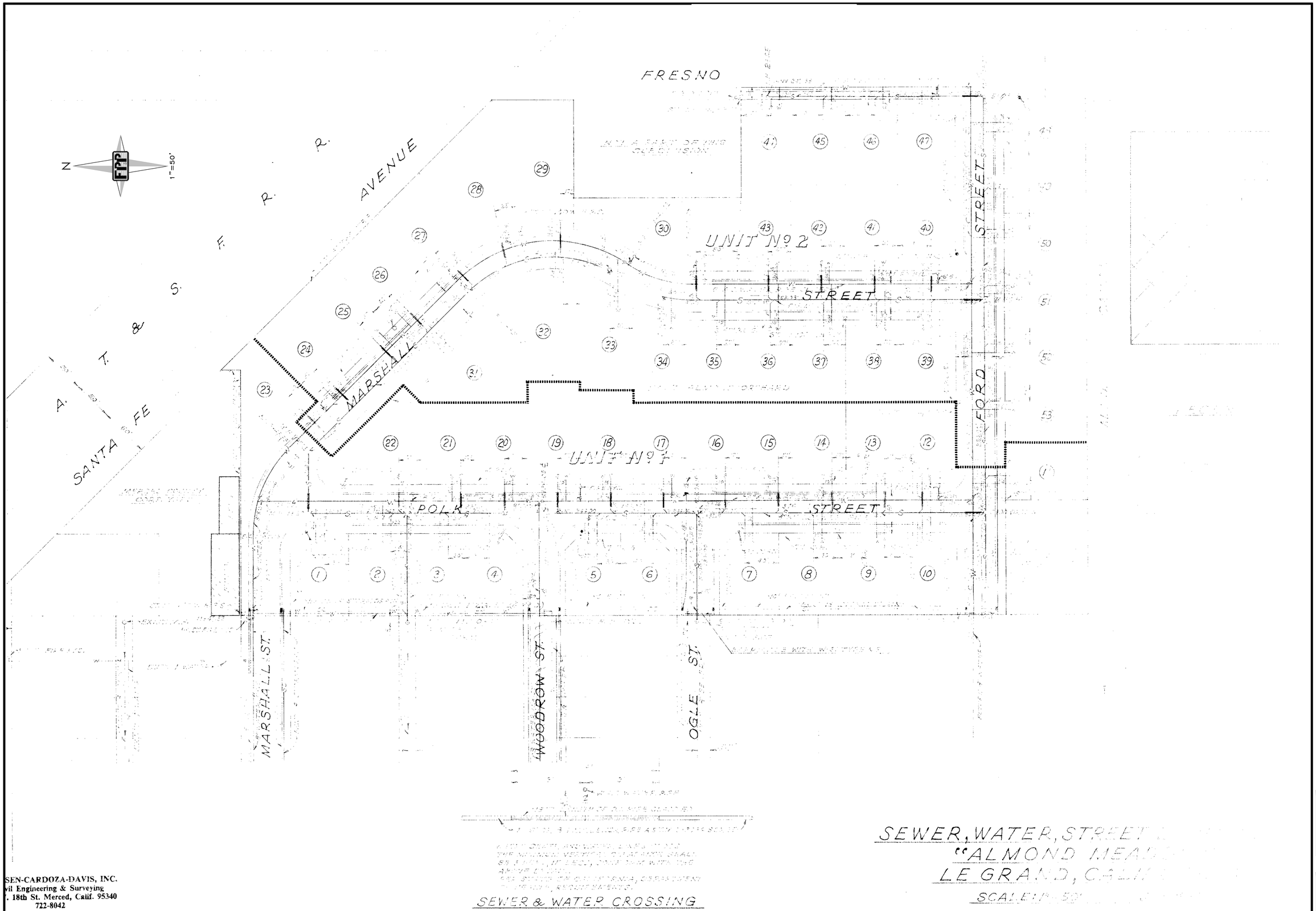
SHEET C10 OF 16



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. 18th St. Merced, Calif. 95340
722-8042

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AS BUILT PLANS

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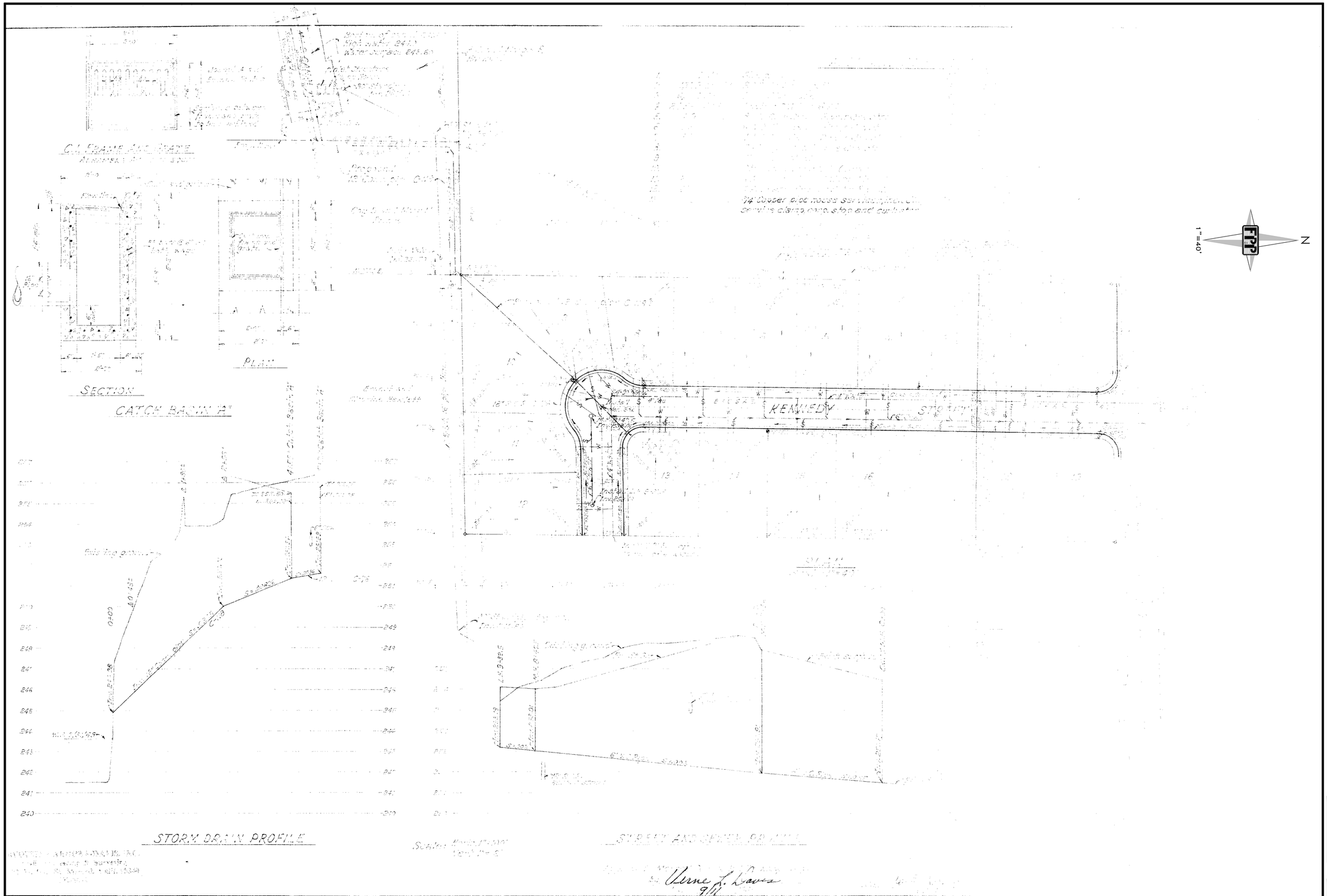
LE GRAND COMMUNITY SERVICES DISTRICT
LE GRAND, CALIFORNIA

DR. BY SAS
APPR. BY
DATE 7-28-11
FILE L002-2011C

L002-2011A
SHEET
C11
OF
16



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OF
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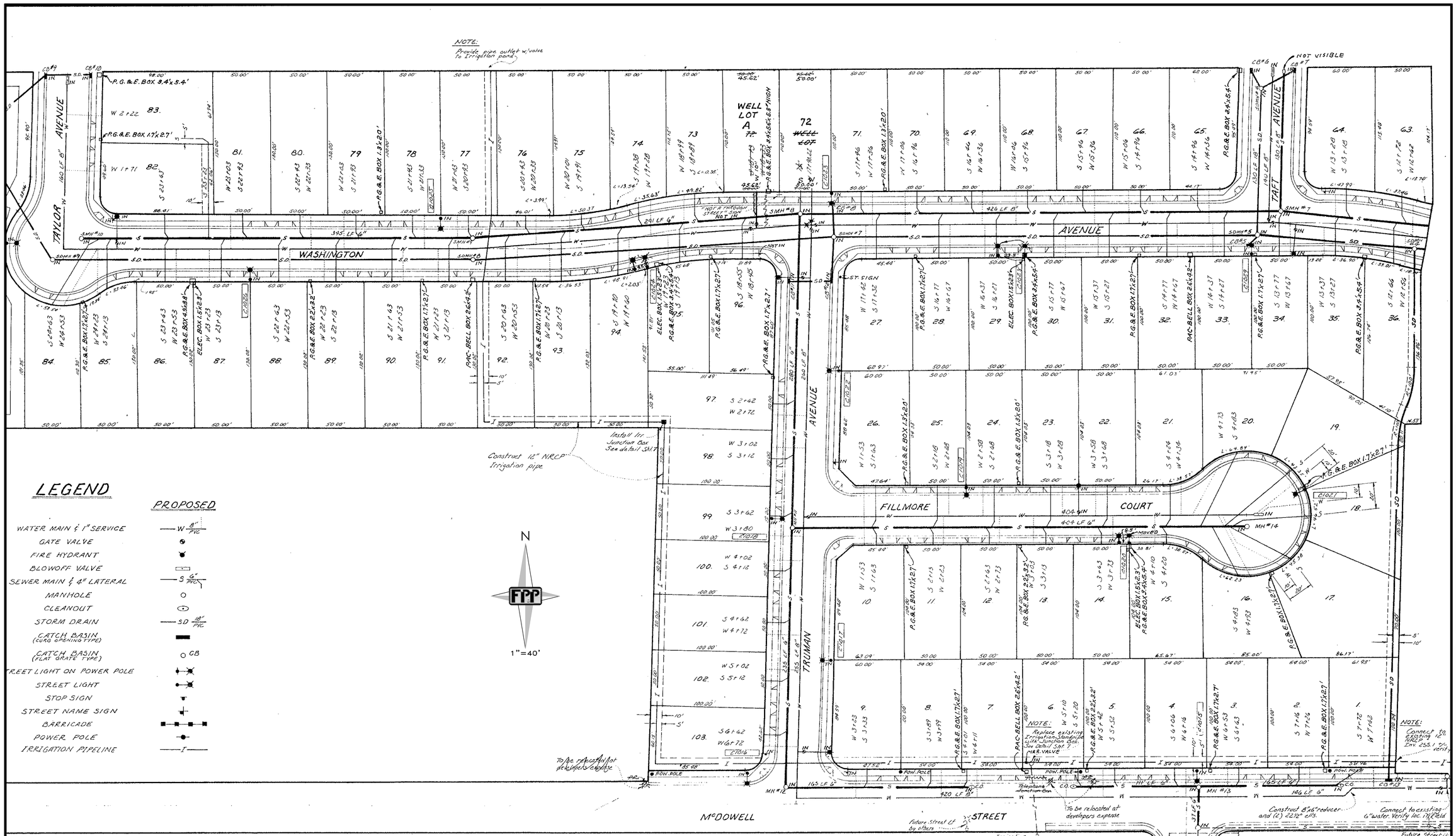


LEGEND

	PROPOSED
WATER MAIN & 1" SERVICE	W 8" PVC
GATE VALVE	
FIRE HYDRANT	
BLOWOFF VALVE	
SEWER MAIN & 4" LATERAL	S 6" PVC
MANHOLE	
CLEANOUT	
STORM DRAIN	SD 18" PVC
CATCH BASIN (CURB OPENING TYPE)	
CATCH BASIN (FLAT GRATE TYPE)	CB
STREET LIGHT ON POWER POLE	
STREET LIGHT	
STOP SIGN	
STREET NAME SIGN	
BARRICADE	
POWER POLE	
IRRIGATION PIPELINE	I

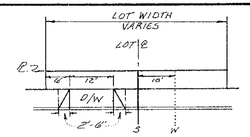
TER SYSTEM
T BLOCK SIZES

2 sq. ft.
3 sq. ft.
4 sq. ft. (inc. FH burials)
6 sq. ft.
8 sq. ft.

PIPELINE MATERIALS

Sanitary Sewers shall be PVC ASTM D 3034 SDR35
Water Mains shall be PVC AWWA C-900 class 150
Storm Drains shall be RCP ASTM C-76 Rubber Gaskets

Irrigation pipes in road R/W shall be RCP ASTM C-76 with bell & spigot O ring joints. All other irrigation pipe shall be N.R.C.P.



TYPICAL LOT FRONT
NO SCALE

"RECORD DRAWING"

3-21-90 JE B-C-A INC.

OAKBROOK associates
552 West Twentieth Street • P.O. Box 2084
Merced, California 95344 • (209) 383-3300

UTILITY PLAN
AMERICAN HERITAGE HOMES #1
LE GRAND MERCED COUNTY CALIFORNIA

Drawn RPR
Date June 85
Scale 1" = 40'
Job No. AA-523
Checked
File No.

James S. Oak L.S. No. 3718
Dennis L. Cote' R.C.E. No. 23791

REVISIONS

Symb	Date	Description	Appd

SHEET 6 OF 19

NO.	DATE	BY	REVISION MADE
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LE GRAND, CALIFORNIA

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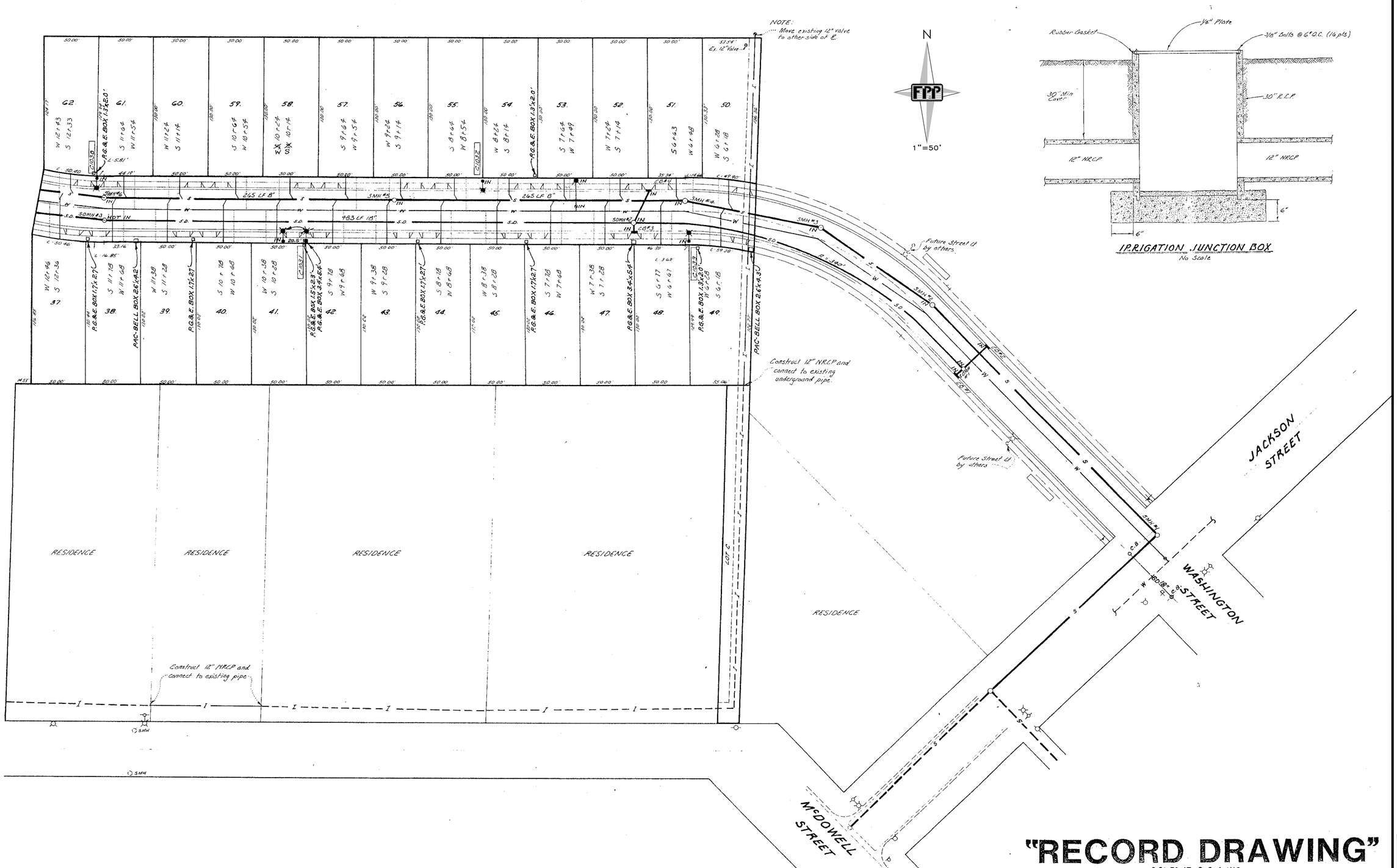
FILE L002-2011C

L002-2011A
SHEET C13 OF 16



OAKBROOK associates
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Merced, California 95344 • (209) 383-3300

UTILITY PLAN
AMERICAN HERITAGE HOMES #1
LE GRAND, MERCED COUNTY CALIFORNIA

Drawn RPR
Date June 85
Scale 1" = 40'
Job No 84-523
Checked
File No

James S. Oak L.S. No. 3718
Dennis L. Cote' R.C.E. No. 23791

REVISIONS			
Symb	Date	Description	Appd.

NO.	DATE	BY	REVISION MADE
1			
2			
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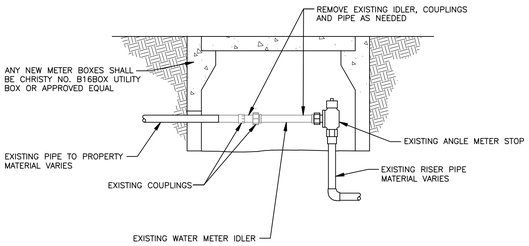
LE GRAND COMMUNITY SERVICES DISTRICT
LE GRAND, CALIFORNIA

DR. BY SAS
APPR. BY
DATE 7-28-11
FILE L002-2011C

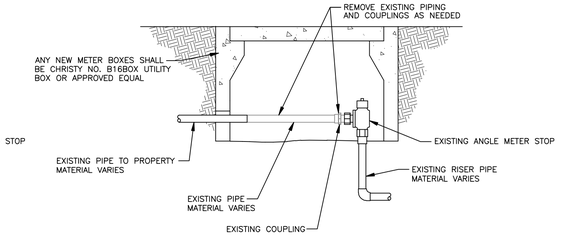
L002-2011A
SHEET C14 OF 16

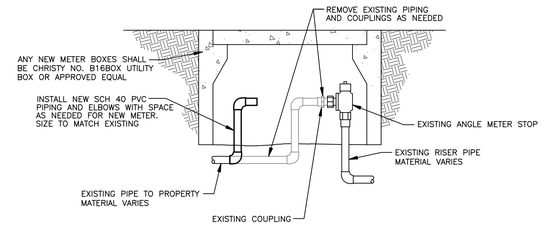


TYPICAL EXISTING WATER METER BOX CONNECTIONS

NOT TO SCALE

1/4

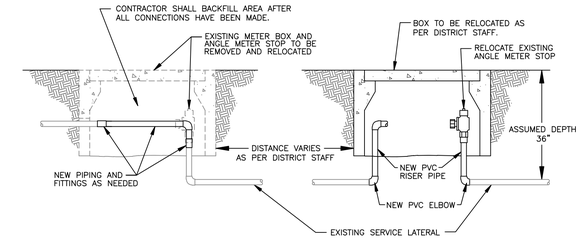




PIPING MODIFICATIONS

NOT TO SCALE

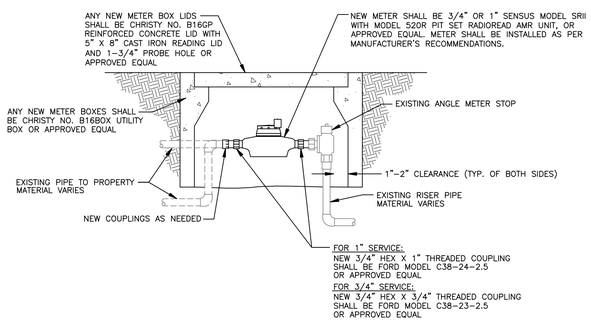
2/4



METER BOX RELOCATION

NOT TO SCALE

3/4

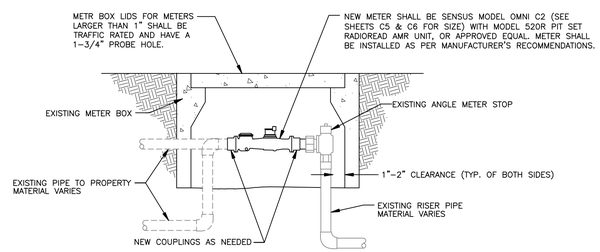


NOTE: PROPOSED CONNECTIONS ARE DESIGNED TO ALLOW THE METER TO BE EASILY REMOVED FOR SERVICE

PROPOSED 3/4" & 1" WATER METER CONNECTION

NOT TO SCALE

4/4

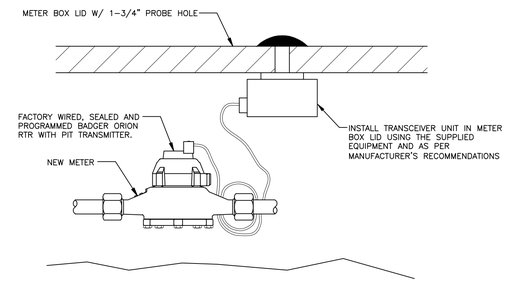


NOTE: PROPOSED CONNECTIONS ARE DESIGNED TO ALLOW THE METER TO BE EASILY REMOVED FOR SERVICE

PROPOSED LARGE WATER METER CONNECTION

NOT TO SCALE

5/4



TRANSCEIVER INSTALLATION

NOT TO SCALE

6/4

NOTES:

1. DUE TO THE LOCATION OF THE EXISTING METER STOP, SOME OF THE EXISTING METER BOXES WILL NEED TO BE RELOCATED TO ALLOW FOR INSTALLATION OF NEW METER. SEE SHEETS C5 & C6 FOR INDICATED BOXES.
2. CONTRACTOR SHALL COMPACT BACKFILLED SOIL AROUND NEW OR RELOCATED METER BOXES TO 90% RELATIVE COMPACTION.
3. NEW METER SHALL BE 3/4" OR 1" SENSUS MODEL SRII WITH MODEL 520R PIT SET RADIOREAD AMR UNIT, OR APPROVED EQUAL.
4. NEW METER BOXES SHALL BE CHRISTY NO. B16BOX UTILITY BOX, OR APPROVED EQUAL.
5. NEW PVC PIPE SHALL BE SCHEDULE 40 CONFORMING TO ASTM D1785.
6. CONTRACTOR MAY NEED TO CLOSE GATE VALVES TO ISOLATE AREAS OF THE WATER SYSTEM DURING CONSTRUCTION. WATER SHALL NOT BE SHUT OFF FOR MORE THAN 4 HOURS AT ANY ONE TIME. CONTRACTOR SHALL NOTIFY AFFECTED RESIDENTS 48 HOURS PRIOR TO SHUTTING OFF WATER.

NO.	DATE	BY	REVISION MADE
1			
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DETAILS

FREMMING, PARSON & PECCHENINO
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SHEET C15 OF 16

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-17

Groundwater Level Changes in Le Grand

Groundwater Draw Downs LGCSD

Date:	***Well 1a Cook St.***			***Well 2 Mcdowell/ Jackson st.***			***Well 4 Fillmore Ct.***		
	St	Drd	Rec	St	Drd	Rec	St	Drd	Rec
3/20/2014		292	270	170	171	171	182	218	187
3/27/2014	215	245	215	170	171	171	186	224	191
4/3/2014	215	245	215	170	171	171	188	222	193
4/10/2014	215	245	215	170	171	171	189	227	194
4/17/2014	0	0	0	170	171	170	188	222	193
4/24/2014	241	270	241	170	171	170	208	243	212
5/1/2014	234	265	234	170	171	170	206	242	210
5/8/2014	236	267	236	170	171	170	208	237	212
5/15/2014	Busy Skipped			Busy Skipped			Busy Skipped		
5/22/2014	239	269	239	OUT			212	236	216
5/29/2014	243	272	244	OUT			233	234	233
5/30/204	274	288	274	OUT			235	233	233
5/31/2014	265	280	267	OUT			235	242	235
6/1/2014	272	284	275	OUT			237	246	237
6/2/2014	271	279	271	OUT			233	233	233
6/3/2014	265	281	271	OUT			233	242	233
6/4/2014	268	290	268	OUT			233	237	233
6/5/2014	267	293	267	OUT			233	233	233
6/6/2014	268	298	268	OUT			235	236	235
6/7/2014		298		OUT			233	236	233
6/8/2014		297		OUT			234	236	234
6/9/2014	266	291	266	OUT			233	235	233

Groundwater Draw Downs LGCSD

6/10/2014		298		OUT	233	234	233
6/11/2014		299		OUT	233	235	233
6/12/2014		297		260	233	235	233
6/13/2014		298		260	232	234	232
6/14/2014	290	296	290	260	241	246	241
6/15/2014	288	294	288	260	240	245	240
6/16/2014	266	285	266	260	234	235	234
6/17/2014		298		260	233	235	233
6/18/2014		298		260	233	234	233
6/19/2014		297		260	233	234	235
6/20/2014		298		260	233	235	233
6/21/2014		299		260	235	237	235
6/22/2014		298		260	233	234	233
6/23/2014	263	284	263	260	233	234	233
6/24/2014	271	294	271	260	233	235	233

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-18

Merced IRWM Salt and Nutrient Study (excerpt)

Merced Integrated Regional Water Management Plan

Salt and Nutrient Study

Prepared by:

In Association with:

August 2013

MERCED INTEGRATED REGIONAL WATER MANAGEMENT PLAN
SALT AND NUTRIENT STUDY

August 12, 2013

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

The findings, recommendations, specifications, or professional opinions presented within the limits described by the client, in accordance with generally accepted professional engineering and geologic practice and within the scope of the project. No other warranty, express or implied, is provided.

David A. Bean, PG, CHg
Principal Hydrogeologist

PROFESSIONAL GEOLOGIST
David M. Bean
No. HG-606
CERTIFIED HYDROGEOLOGIST
STATE OF CALIFORNIA

TABLE OF CONTENTS

Page

1 INTRODUCTION 1
- 1.1 Related Efforts 1
- 1.2 Occurrence of Groundwater 5
- 1.3 Occurrence of Surface Water 6
- 1.4 Delivered Water 7
- 1.5 Treated Wastewater 7

2 GROUNDWATER QUALITY 7
- 2.1 Salinity and Nutrient Constituents 8
- 2.2 Petroleum Hydrocarbon, Pesticides, and Organic Constituents 12
- 2.3. Emerging Contaminants 14

3 SURFACE WATER AND DELIVERED WATER QUALITY 14

4 RECYCLED WATER WATER QUALITY 15

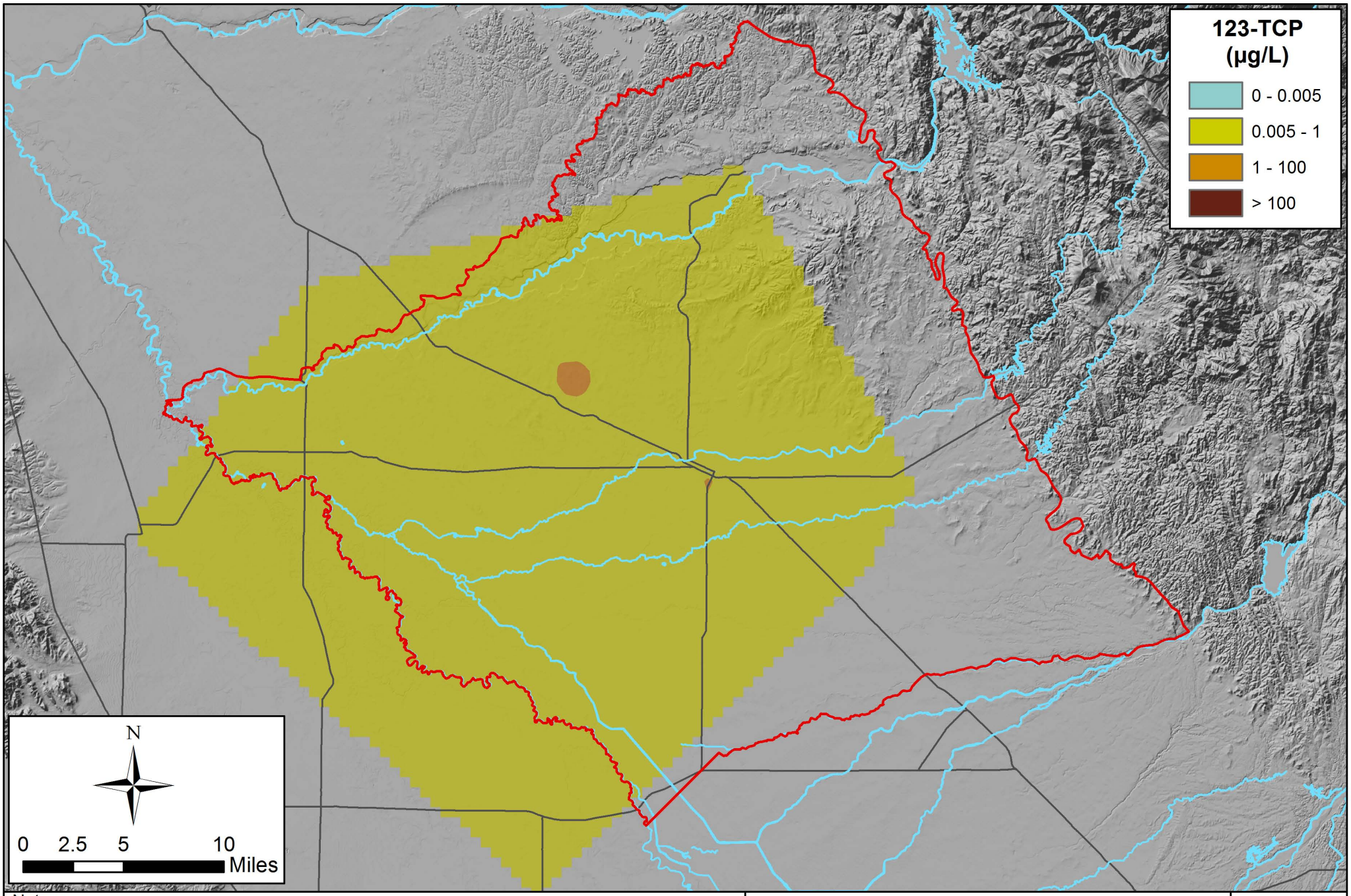
5 DATA GAPS, LOCAL DATA MANAGEMENT, AND VULNERABILITIES 15

6 SUMMARY 16

7 REFERENCES 17

LIST OF FIGURES

Figure 1 Groundwater Subbasins within the Merced IRWM Area
Figure 2 Generalized Geology Merced IRWM Area
Figure 3 Lateral Extent and Thickness of the Corcoran Clay within the Merced IRWM Area
Figure 4 Watersheds within the Merced IRWM Area
Figure 5 Lake McClure Reservoir Storage
Figure 6 Water Districts within the Merced IRWM Area
Figure 7 Township-Range Centroids for Composite Time-Concentration Plots
Figure 8 Groundwater Quality Type Merced IRWM Area
Figure 9 5-Year Average Distribution of Total Dissolved Solids in Groundwater
Figure 10 5-Year Average Distribution of Electrical Conductivity in Groundwater
Figure 11 5-Year Average Distribution of Arsenic in Groundwater
Figure 12 5-Year Average Distribution of Chloride in Groundwater
Figure 13 5-Year Average Distribution of Iron in Groundwater
Figure 14 5-Year Average Distribution of Hexavalent Chromium in Groundwater
Figure 15 5-Year Average Distribution of Manganese in Groundwater
Figure 16 5-Year Average Distribution of Nitrate in Groundwater
Figure 17 5-Year Average Distribution of Perchlorate in Groundwater
Figure 18 5-Year Average Distribution of Benzene in Groundwater
Figure 19 5-Year Average Distribution of MTBE in Groundwater
Figure 20 5-Year Average Distribution of DBCP in Groundwater
Figure 21 5-Year Average Distribution of 111-TCA in Groundwater
Figure 22 5-Year Average Distribution of 123-TCP in Groundwater
Figure 23 5-Year Average Distribution of PCE in Groundwater
Figure 24 5-Year Average Distribution of TCE in Groundwater
Figure 25 Merced River Surface Water Piper Diagram
Figure 26 Wastewater Treatment Plant Effluent Piper Diagram
Figure 27 Groundwater Quality Stiff Diagrams



Notes:
1) Refer to Section 2, Evaluation Methodology, for details of spatial and temporal averaging
2) Average of data colleceted between 2007 and 2012
3) Sources: Merced County Division of Environmental Health
USGS GAMA Program
State Water Board GeoTracker
4) Notification Level = 0.005 µg/L

5-Year Average Distribution of 123-TCP in Groundwater

2013

Figure 22

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-19

LGCSD Water Meter Conservation Project Water Supply Benefits

LGCSD Water Conservation Meter Project - Water Supply Benefits

Le Grand CSD

Water wells - Monthly Pumping Volumes

Well Number	Unit	June 2013	July 2013	August 2013	Sept. 2013	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May 2014	Total	
#1A	Gallons	14590800	15096400	14821500	9034600	0	1876300	3307200	4005900	35745000	6132000	9511100	13206000	127,326,800.00	
#2	Gallons	427300	10300	2800	265900	296900	11200	3200	29200	45400	5500	144700	38500	1,280,900.00	
#4	Gallons	810000	2470000	1143000	4354000	11217000	5563000	430000	33000	0	12000	20000	203000	26,255,000.00	
													Total:	154,862,700.00	
												25% reduction		38,715,675.00	Gallons
														118.78	AF

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-20

LGCSD Water Meter Conservation Project Energy Usage from 2013-2014 and Reduction in Energy Usage Benefits

Le Grand CSD
Electrical usage for Water wells

Well Number	**Unit**	**Energy Usage by Month**												
		June 2014	July 2013	August 2013	Sept. 2013	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May 2014	**Total**
#1A	kWh	14972	30421	33261	31733	15024	258	3594	9181	10397	7626	9297	18730	184,494.00
#2	kWh	572.28	766.158	28.235	31.118	693.235	253.548	43.195	51.281	41.033	80.372	28.085	119.187	2,707.73
#4	kWh	9639.02	370.221	4802.47	2553.815	17616	22518.83	8253.028	878.703	824.217	807.223	725.241	4019.165	73,007.93
													Total:	260,209.66

Energy Savings for the Water Meter Conservation Project (25% reduction) **65,052.42** **kWh**

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-9
Statement Date: 06/15/2014
Due Date: 07/02/2014

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	572.280000 kWh	$651.77
Total			**$651.77**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	9,639.020000 kWh	$2,205.68
Total			**$2,205.68**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	14,972.000000 kWh	$3,402.32
Total			**$3,402.32**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	418.873300 kWh	$105.33
Total			**$105.33**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	25,040.000000 kWh	$4,796.90
Total			**$4,796.90**
vice For: **4239 MC KEE ST**			
Service Agreement ID 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,173.864000 kWh	$277.15
Total			**$277.15**

294,867.322 kWh

25,103.3

25,103.3

Visit **www.pge.com/MyEnergy** *for a detailed bill comparison.*

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-5
Statement Date: 05/12/2014
Due Date: 05/29/2014

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	119.187000 kWh	$376.21
Total			**$376.21**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	4,019.165000 kWh	$875.40
Total			**$875.40**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	18,730.000000 kWh	$2,797.23
Total			**$2,797.23**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	270.477400 kWh	$59.08
Total			**$59.08**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	23,240.000000 kWh	$3,184.06
Total			**$3,184.06**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,397.699000 kWh	$262.61
Total			**$262.61**

22,868,352

22,868,352

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814205000-0

Statement Date: 04/10/2014

Due Date: 04/28/2014

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2 Electric Charges	1004549103	28.085000 kWh	$179.54
Total			**$179.54**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018 Electric Charges	1005461671	725.241000 kWh	$127.69
Total			**$127.69**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1 Electric Charges	1003204520	9,297.000000 kWh	$1,425.76
Total			**$1,425.76**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD Electric Charges	1005777666	232.937300 kWh	$45.24
Total			**$45.24**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT Electric Charges	1003648527	23,440.000000 kWh	$3,000.33
Total			**$3,000.33**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP Electric Charges	1005461238	1,337.398000 kWh	$220.81
Total			**$220.81**

10,050.326

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-9
Statement Date: 03/13/2014
Due Date: 03/31/2014

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	80.372000 kWh	$313.82
Total			**$313.82**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	807.223000 kWh	$140.64
Total			**$140.64**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	7,626.000000 kWh	$1,205.95
Total			**$1,205.95**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	238.781200 kWh	$46.44
Total			**$46.44**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	21,520.000000 kWh	$2,759.50
Total			**$2,759.50**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,393.389000 kWh	$228.47
Total			**$228.47**

8513.595

Visit **www.pge.com/MyEnergy** *for a detailed bill comparison.*

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	41.033000 kWh	$216.84
Total			**$216.84**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	824.217000 kWh	$143.41
Total			**$143.41**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	10,397.000000 kWh	$1,539.77
Total			**$1,539.77**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	156.751700 kWh	$33.89
Total			**$33.89**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	25,280.000000 kWh	$3,186.41
Total			**$3,186.41**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,691.217000 kWh	$273.09
Total			**$273.09**

11262.250

Visit **www.pge.com/MyEnergy** *for a detailed bill comparison.*

ENERGY STATEMENT

www.pge.com/MyEnergy

Statement Date: 01/09/2014

Due Date: 01/27/2014

mmary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	51.281000 kWh	$206.53
Total			**$206.53**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	878.703000 kWh	$151.70
Total			**$151.70**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	9,181.000000 kWh	$1,462.58
Total			**$1,462.58**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	234.963000 kWh	$45.70
Total			**$45.70**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	24,960.000000 kWh	$3,069.61
Total			**$3,069.61**
vice For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,652.494000 kWh	$267.08
Total			**$267.08**

10110.98

ENERGY STATEMENT

www.pge.com/MyEnergy

Statement Date: 12/10/2013
Due Date: 12/27/2013

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2 Electric Charges	1004549103	43.195000 kWh	$360.95
Total			**$360.95**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018 Electric Charges	1005461671	8,353.026000 kWh	$1,269.52
Total			**$1,269.52**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1 Electric Charges	1003204520	3,594.000000 kWh	$910.94
Total			**$910.94**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD Electric Charges	1005777666	266.909000 kWh	$51.41
Total			**$51.41**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT Electric Charges	1003648527	25,880.000000 kWh	$3,154.36
Total			**$3,154.36**
vice For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP Electric Charges	1005461238	1,817.328000 kWh	$293.74
Total			**$293.74**

11990.221

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No. 4814263558-3
Statement Date: 11/12/2013
Due Date: 12/02/2013

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	253.548000 kWh	$445.82
Total			**$445.82**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	22,518.826000 kWh	$4,569.12
Total			**$4,569.12**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	258.000000 kWh	$980.30
Total			**$980.30**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	237.188000 kWh	$58.09
Total			**$58.09**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	24,440.000000 kWh	$4,200.08
Total			**$4,200.08**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,525.594000 kWh	$323.80
Total			**$323.80**

23,030.374

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-
Statement Date: 10/09/201
Due Date: 10/28/201

ummary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	693.235000 kWh	$641.50
Total			**$641.50**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	17,616.004000 kWh	$3,748.98
Total			**$3,748.98**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	15,024.000000 kWh	$3,053.35
Total			**$3,053.35**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	275.834200 kWh	$69.39
Total			**$69.39**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	18,600.000000 kWh	$3,343.45
Total			**$3,343.45**
..vice For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,441.588000 kWh	$325.23
Total			**$325.23**

33333.239

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-9
Statement Date: 09/10/2013
Due Date: 09/27/2013

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	31.118000 kWh	$235.15
Total			**$235.15**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	2,553.815000 kWh	$568.86
Total			**$568.86**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	31,733.000000 kWh	$5,440.58
Total			**$5,440.58**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	381.097300 kWh	$93.26
Total			**$93.26**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	20,440.000000 kWh	$3,501.59
Total			**$3,501.59**
vice For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,597.934000 kWh	$358.24
Total			**$358.24**

34317933

ENERGY STATEMENT

www.pge.com/MyEnergy

Account No: 4814263558-9
Statement Date: 08/09/2013
Due Date: 08/26/2013

Summary of your energy related services

	Meter Number	Usage	Amount
Service For: **MCDOWELL WS S/JACKSON**			
Service Agreement ID: 4814263795 WELL #2			
Electric Charges	1004549103	28.235520 kWh	$269.16
Total			**$269.16**
Service For: **E/O FILLMORE AVE**			
Service Agreement ID: 4814263995 WELL #4-6014018			
Electric Charges	1005461671	4,802.473000 kWh	$1,034.78
Total			**$1,034.78**
Service For: **W/COOK 100FT S/MURDOCK**			
Service Agreement ID: 4814263025 WTR SUPPLY WELL #1			
Electric Charges	1003204520	33,261.000000 kWh	$5,652.22
Total			**$5,652.22**
Service For: **4051 S SANTA FE AVE**			
Service Agreement ID: 4814263393 STORAGE YARD			
Electric Charges	1005777666	361.984600 kWh	$88.42
Total			**$88.42**
Service For: **5529 MCKEE ST**			
Service Agreement ID: 4814263040 SEWER PLANT			
Electric Charges	1003648527	19,320.000000 kWh	$3,330.51
Total			**$3,330.51**
Service For: **4239 MC KEE ST**			
Service Agreement ID: 4814263751 LIFT PUMP			
Electric Charges	1005461238	1,334.203000 kWh	$302.69
Total			**$302.69**

38091.70852

LE GRAND COMMUNITY SERVICES DISTRICT
MCDOWELL WS S/JACKSON
130FT
LE GRAND CA 95333

ELECTRIC ACCOUNT DETAIL

Service ID #: 4814263795 WELL #2
Rate Schedule: A10S Medium General Demand-Metered Service
Billing Days: 30 days

Serial	Rotating Outage Blk	Meter #	Total Usage
J	10N	1004549103	766.158500 Kwh

Charges

06/11/2013 - 07/10/2013

Electric Charges	$667.06	
Net Charges		$667.06

The net charges shown above include the following component(s).
Please see definitions on Page 2 of the bill.

Generation	$183.97
Transmission	141.48
Distribution	324.40
Public Purpose Programs	10.64
Nuclear Decommissioning	0.38
DWR Bond Charge	3.78
Ongoing CTC	2.56
Energy Cost Recovery Amount	0.15-

Taxes and Other

Energy Commission Tax $0.22

Demand Detail

Billing Demand Summer 31

TOTAL CHARGES **$667.28**

Usage Comparison	Days Billed	Kwh Billed	Kwh per Day
This Year	30	766.158500	25.538617
Last Year	N/A	N/A	N/A

Rotating outage blocks are subject to change without advance notice due to operational conditions.

Generation includes PG&E's total cost of energy. Approximately 1% of your energy is provided by the Department of Water Resources (DWR) and collected by PG&E as DWR's agent. In 2013, DWR will return $26 million to bundled service customers which offsets other generation charges in this bill.

The rates shown above are applicable to bundled service customers. Direct Access and Community Choice Aggregation customers pay only a portion of these rates. Please see the appropriate rate schedule for the applicable charges.

E/O FILLMORE AVE
LE GRAND CA 95333

ELECTRIC ACCOUNT DETAIL

Service ID #: 4814263995 WELL #4-6014018

35,323.82202

LE GRAND COMMUNITY SERVICES DISTRICT

Rate Schedule: A1X Small General Time-of-Use Service
Billing Days: 30 days

Serial	Rotating Outage Blk	Meter #	Total Usage
J	10N	1005461671	4,136.663520 Kwh

Charges

06/11/2013 - 07/10/2013

Electric Charges		
Net Charges	$893.53	
		$893.53

The net charges shown above include the following component(s).
Please see definitions on Page 2 of the bill.

Generation	$408.01
Transmission	65.98
Distribution	321.60
Public Purpose Programs	63.67
Nuclear Decommissioning	2.07
DWR Bond Charge	20.40
Ongoing CTC	12.58
Energy Cost Recovery Amount	0.78-

Taxes and Other

Energy Commission Tax	$1.20

Time of Use Detail

Season: Summer	Energy
Peak	334.436000 @$0.23120
Partial-Peak	1,488.681000 @$0.22358
Off-Peak	2,313.546520 @$0.20041

TOTAL CHARGES **$894.73**

Usage Comparison	Days Billed	Kwh Billed	Kwh per Day
This Year	30	4,136.663520	137.888784
Last Year	30	470.846500	15.694883

Rotating outage blocks are subject to change without advance notice due to operational conditions.

Generation includes PG&E's total cost of energy. Approximately 1% of your energy is provided by the Department of Water Resources (DWR) and collected by PG&E as DWR's agent. In 2013, DWR will return $26 million to bundled service customers which offsets other generation charges in this bill.

The rates shown above are applicable to bundled service customers. Direct Access and Community Choice Aggregation customers pay only a portion of these rates. Please see the appropriate rate schedule for the applicable charges.

W/COOK 100FT S/MURDOCK
LE GRAND CA 95333

ELECTRIC ACCOUNT DETAIL

Service ID #: 4814263025 WTR SUPPLY WELL #1
Rate Schedule: A10S Medium General Demand-Metered Service
Billing Days: 30 days

Serial	Rotating Outage Blk	Meter #	Prior Meter Read	Current Meter Read	Difference	Meter Constant	Usage
J	10N	1003204520	60,113	90,534	30,421	1	30,421 Kwh

LE GRAND COMMUNITY SERVICES DISTRICT

Charges

06/04/2013 - 07/03/2013

Electric Charges	$5,246.28	
Net Charges		$5,246.28

The net charges shown above include the following component(s).
Please see definitions on Page 2 of the bill.

Generation	$2,978.01
Transmission	314.22
Distribution	1,270.48
Public Purpose Programs	422.55
Nuclear Decommissioning	15.21
DWR Bond Charge	149.98
Ongoing CTC	101.61
Energy Cost Recovery Amount	5.78-

Taxes and Other

Energy Commission Tax $8.82

Demand Detail

Billing Demand Summer 54

TOTAL CHARGES **$5,255.10**

Usage Comparison	Days Billed	Kwh Billed	Kwh per Day
This Year	30	30,421	1,014.0
Last Year	28	24,317	868.5

Rotating outage blocks are subject to change without advance notice due to operational conditions.

Generation includes PG&E's total cost of energy. Approximately 1% of your energy is provided by the Department of Water Resources (DWR) and collected by PG&E as DWR's agent. In 2013, DWR will return $26 million to bundled service customers which offsets other generation charges in this bill.

The rates shown above are applicable to bundled service customers. Direct Access and Community Choice Aggregation customers pay only a portion of these rates. Please see the appropriate rate schedule for the applicable charges.

4051 S SANTA FE AVE
LE GRAND CA 95333

ELECTRIC ACCOUNT DETAIL

Service ID #: 4814263393 STORAGE YARD
Rate Schedule: A1X Small General Time-of-Use Service
Billing Days: 30 days

Serial	Rotating Outage Blk	Meter #	Total Usage
J	10N	1005777666	370.221950 Kwh

Charges

06/11/2013 - 07/10/2013

Electric Charges	$90.43	
Net Charges		$90.43

The net charges shown above include the following component(s).
Please see definitions on Page 2 of the bill.

Merced Integrated Regional Water Management Implementation Grant Proposal

Appendix 3-21

LGCSD Water Meter Conservation Project Chemical Usage in 2013 and Reduction in Chemical Usage Benefits

Le Grand CSD

Chlorine Usage 2013

Gallons

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total:
210	240	240	240	240	240	300	300	240	210	210	210	2880 gallons

Chlorine Usage Reduction (25% reduction) for the Water Meter Conservation Project **720 gallons**