FUGRO CONSULTANTS, INC.

NORTHERN CITIES MANAGEMENT AREA
2013 ANNUAL MONITORING REPORT

Prepared for:
The Northern Cities Management Area Technical Group

City of Arroyo Grande
City of Grover Beach
Oceano Community Services District
City of Pismo Beach

Prepared by:
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April 28, 2014

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Northern Cities Management Area

Northern Cities Management Area
2013 Annual Monitoring Report

Fugro Consultants is pleased to submit the 2013 Annual Monitoring Report for the Northern Cities Management Area. The report is prepared pursuant to the requirements of the Stipulation and Judgment for the Santa Maria Groundwater Adjudication. The report is prepared on behalf of the Northern Cities Management Area, which is comprised of the City of Arroyo Grande, City of Grover Beach, Oceano Community Services District, and City of Pismo Beach.

Sincerely,

FUGRO CONSULTANTS, INC.

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NORTHERN CITIES MANAGEMENT AREA
2013 ANNUAL MONITORING REPORT

1.0 EXECUTIVE SUMMARY

This 2013 Annual Report for the Northern Cities Management Area (NCMA) is prepared pursuant to the requirements of the Stipulation and Judgment for the Santa Maria Groundwater Basin Adjudication. The Annual Report provides an assessment of hydrologic conditions for the NCMA based on data collected during the calendar year of record. As specified in the Judgment, the Northern Cities agencies, consisting of the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach, and Oceano Community Services District, are to conduct groundwater monitoring in the NCMA, and collect and analyze data pertinent to water supply and demand, including:

- Land and water uses in the basin;
- Sources of supply to meet those uses;
- Groundwater conditions (including water levels and water quality);
- Amount and disposition of developed water supplies; and
- Amount and disposition of other sources of water supply in the NCMA.

Results of the data compilation and analysis for calendar year 2013 are documented and discussed in this Annual Report.

1.1 FINDINGS

- Rainfall in the NCMA for calendar year 2013 was 4.32 inches, equal to 27 percent of the long-term average annual rainfall for the area. Below average rainfall occurred for eight of the twelve months. Most rainfall typically falls from November through April, however the year was marked by substantially lower than average rainfall (21 percent of normal) in the "wet" months of January, February, March, April, November, and December.
- Spring (April 2013) groundwater level elevations underlying the NCMA shows groundwater elevations highest in the eastern portion of the NCMA and approximately 5 feet above sea level along the shore line. A relatively shallow westward-facing pumping trough developed in the Spring 2013 in the northern part of the area, apparently in response to municipal pumping in the Arroyo Grande and Grover Beach area. A comparison with Spring 2012 contours shows that Spring 2013 water levels were generally 10 to 15 feet lower throughout the NCMA from one year ago.
- Fall groundwater elevations in October 2013 were also highest in the eastern portion of the NCMA, and approximately 2 to 5 feet above sea level along the shoreline. Groundwater elevations were generally above mean sea level (msl) in the Fall throughout the NCMA, with the exception of a few measurements in agricultural wells in the east-central part of the area where water level elevations were measured as deep as 6.7 feet below msl. These lower water level elevations maintain the previously recognized depression in the water table in the so-called "pumping trough," located

south of the municipal well fields and in the vicinity of, and south of, lower Arroyo Grande Creek. Water elevations in this area are generally 5 to 10 feet lower than levels measured in Fall 2012.

- Total water use in the NCMA in 2013, including urban use by the Northern Cities agencies as well as applied irrigation and private pumping by rural water users, was 10,722 acre feet (AF). Of this amount, groundwater pumping accounted for approximately 4,206.7 AF. The breakdown is shown on the following table.

Urban Area	Lopez Lake	State Water Project	Groundwater	Transfers	Other Supplies	Total
Arroyo Grande	*2,722.3*	*0.0*	*268.4*	*0.0*	*120.2*	3,110.9
Grover Beach	*802.7*	*0.0*	*988.8*	*0.0*	*0.0*	1,791.5
Pismo Beach	*1,457.4*	*618.0*	*73.0*	*0.0*	*0.0*	2,148.4
Oceano CSD	*44.9*	*750.0*	*92.8*	*0.0*	*0.0*	887.7
Urban Water Use Total	**5,027.3**	**1,368.0**	**1,423.0**	**0.0**	**120.2**	**7,938.5**
Applied Irrigation	*0.0*	*0.0*	*2,742.0*	*0.0*	*0.0*	2,742.0
Rural Water Users	*0.0*	*0.0*	*41.7*	*0.0*	*0.0*	41.7
Total	**5,027.3**	**1,368.0**	**4,206.7**	**0.0**	**120.2**	**10,722.2**

- In April 2013 municipal groundwater pumpage was increased to replace temporarily unavailable supplies from Lake Lopez. As a result, the groundwater level in Sentry Well 30F03 (Highway 1 well) declined by as much as 14 feet in 7 days and was below sea level for a total of 6 days. The decline in water level due to increased pumpage required almost two weeks to recover to the initial water levels observed prior to the increased pumping. Similar water level declines, albeit of less magnitude, were also observed in deep wells 24B03 (North Beach Campground) and 30N02 (Pier Avenue).
- Averaging the groundwater elevations from the three deep sentry wells provides a single, representative index for tracking the status and apparent health of the basin. Previous studies suggest that the deep well index is 7.5 feet NAVD88. As described in previous Annual Reports, the measured index values of the three deep wells remained below 7.5 feet between October 2007 and August 2009, during which high concentrations of chloride and sodium occurred in two sentry wells in late 2009. This relationship implies a lag in time between lowered water levels in the deep sentry wells and significant increases in sodium and chloride. This is potentially significant because the measured index level was as much as 6 feet below the index value of 7.5 in April 2013 and remained at or below the index from early June 2013 until mid-December 2013. Continued average values below the index create a potential environment for increased risk of sea water intrusion.
- The index value ended the year above the 7.5-foot index level. However, February through April is the time of year that historically has the highest index level value (at least since January 2010). The index value at the end of 2013 is 2 to 4 feet lower than

the end of year levels of 2010 through 2012. If the wells experience a 1-foot rise through February to April followed by a 5-foot decline in water level elevations until October 2014 (as is typical in past years), then the index value may potentially be as low as 4 feet in October 2014. Considering the effects of any increased pumpage related to anticipated cutbacks in surface water deliveries, the index level may approach the level seen in 2008-2009, just prior to observing the elevated chloride concentrations in the Pier Avenue well.

- Minor variations and changes in water quality were observed in the sentry wells throughout the year; however there are no indications of sea water intrusion in the deeper levels of the groundwater production zone.
- The various water quality indicators observed in 2013 suggest that the local interface/mixing zone between seawater and fresh groundwater remains seaward of the sentry wells (shoreline). The location of the seawater interface is not known due to the heterogeneity of the aquifer. The only indication of the location of the interface would be when one or more monitored wells show an increase in total dissolved solids, chlorides, sodium, or other constituent along with a geochemical signature resembling seawater. These changes may be brought on by reduced recharge (e.g. drought conditions) or if pumping exceeds available groundwater supply, or both.
- Numerous management objectives are described in the Annual Report, including strategies to meet the objectives. Due to potential constraints on supply, all NCMA agencies, both individually and jointly, are engaged in water resource management projects, programs, and planning efforts that address water supply and demand issues, particularly efforts to assure a long-term sustainable supply. Constraints on supply include drought cycles, limitations on surface water allocations and risk of seawater intrusion of the aquifer system.
- A key water supply planning and management activity started in late 2013 by the NCMA is the initiation of joint Strategic Planning efforts for the purpose of providing the NCMA Technical Group with a framework for identifying common water resource planning goals and objectives, and to establish a 10-year work plan for implementation of those efforts. Several key objectives have been identified, including water supply reliability, increased outreach, and basin management. These efforts will continue throughout 2014.
- The deepening pumping depression within the NMMA and expansion of the groundwater depression to the west and north, towards the NCMA, appears to have eliminated the historical groundwater divide between the NCMA and NMMA. With the loss of this divide there has been a reversal of groundwater gradients and the development of a landward gradient in the southern portion of the NCMA. This landward gradient eliminates the historic recharge volume of subsurface inflow into the NCMA (thereby reducing the yield of the aquifer), and creates conditions favorable for seawater intrusion in the NCMA and NMMA. To mitigate the risk of seawater intrusion and restore the subsurface inflow into the aquifer, immediate conservation measures must be made to reduce demand in the NMMA. Additionally, the County of San Luis Obispo, which possesses land use authority, must restrict any future development that increases water demand in the NMMA.

2.0 INTRODUCTION

2.1 INTRODUCTION

This report summarizes hydrologic conditions during the calendar year 2013 in the Northern Cities Management Area (NCMA) of the Santa Maria Groundwater Basin (SMGB) in San Luis Obispo County, California. This report was prepared on behalf of four public agencies collectively referred to as Northern Cities, which includes the City of Arroyo Grande (Arroyo Grande), City of Grover Beach (Grover Beach), City of Pismo Beach (Pismo Beach) and the Oceano Community Services District (Oceano CSD). These agencies, along with local land owners, the County of San Luis Obispo (County), and the San Luis Obispo County Flood Control & Water Conservation District (SLOFCWCD) have managed local surface water and groundwater resources in the area since the late 1970s to preserve the long-term integrity of water supplies.

The collaborative approach was formalized in the 2002 Management Agreement between the Northern Cities, Northern Landowners, and Other Parties, and incorporated in the 2005 Settlement Stipulation for the Santa Maria Groundwater Basin Adjudication (Stipulation). On June 30, 2005 the Stipulation was agreed upon by numerous parties, including the Northern Cities. The "Settlement Agreement" attached to the Stipulation included the Management Agreement of 2002. The approach was then adopted by the Superior Court of California, County of Santa Clara, in its Judgment After Trial, entered January 25, 2008 (Judgment). Although appeals to that decision were filed, a subsequent decision by the Sixth Appellate District (filed November 21, 2012) has upheld the Court's Judgment. Most recently, the Supreme Court of California denied a petition to review the decision on February 13, 2013.

The Judgment orders the stipulating parties to comply with all terms of the Stipulation. The 2002 Settlement Agreement is generally affirmed as part of the Judgment and its terms incorporated into the Stipulation. However provisions of the Stipulation supersede the 2002 Settlement Agreement in the areas of continuing jurisdiction, groundwater monitoring and reporting. As specified in the Judgment and as outlined in the *Monitoring Program for the Northern Cities Management Area* (Monitoring Program, Todd 2008), the Northern Cities agencies are to conduct groundwater monitoring of wells in the NCMA. In accordance with requirements of the Judgment, the agencies comprising the NCMA group collect and analyze data pertinent to water supply and demand, including:

- Land and water uses in the basin;
- Sources of supply to meet those uses;
- Groundwater conditions (including water levels and water quality);
- Amount and disposition of developed water supplies; and,
- Amount and disposition of other sources of water supply in the NCMA.

The Monitoring Program requires that the NCMA gather and compile pertinent information on a calendar year basis; this is accomplished through data collected by Northern Cities agencies (including necessary field work), requests to other public agencies, and from online sources. Periodic reports such as Urban Water Management Plans (UWMP) prepared by the Cities of Arroyo Grande, Grover Beach and Pismo Beach provide information on demand, supply, and

water supply facilities. Annual data are added to the comprehensive Northern Cities Management Area Database (NCMA DB) and analyzed. Results of the data compilation and analysis for calendar year 2013 are documented and discussed in this Annual Report.

As shown on Figure 1, the Northern Cities Management Area (NCMA) represents the northernmost portion of the Santa Maria Groundwater Basin, as defined in the adjudication and by California Department of Water Resources (DWR 1958) as the Santa Maria River Valley groundwater basin (Basin 3-12). Adjoining the NCMA to the southeast is the Nipomo Mesa Management Area (NMMA); the Santa Maria Valley Management Area (SMVMA) encompasses the remainder of the groundwater basin. Figure 2 shows the locations of the four Northern Cities agencies within the NCMA.

2.2 BACKGROUND

2.2.1 Description of the Northern Cities Management Area Technical Group

The NCMA Technical Group (TG) is composed of representatives of Arroyo Grande, Grover Beach, Pismo Beach, and Oceano CSD (Table 1).

Table 1. NCMA TG Representatives

Agency	Representative
City of Arroyo Grande	Teresa McClish Director of Community Development
City of Arroyo Grande	Shane Taylor Utilities Services Supervisor
City of Grover Beach	Gregory A. Ray, PE Director of Public Works/City Engineer
City of Grover Beach	R.J. (Jim) Garing, PE Consulting City Engineer for Water and Sewer
City of Pismo Beach	Benjamin A. Fine, PE Director of Public Works/City Engineer
Oceano Community Services District	Tony Marracino Utility Systems Supervisor

The TG contracts with a consulting firm to serve as staff extension to assist the TG in all functions of the roles and responsibilities of the TG for purposes of managing the water supply resources. The TG also contracts with a consulting firm to conduct the quarterly groundwater monitoring and sampling tasks, evaluate water demand and available supply, identify threats to water supply, and assist the group in preparation of the Annual Report.

2.2.2 Coordination with Management Areas

Since 1983, management of the NCMA has been based on cooperative efforts of the four Northern Cities agencies with ongoing collaboration with San Luis Obispo County, the SLOFCWCD, and other local and state agencies. Specifically the NCMA agencies have limited their pumping and, in cooperation with SLOFCWCD, invested in surface water supplies so as to not exceed the safe yield of the NCMA portion of the Santa Maria Valley groundwater basin (SMGB). Other organizations participate as appropriate to the issues of the time. In addition to the efforts discussed in the report, cooperative management occurs through many means including communication of the Northern Cities in their respective public meetings and participation in the Water Resources Advisory Council (the County-wide advisory panel on water issues). The NCMA agencies participated in preparation and adoption of the 2007 San Luis Obispo County Integrated Regional Water Management Plan (IRWMP), and are participating in the ongoing IRWMP update efforts. The IRWMP promotes integrated regional water management to ensure sustainable water uses, reliable water supplies, better water quality, environmental stewardship, efficient urban development, protection of agriculture, and a strong economy.

Since the 2008 Judgment, the NCMA has taken the lead in cooperative management of its management area. The NCMA has also been a proactive participant in the Santa Maria Groundwater Basin Management Area technical subcommittee, which formed in 2010. These efforts continued throughout 2013. The NCMA Technical Group met monthly (at a minimum) throughout 2013. The group also met four times with the NMMA and SMVMA groups. The coordination among the management areas is leading to joint projects such as enhanced monitoring of groundwater levels and improved sharing of data.

A key water supply planning and management activity started in late 2013 by the NCMA is the initiation of joint Strategic Planning efforts for the purpose of providing the NCMA Technical Group with a framework for identifying common water resource planning goals and objectives, and to establish a 10-year work plan for implementation of those efforts. Several key objectives have been identified, including water supply reliability, increased outreach, and basin management. These efforts will continue throughout 2014.

3.0 BASIN DESCRIPTION

3.1 SETTING

The Santa Maria Groundwater Basin, as defined in the adjudication and as defined by the Department of Water Resources (DWR 1958) as the Santa Maria River Valley groundwater basin (Basin 3-12), generally has three hydrologic elements. As shown in Figure 1 (following text), the Northern Cities Management Area (NCMA) represents the northernmost portion of the Santa Maria Groundwater Basin. Adjoining the NCMA to the southeast is the NMMA, while the Santa Maria Valley Management Area encompasses the remainder of the groundwater basin.

Groundwater pumped from the NCMA is derived from the Paso Robles Formation comprising heterogeneous alluvial materials that extend westward at depth beneath the ocean. The northern and eastern portions of the basin are bounded by bedrock and faults that potentially reduce groundwater recharge by underflow. The southern boundary of the NCMA is coincident with the NMMA portion of the Santa Maria Groundwater Basin and historically has been considered a groundwater divide and source of recharge (DWR 2002).

The groundwater resource developed in the NCMA has several sources of recharge: precipitation, seepage from stream flow, and underflow from adjacent areas. In addition, some return flow occurs from imported surface sources: Lopez Reservoir and the State Water Project. Groundwater gradients show that discharge occurs from the groundwater basin in the NCMA area to the ocean. As discussed in Section 4.1, this discharge and positive westward gradient controls the risk of seawater from entering the production zones of the basin aquifer.

3.2 CLIMATE

Each year climatological and hydrologic (stream flow) data for the NCMA are added to the NCMA database. Annual precipitation from 1950 to 2013 is presented on Figure 3. Monthly rainfall and evapotranspiration (ET) for 2013 as well as average monthly historical rainfall and ET are presented on Figure 4.

3.2.1 Precipitation

Historical rainfall data have been compiled on a monthly basis for the following four stations:

- National Oceanic and Atmospheric Administration (NOAA) Pismo Beach Fire Station (Coop ID: 46943) for 1949 to Present;
- DWR California Irrigation Management Information System (CIMIS) Nipomo Station (No. 202) for 2006 to Present;
- Desert Research Institute (DRI): Western Regional Climate Center Pismo Station for 1950 to Present; and,
- San Luis Obispo County-operated rain gage in Oceano for 2005 to 2009.

Based on the acquired data for the four rainfall stations listed above, the average rainfall for calendar year 2013 was 4.32 inches, equal to 27 percent of the long-term average annual rainfall for the NCMA.

Below average rainfall occurred for eight of the twelve months (67 percent of year; Figure 4). Most rainfall typically occurs from November through April. The year 2013 was marked by substantially lower than average rainfall (21 percent of normal) in the "wet" months of January, February, March, April, November, and December.

Average precipitation data is presented on Figure 3 for the period of 1950 through 2013 on a calendar year basis. Annual average rainfall for the NCMA for the period is approximately 16.1 inches. Figure 3 illustrates annual rainfall and exhibits several multi-year drought cycles (e.g., 7 years, 1984-1990) followed by cycles of above average rainfall (e.g., 8 years, 1991-1998). With the exception of 2010, the period 2006 through 2013 (8 years) has experienced below average annual rainfall suggesting a "dry" hydrologic period. The average rainfall 2006 through 2013 (including 2010) is 10.3 inches, 64 percent of the long-term average.

3.2.2 Evapotranspiration

The California Irrigation Management Information System (CIMIS) maintains weather stations in locations throughout the state in order to provide real time wind speed, humidity and ET data. Two CIMIS stations are located near the NCMA; Nipomo and San Luis Obispo. The Nipomo and San Luis Obispo stations have gathered data since 2006 and 1986, respectively. Monthly ET data for the Nipomo station are presented on Figure 4 for 2013 and average (7-years) conditions. ET rate affects recharge potential of rainfall and the amount of outdoor water use (irrigation). In all months, ET exceeded rainfall, indicating the recharge to groundwater from direct precipitation in 2013 was likely nonexistent.

4.0 WATER SUPPLY AND DEMAND

4.1 WATER SUPPLY

Section 4.1 provides an overview of NCMA water supply sources, presents groundwater conditions that occurred in 2013, and discusses threats to water supply.

4.1.1 Sources of Supply

The NCMA water supply consists of three major sources: Lopez Lake, the State Water Project Coastal Branch, and groundwater. Each source of supply has a defined delivery volume which varies from year to year based on a number of factors. Both supply and demand are discussed below; demand is discussed in more detail in Section 4.2.

4.1.1.1 Lopez Lake

Lopez Lake and Water Treatment Plant is operated by SLOFCWCD Zone 3, provides water to all four agencies in the NCMA, and releases water to Arroyo Grande Creek for habitat conservation and agricultural purposes. The safe yield of Lopez Lake is 8,730 acre feet per year (AFY), which reflects the amount of sustainable water supply during a drought of defined severity. Of this yield, 4,530 AFY has been apportioned by agreements to contractors including each of the Northern Cities plus County Service Area (CSA) 12 (in the Avila Beach area). Zone 3 allocations are summarized in Table 2. Of the 8,730 AFY safe yield, the remaining 4,200 AFY is used for downstream releases to maintain flows in Arroyo Grande Creek and provide groundwater recharge.

Table 2. Zone 3 Contractors Water Allocation (AFY)

Contractor	Water Allocation, (AFY)
City of Arroyo Grande	2,290
City of Grover Beach	800
City of Pismo Beach	896
Oceano CSD	303
CSA 12 (not in NCMA)	241
Total	**4,530**
Downstream Releases	*4,200*
Safe Yield of Lopez Lake	*8,730*

Source: SLOFCWCD, Zone 3 UWMP 2005 Update

In the past, when management of releases resulted in a portion of the 4,200 AFY remaining in the reservoir, the water was offered to the contractors as surplus water. Surplus water was available in 2013, resulting in the delivery of 2,715 AF of surplus water from Lopez

Lake to the NCMA agencies. Total discharge from Lopez Lake in 2013 was 9,428.9 acre feet (AF), of which 5027.3 AF was delivered to NCMA contractors, 123.3 AF delivered to CSA 12, and 4,278.3 AF was released downstream to maintain flow in Arroyo Grande Creek (individual deliveries are shown in Table 3).

Table 3. 2013 Lopez Lake Deliveries (AF)

Agency	2013 Allocation Usage (AF)	2013 Surplus Usage (AF)	2013 Total Lopez Lake Water Delivery, (AF)
City of Arroyo Grande	1,188.1	1,534.2	2,722.3
City of Grover Beach	266.7	536.0	802.7
City of Pismo Beach	857.1	600.3	1,457.4
Oceano CSD	0	44.9	44.9
Total NCMA 2013 Usage	**2,311.9**	**2,715.4**	**5,027.3**
CSA 12 (not in NCMA)	0	123.3	123.3
Downstream Releases	4,278.3	--	4,278.3
Total 2013 Lopez Lake Deliveries			**9,428.9**

During April maintenance work was performed on the Lopez Lake Pipeline. During that period no deliveries were made. As discussed below, groundwater was used to make up the lost supplies.

4.1.1.2 State Water Project

Pismo Beach and Oceano CSD have contracts with SLOFCWCD to receive water from the State Water Project (SWP). The SLOFCWCD serves as the SWP contractor, providing the imported water to local retailers through the Coastal Branch pipeline. Pismo Beach and Oceano CSD have contractual water delivery allocations (commonly referred to as “Table A” water) of 1,240 AFY and 750 AFY, respectively (see Table 4, page 10). In addition to its Table A allocation, Pismo Beach holds 1,240 AFY of additional allocation with SLOFCWCD. The additional allocation held by Pismo Beach (usually referred to as a “drought buffer”) is available to augment requests when the state-wide SWP allocations are insufficient to meet local needs. This “drought buffer” is an additional amount that the SLOFCWCD holds in excess of the contracted amount that can be delivered when there is a reduced delivery; however the total of water delivered between the base contractual allocation and drought buffer cannot exceed 1,240 AF in any given year. In addition, the drought buffer allocation is also reduced by the percent delivery set by DWR and so may not allow Pismo Beach full deliveries of 1,240 AFY in years when deliveries are less than 50%.

On November 29, 2012, in response to state-wide drought in SWP source areas, the initial allocation to SWP contractors for 2013 was set at 30 percent of Table A contractual allocation amounts. On December 21, 2012 the allocation amounts were increased to 40 percent, then subsequently decreased to 35 percent on March 22, 2013 based on the amount of water in SWP

facilities and expected operational constraints in the Delta. As a result Pismo Beach and Oceano CSD modified their planning to maximize their SWP deliveries. Oceano CSD accepted 35% of their 750 AF allocation and purchased additional water from the SLOCFCWCD and a new State program allowing purchase of carryover water held in San Luis Reservoir. In 2013, Pismo Beach took actual delivery of 618 AF and Oceano CSD took delivery of 750 AF, for a total delivery of 1,368 AF of SWP water to NCMA (Table 9, page 25).

4.1.1.3 **Groundwater**

Each of the NCMA agencies have established groundwater supplies using wells which draw from developed aquifers in the northern portion of the NCMA. Groundwater also satisfies applied irrigation and rural uses in the NCMA. Groundwater use in the NCMA is governed by the Judgment and the 2002 Settlement Agreement which establishes that groundwater will continue to be allotted and independently managed by the "Northern Parties" (Northern Cities, NCMA overlying owners, and the SLOFCWCD).

A safe yield value of 9,500 AFY for the NCMA groundwater basin was cited in the 2002 Groundwater Management Agreement among the Northern Cities with allotments for applied irrigation (5,300 AFY), subsurface outflow to the ocean (200 AFY), and urban use (4,000 AFY). The Management Agreement's safe yield allotment for urban use was subdivided as follows and as shown in Table 4:

- City of Arroyo Grande: 1,202 AFY
- City of Grover Beach: 1,198 AFY
- City of Pismo Beach: 700 AFY
- Oceano Community Services District: 900 AFY

According to Todd (2007), the Groundwater Management Agreement's subdivision for applied irrigation is higher than the actual applied irrigation groundwater use and the amount designated for subsurface outflow is unreasonably low. Since anticipated agriculture expansion is not significant and long term increased use is unlikely, the current balance of water use between agriculture and municipal uses has been sustainable for the last 40 years.

Maintenance of subsurface outflow along the coast is essential to preventing seawater intrusion. While the minimum subsurface outflow needed to prevent seawater intrusion is unknown, a regional outflow on the order of 3,000 AFY has been estimated as a reasonable approximation (Todd, 2007).

The 2002 Management Agreement provides that allotments of the various urban parties can be increased when land within the corporate boundaries is converted from agricultural uses to urban uses, referred to as an agricultural conversion credit. Agricultural credits for the cities of Arroyo Grande and Grover Beach did not change from 2011. The agricultural credit for 2013 for Arroyo Grande and Grover Beach remain unchanged from 2012 and are 121 AFY and 209 AFY, respectively, for a total of 330 AFY (Table 4).

4.1.1.4 **Developed Water**

As defined in the Stipulation, "developed water" is "Groundwater derived from human intervention" and includes "Lopez Lake Water, Return Flow, and recharge resulting from storm

water percolation ponds." Return flow results from deep percolation of water used in irrigation that is in excess of plant needs and from outdoor uses of Lopez Lake and SWP deliveries. These return flows have not been recently estimated, but would be considered part of the groundwater basin yield.

In 2008, the cities of Arroyo Grande, Grover Beach, and Pismo Beach prepared storm water management plans. The cities currently are working with the Central Coast Regional Water Quality Control Board to address local storm water quality issues. In order to control storm water runoff, each City anticipates construction of retention or detention ponds associated with new development that may provide groundwater recharge. During 2013, no new ponds were installed in the NCMA and no new data were available, so previous estimates of recharge were used in this report. Estimated recharge values should be updated and refined as new recharge facilities are installed and as additional information on flow rates, pond size, infiltration rates, and tributary watershed area becomes available.

Construction of recharge basins or other means to increase groundwater recharge could substantially augment the yield of the groundwater basin and thus warrant provision of recharge credits to one or more of the Northern Cities. Pursuant to the Settlement Agreement, recharge credits would be based on a mutually-accepted methodology to evaluate the amount of recharge which would involve quantification of such factors as Lopez Lake and State Water recharge, storm water runoff amounts, determination of effective recharge under various conditions, and methods to document actual recharge to developed aquifers.

4.1.1.5 **Water Use by Supply Source**

Table 4 summarizes the water supplies currently available to the Northern Cities, including Lopez Lake allocation, SWP allocations, groundwater allotments, and agricultural credits. In addition to direct available supplies, the Lopez water year 2013-14 was the final year of a 5-year agreement between Arroyo Grande and Oceano CSD for the temporary purchase of groundwater or Lopez Lake supplies. No transfers were completed in Calendar Year 2013. The final transfer was completed in January 2014, therefore is not reflected in this report. The category of "Other Supplies" includes groundwater pumped from outside the NCMA boundaries.

A graphical depiction of the water use sorted by supply source for each NCMA agency since 1999 is presented as Figure 5. The graphs depict changes in water supply availability and use over time, including the increased use of SWP water (to a maximum in 2001). The figure also indicates the reduced and less variable Lopez Lake water use due to the unavailability of Lopez Lake surplus flows from 2002 to 2008. Although no recycled water was available in 2013, plans have been developed to construct recycled water facilities (see Section 6.2.5).

Table 4. Available Urban Water Supplies, 2013 (AFY)

Urban Area	Lopez Lake	SWP Allocation	Groundwater Allotment	Ag Credit	Temporarily Purchased	Other Supplies	Total
Arroyo Grande	2,290	0	1,202	121	0	160	**3,773**
Grover Beach	800	0	1,198	209	0	0	**2,207**
Pismo Beach	896	1,240	700	0	0	0	**2,836**
Oceano CSD	303	750	900	0	0	0	**1,953**
Total	**4,289**	**1,990**	**4,000**	**330**	**0**	**160**	**10,769**

Figure 6 shows total NCMA water use for each supply source, including Lopez Lake, SWP, and groundwater. As shown, the full amount of Lopez Lake supply (4,289 AFY) is currently used (augmented by surplus water as available). In 2001 through 2003, SWP supplies (1,850 AFY) were used to the maximum extent. From 2004 to 2008, SWP use decreased to just over 1,100 AFY, mostly reflecting a partial shift by Pismo Beach from SWP to groundwater supply. This changed in 2009 and 2010 when Pismo Beach increased SWP use and significantly decreased groundwater use to provide a more economical water supply and to ease the burden on the groundwater basin during the drought (see Figure 5). In 2013 Pismo Beach took delivery of 618 AF of SWP water (50% allocation) and pumped 73.01 AF from the groundwater basin. In 2013 Oceano CSD took delivery of 750 AF of SWP water (100% allocation) and pumped 92.84 AF from the groundwater basin.

Total NCMA groundwater use is shown in Table 5 (following page) and Figure 6. Estimated applied irrigation and rural uses are added to the urban uses detailed in Table 5 and Figures 5 and 6. From 1999 through 2013, total estimated groundwater use averaged approximately 5,087 AFY and exceeded 6,000 AFY in 2007 and 2008. With an estimated safe yield of 9,500 AFY, the remaining groundwater represents storage and outflow to the ocean, an unknown but major portion of which is needed to repel seawater intrusion.

Groundwater pumpage reached a peak in 2007, and then declined in 2008, 2009, and 2010. Since 2010, although there has been a slight but steady increase in pumpage every year, overall groundwater use has remained significantly lower than historic annual pumpage rates. In 2013, urban groundwater use increased 25%, from 1,138 in 2012 to 1,423 AF. Although urban groundwater pumpage has been slowly increasing the past few years, it still remains significantly below the 4,000 AFY allotment.

Table 5. Groundwater Pumpage (AF)

Agency	2013 Groundwater Use (AF)
City of Arroyo Grande	268.4
City of Grover Beach	988.8
City of Pismo Beach	73.0
Oceano CSD	92.8
Total Urban Groundwater Use	**1,423.0**
Applied Irrigation	**2,742.0**
Rural Water Users	**41.7**
Total Groundwater Use	**4,206.7**

4.1.2 Groundwater Conditions

The NCMA groundwater monitoring program includes: 1) compilation of groundwater elevation data from San Luis Obispo County, 2) water quality and groundwater elevation monitoring data from the network of sentry wells in the NCMA, 3) water quality data from the California Department of Public Health (DPH), and 4) groundwater elevation data from municipal pumping wells. Analysis of this data is summarized below in accordance with the July 2008 Northern Cities Monitoring Program.

4.1.2.1 Groundwater Monitoring Network

Approximately 145 wells within the NCMA were monitored by the County at some time during the past few decades. The County currently monitors 38 wells on a semi-annual basis (April and October), including five "sentry well" clusters (piezometers) located along the coast and a newly constructed monitoring well (County Well #3) along the boundary between the NCMA and NMMA (Figure 7). The County monitors more than 70 additional wells in southern San Luis Obispo County. Following the findings of the 2008 Annual Report, the Northern Cities initiated a quarterly sentry well monitoring program to supplement the County's semi-annual schedule. The quarterly monitoring well measurements include County Well #3.

To monitor overall changes in groundwater conditions, representative wells within the NCMA were selected for preparation of hydrographs and evaluation of water level changes. Wells were selected based on the following criteria:

- The wells must be part of the County's current monitoring program;
- Detailed location information must be available;
- The wells should have a wide geographic distribution; and,
- The historic record of water level data must be long and relatively complete.

Many of the wells that have been used in the program are production wells that were not designed for monitoring purposes and may be screened in various producing zones. Moreover,

many of the wells are active production wells or located near active wells and thus are subject to localized pumping effects that result in measurements that are lower than the "static" or more broadly representative water level. These effects are not always apparent at the time of measurement. As a result, the data cannot easily be identified as representing static groundwater levels in specific zones (e.g., unconfined or deep confined). Hence, the data should be considered as a whole in developing a general representation of groundwater conditions.

The "sentry wells" are a critical element of the groundwater monitoring network and provide an early warning system to identify and quantify potential seawater intrusion episodes in the basin (Figure 7). Each sentry well consists of a cluster of multiple wells allowing for the measurement of groundwater elevation and quality from discrete depths. Also shown on Figure 7 is the Oceano CSD Observation well cluster, a dedicated monitoring well cluster located just seaward of Oceano CSD production wells 7 and 8. Figure 8 shows the depth and well names of the sentry well clusters and the Oceano CSD observation well cluster.

The wells are divided into three basic depth categories: shallow, intermediate, and deep. Since initiation of the sentry well monitoring program, 20 quarterly events have been conducted with one each in May, August, and October 2009, and winter, spring, summer and fall 2010 through 2013, as well as January 2014 (the January 2014 data will be included in the 2014 annual report). These monitoring events include collection of synoptic groundwater elevation data and water quality samples for laboratory analysis.

4.1.2.2 **Groundwater Levels**

Groundwater elevation data is gathered from the network of wells throughout the NCMA. Water level measurements in these wells were used to monitor effects of groundwater use, groundwater recharge, and as an indicator of risk of seawater intrusion. Analysis of these groundwater elevation data has included development of groundwater surface contour maps, hydrographs, and an index of key sentry well water levels over time (Figures 9 through 13).

Contoured groundwater elevations for the Spring (April 2013) and Fall (October 2013) monitoring events, including data from the County of San Luis Obispo monitoring program, are shown on Figures 9 and 10. Figure 9 shows the Spring 2013 groundwater elevations were highest in the eastern portion of the NCMA and approximately 5 feet above sea level along the shore line. Of note is the development of a possible westward-facing trough that developed in the Spring in the northern part of the area, apparently in response to municipal pumping in the Arroyo Grande and Grover Beach area. A comparison with Spring 2012 contours shows that Spring 2013 water levels were generally 10 to 15 feet lower throughout the NCMA.

Groundwater elevations in October 2013 (Figure 10) were again highest in the eastern portion of the NCMA. Water level elevations were approximately 2 to 5 feet above sea level along the shoreline. Groundwater elevations were generally above mean sea level (msl) throughout the NCMA during the October monitoring event, with the exception of some measurements in agricultural wells in the east-central part of the area where water level elevations were measured as deep as -6.7 feet msl. These lower water level elevations create and maintain the previously recognized depression in the water table in the so-called "pumping trough," located south of the municipal well fields and in the vicinity of, and south of, lower Arroyo Grande Creek. Water elevations in this area are generally 5 to 10 feet lower than levels measured in Fall 2012.

Figure 11 shows hydrographs of selected wells from the County well monitoring program, illustrating long-term changes in groundwater levels in the NCMA. To provide geographic context, hydrographs from two wells located just east of the NCMA in the NMMA are also presented.

The hydrographs for wells 32D03 and 32D11, and wells 31H08 and 31H09 (Figure 11) are paired hydrographs for wells south of and in the vicinity of the municipal well fields. Depending on duration of pumping of the municipal wells, water levels in these wells have historically been below levels in other areas of the basin for prolonged periods of time. Although the data sets are incomplete, the hydrographs show that, historically, groundwater elevations in these wells have generally been above mean sea level. However, an area of lower groundwater elevations ("trough") beneath the active well field appeared during the period of reduced rainfall in 2007 and 2008. Although the presence of the trough has been relatively persistent, the water levels in this area have remained above sea level.

Prior to 2013, groundwater elevations throughout the area recovered from the 2007-2008 lows and remained at levels similar to 2006 (a wet year). However, the very low rainfall year of 2013 resulted in water levels throughout the area declining 5 to 10 feet.

The sentry well clusters are the essential tool for tracking critical groundwater elevation changes at the coast. Groundwater elevations in these wells are monitored quarterly as part of the sentry well monitoring program. As shown by the hydrographs for the five sentry well clusters (Figure 12), the sentry wells provide a long history of groundwater elevations. The deepest wells in the clusters (wells 24B03, 30F03, and 30N02) are screened at depths closely matching the screened depths of most local pumping wells. Hence, measured water elevations in these deepest wells reflect the net effect of changing groundwater recharge and discharge conditions in the primary production aquifer.

Averaging the groundwater elevations from these three deep sentry wells provides a single, representative index for tracking the status and apparent health of the basin. Historical variation of this index is represented by the average deep sentry well elevations on Figure 13. Figure 13 clearly shows three years of drought (2007-2009) followed by recovery of the index values in subsequent years as rainfall increased and pumpage declined. The graph shows that the index values improved significantly since 2008 and remained above the 7.5-foot index until late April 2013.

In April 2013 municipal groundwater pumpage was increased to replace temporarily unavailable supplies from Lake Lopez. As a result, the groundwater level in Sentry Well 30F03 declined by as much as 14 feet in 7 days and was below sea level for a total of 6 days (Figure 16). The rather dramatic decline in water level due to increased pumpage required almost two weeks to recover to the initial water levels observed prior to the increased pumping. Similar water level declines, albeit of less magnitude, were also observed in deep wells 24B03 and 30N02 (Figures 15 and 17, respectively).

To provide more detail regarding seasonal and other groundwater level changes in the area between the NCMA and NMMA, detailed water level monitoring of well 32C03 was initiated in April 2012 and monitored throughout 2013. A sensor was installed to document long- and short-term changes in water level, temperature and electrical conductivity (EC). The acquired data indicates that water levels in Well 32C03 fluctuate on a daily basis by as much as one foot. The water level in well 32C03 declined between April 2012 (when the transducer was installed)

and September 2012 by 15 feet, then increased by 10 feet through February 2013. From February 2013 to early October 2013, water levels declined by about 15 feet. Since October 2013, water levels in the well increased about 6 feet; the most recent measurement in January 2014 shows a water level elevation of 6.7 feet (NAVD88).

The water levels in the deep sentry wells at the four coastal locations (24B03, 30F03, 30N02, and 36L02) range from 1.33 feet to 7.52 feet lower at the end of 2013 than the water levels measured in January 2013 (Figures 15 through 17, Appendix A).

As discussed earlier, the average elevation of the three deep wells has been used as a representative index of water levels in the main production zones. As shown on Figure 13, the index reflects both seasonal pumping and annual variations in the relationship between recharge and discharge. In October 2013 the average water elevation in the representative key wells was 6.31 feet, which is 1.19 feet below the adjusted "index" of 7.5 feet NAVD88. By the end of 2013, the average water elevation in the three-well index increased to 8.14 feet, which is above the index of 7.5 feet by 0.64 feet.

As shown on Figure 13, the index remained below 7.5 feet between October 2007 and August 2009. The index water level increased to 7.37 in October 2009 and 9.65 in January 2010. As discussed in previous annual reports and shown in Figure 13, high levels of chloride (and sodium) in wells 30N02 and 30N03 occurred between May 2009 and January 2010. This relationship implies a lag in time between lowered water levels in the deep sentry wells and significant increases in sodium and chloride. This is potentially significant because Figure 13 shows that during April 2013 the calculated index level was as deep as 6 feet below the index value of 7.5 and remained at or below the index from early June 2013 until mid-December 2013. Furthermore, the water level elevation in Well 30F03 was below sea level for 6 days in late April. Continued average values below the index create a potential environment for increased risk of sea water intrusion.

Additional observations include:

- Water levels in the deep sentry wells reached their lowest level in 2012 in September of that year; the lowest levels observed in 2013 were observed in October.
- Water levels in the deep sentry wells reached their highest levels of 2013 in February. From February to late November, water levels declined steadily; water level elevations in all the deep wells started increasing from late November 2013 through the end of the year.
- Water levels in the deep wells showed significant effects of short-term increased local groundwater extraction in late April. Full recovery of the water levels following cessation of the short-term increased pumping did not occur until early June.
- Although it is encouraging that the index value ended the year above the index, February through April is the time of year that is historically the highest value (at least since January 2010). The index value at the end of 2013 is 2 to 4 feet lower than the end of year levels of 2010 through 2012. If the wells experience a 1-foot rise through February to April followed by a 5-foot decline in water level elevations until October 2014 (as is typical in past years), then the index value may potentially be as low as 4 feet in October 2014. Considering the effects of any increased pumpage related to anticipated cutbacks in

surface water deliveries, the index level may approach the level seen in 2008-2009, just prior to observing the elevated chloride concentrations in the Pier Avenue well.

4.1.2.3 **Water Quality**

Water is used in several ways in the NCMA, each use requiring a certain minimum water quality. Since contaminants from seawater intrusion or anthropogenic sources can potentially lower the quality of water in the basin, water quality is monitored at each of the sentry well locations in the NCMA and at County Monitoring Well #3.

Four separate monitoring events occurred in 2013, with each piezometer in the sentry wells and in the Oceano CSD wells measured in January, April, July, and October 2013. During each event, the wells were all sampled in accordance with ASTM International Standard D4448-01. The water quality data from these events and available historical data from these wells are presented in Appendix A. Because water quality trends are used to monitor for seawater intrusion, data collected in 2013 were added to previous data and the variation of selected constituents were plotted against time. Figures 19 and 20 show variation of chloride and TDS concentration, respectively, since 2009.

The historic water quality data presented in Appendix A shows that water quality varied, sometimes widely, during the years 2009 through 2012. However, samples obtained in 2013 show very little change (variation) throughout the year and a general improvement in overall quality compared to 2009 (Figure 21). The *NCMA 2009 Annual Monitoring Report* suggested the observed historic variation in water quality data could be due to a number of factors, including variable permeability of geologic materials; potential mixing with seawater; ion exchange in clay-rich units; and variability in surface recharge sources such as Arroyo Grande and Meadow creeks. Changes in groundwater demand since 2009 and abundant rainfall in 2010-11 may have contributed to groundwater quality becoming relatively stable in the past few years.

With the exception of shallow Wells 24B01 and 30N01, the 2013 data indicate no significant change compared to recent past measurements. Well 24B01 continues to show higher levels of TDS, chloride and sodium than the other wells in the monitoring network, and the data indicate a slight decrease in TDS and chloride but no change in sodium since the start of the year. TDS and sodium decreased slightly in 2013.

A second shallow well, Well 30N01, shows a slight increase in TDS, sodium and chloride compared to the previous year. Water quality results in the well continue to exhibit concentration levels of TDS, chloride and sodium more in the range of other sentry wells.

Sentry well cluster 32S/13E 30N (Pier Avenue) is located west of Highway 1 in Oceano and includes three piezometers. This sentry well cluster is just south of the “pumping trough” recognized in April 2013, and within the area of broad lowering of the water table recognized in October 2013 (Figures 9 and 10). The deep and intermediate level piezometers at this location showed low groundwater levels in 2008 and 2009 (NCMA 2008 and 2009 Annual Monitoring Reports, respectively). Data from this sentry well cluster was interpreted to indicate localized seawater intrusion affecting the deep zone (30N02) and, to a lesser extent, the middle zone (30N03) in 2009. Thus, water quality in the 30N well cluster is considered a key indicator of potentially encroaching seawater intrusion.

Data collected in 2010 from piezometers 30N03 and 30N02 show geochemical signatures of seawater intrusion on Schoeller geochemical plots (Figures 21 and 23, respectively). The Schoeller diagrams shown on Figures 21 through 25 are graphical representations of common cation and anion concentrations in water expressed in milliequivalents per liter (meq/l). Because several samples may be plotted on the same graph, variation in hydrogeochemical water characteristics may be easily recognized. This approach allows graphical, or visual, means to evaluate measured water quality against potential water sources. Each line of connected points illustrates the water quality signature from a specific well (e.g., 30N03, Figure 21) for a given sample period. For comparison, the Schoeller diagrams included here also show the typical geochemical signature for seawater (in black) and the typical signature for a groundwater basin water supply well (labeled "GW Base", in blue). Most of the water quality samples plotted on the lower portion of the diagram are similar in shape to the groundwater basin sample and are combined within the shaded area.

After the period of lower water level in the index wells in 2007 and 2008, wells 30N02 and 30N03 exhibited increased TDS, sodium and chloride in samples collected in 2009 (Figures 21 and 23). Beginning in 2010, both wells have shown lower TDS, sodium and chloride as well as a more narrow range in chemical variation (Figures 22 and 24). TDS, sodium and chloride values in the 2013 Q4 samples from both 30N02 and 30N03 showed only nominal changes compared to the previous year.

The samples taken from the shallow completion well in this cluster (Well 30N01) continues to show somewhat elevated sodium and chloride; however it appears not to indicate sea level intrusion of the deeper levels that are screened in the groundwater production zone. This conclusion is based on the following related observations:

- The well is shallow (screened from 15 to 40 feet), located near a coastal lagoon, and may be influenced by periods of high sea level or seasonal stagnation.
- None of the deeper wells at any of the sentry well locations show high levels of TDS, sodium and chloride (indications of sea water intrusion).
- Water levels of all deep wells generally exhibit a greater seasonal range than Well 30N01.
- Compared to 2011, levels of TDS and most other measured water quality parameters declined through July 2012. Since then, these parameters have remained relatively stable as of the end of 2013.

The shallow well in sentry well cluster 32S/12E 24B has historically contained brackish water. This sentry well is located in the northwestern corner of the basin in Pismo Beach. The shallow well (24B01) shows a similar geochemical signature (albeit muted) to that of seawater (Figure 25). Water samples from this well historically have shown high sodium and chloride concentrations. While these data have been interpreted by the California Department of Water Resources to be the result of a solution of residual marine and evaporative salts indigenous to the geologic environment in this part of the basin, it may be because the well is located near the lagoon at the mouth of Pismo Creek and is subject to storm surge and local flooding during storm and high sea conditions. The water sample from the shallow piezometer (24B01) showed elevated Cl and Na in October 2010 and all quarterly samples taken in 2011, 2012, and 2013 while samples from the two deeper piezometers had TDS, Cl, and Na levels that indicate no such effect.

These various water quality indicators described above suggest that the local interface/mixing zone between seawater and fresh groundwater remains seaward of the sentry wells. The location of the seawater interface is not known due to the heterogeneity of the aquifer. The only indication of the location of the interface would be when one or more monitored wells show an increase in TDS along with a geochemical signature resembling seawater. Based on experience in the NCMA, retreat of the interface may be reversed, and again become shoreward, if seaward gradients are reduced or reversed. These changes may be brought on by reduced recharge (e.g. drought conditions) or if pumping exceeds available groundwater supply, or both.

Well 32C03 (County monitoring well #3) is located south and east of the main NCMA groundwater development area. It has exhibited little change compared to the initial sample taken in April 2012. Water in well 32C03 exhibits lower calcium, magnesium, and carbonates than all other wells and has a higher ratio of Na+Cl to CA+Mg+Carbonate.

4.1.3 Threats to Water Supply

Because the NCMA depends on both local and imported water supplies, changes in either state-wide or local conditions can threaten the NCMA water supply. Water supply imported from other areas of the state may be threatened by State-wide drought, effects of climate change in the SWP source area, management and environmental protection issues in the Sacramento-San Joaquin Delta that affect the amount and reliability of SWP deliveries and risk of seismic damage to the SWP delivery system. Local threats to NCMA water supply similarly include extended drought and climate change that may affect the yield from Lopez Lake as well as reduced recharge to the NCMA (northern portion of the Santa Maria Groundwater Basin). In addition, the NCMA is not hydrologically isolated from the rest of the Santa Maria Groundwater Basin, and increased growth and excessive pumping on the Nipomo Mesa have contributed to a deepening groundwater depression underlying the NMMA.[1] In addition, there is a potential impact from seawater intrusion if the groundwater system as a whole is not adequately monitored (as discussed in the above section) and managed. In particular the management of the basin may need to account for sea level rise and the relative change in groundwater gradient along the shore line as well as an ongoing imbalance between pumping and recharge in the NMMA (NMMA Technical Group. 2011). The ongoing drought has resulted in a lowering of groundwater levels throughout the NCMA, most notably in the agricultural production area and the upgradient (eastern) area represented by County Monitoring Well 3 (32-C).

4.1.3.1 Threats to State Water Project Supply

Both extended drought and long-term reduction in snowpack due to climate change can affect deliveries from the State Water Project. California is entering the third year of a drought that has resulted in below-average precipitation and runoff in the SWP source area; in fact 2013 was the driest year on record. As a result, DWR has announced that storage in SWP reservoirs is low and deliveries for 2014 will be substantially reduced or even eliminated (as of January 31, 2014, DWR announced a reduction of Table A Allocation to zero percent). In addition to drought

[1] To address the pumping in excess of local recharge and the growing groundwater depression in the NMMA, the Settlement Stipulation and Judgment require the NCSD to purchase and deliver a minimum of 2,500 acre-feet per year (AFY) of supplemental water to the Nipomo Mesa.

conditions, SWP pumping capacity was reduced as the result of a May 2007 federal court ruling to protect Delta smelt. These factors will directly reduce the allocation of water available to Pismo and OCSD through the SLOFCWCD in 2014.

However, the threat of reduced delivery to local SWP users—Oceano CSD and Pismo Beach—has not fully materialized to date, as deliveries to certain areas in San Luis Obispo County continues to be approved in greater amounts than if the full SWP delivery reductions were occurring, in part because the SLOFCWCD is able to use some of its unallocated Table A amount to augment deliveries. The SLOFCWCD holds SWP allocation in addition to the amount needed to meet contracts with local agencies. This source of extra allocation may be used by service areas in San Luis Obispo County with SWP contracts such as Oceano CSD and Pismo Beach as a drought buffer to provide additional deliveries during years when full deliveries are not available. Nonetheless, in the future, the Delta's fragile ecosystem, uncertain precipitation patterns and reduced snowmelt may further reduce California's water supply reliability with potential ramifications for Oceano CSD and Pismo Beach.

4.1.3.2 **Seawater Intrusion**

The NCMA is underlain by an accumulation of alluvial materials that slope gently offshore and extend for many miles under the ocean (DWR 1970, 1975). Coarser materials within the alluvial materials comprise aquifer zones that receive freshwater recharge in areas above sea level. If sufficient outflow from the aquifer occurs, the dynamic interface between seawater and fresh water will be prevented from moving onshore. Sufficient differential pressure to maintain a net outflow is indicated by onshore groundwater elevations that are above mean sea level and establish a seaward gradient to maintain that outflow.

The 2008 Annual Report documented that a portion of the NCMA groundwater basin exhibited water surface elevations below sea level (*NCMA 2008 Annual Monitoring Report*). Hydrographs for NCMA sentry wells (Figure 12) show coastal groundwater elevations that were at relatively low levels for as long as two years. Such sustained low levels had not occurred previously in the historical record and reflected the impact of drought on groundwater levels. The low coastal groundwater levels indicated a potential for seawater intrusion. Increased TDS, Na and Cl concentrations were found in sentry well 32S/13E N03 in August 2009 and in 32S/13E N02 in August and October 2009[2].

As documented in Section 4.1.2 of this report, groundwater elevations in July 2013 and October 2013 were significantly below groundwater elevations in July and October 2012. However they were above water level elevations measured in the same months in 2008 and 2009. Water elevation and water quality measurements in 2009 through October 2013 indicate the following:

- Sentry wells in the cluster 32S/13E 30N may be relatively sensitive to seawater intrusion because of their location near Arroyo Grande Creek and the more permeable sediments

[2] In addition to increased water levels beginning in 2010, well head modifications were made to all sentry wells in July 2011. Specifically, all well heads were raised above ground level. Prior to the modifications, the sentry wells including 30N piezometers were completed below land surface. The location and condition of the well heads raised concerns about the potential for contamination of samples.

deposited by the ancestral creek (*NCMA 2009 Annual Monitoring Report*) as well as the lower groundwater elevations typical to the east (Figures 9 and 10).

- The initial portions of the seawater/groundwater interface were detected onshore at one site beginning with elevated chloride levels in May 2009; by October 2009 the interface had manifested in the middle and deep aquifer zones monitored by sentry wells 30-N02 and 30-N03. The extent to which seawater may have intruded other localized aquifer zones along the coast without being detected in the NCMA sentry wells is unknown due to heterogeneity of the aquifer and spacing of sentry wells.
- Above average precipitation and decreased groundwater withdrawal in 2010 resulted in increased water levels in the sentry wells on a comparative seasonal basis and an apparent relief of the water table depression immediately south of lower Arroyo Grande Creek. Recent dry conditions in 2012 and 2013 have caused an overall lowering of water levels in the sentry wells and a resumption of the pumping depression that was recognized in 2009 (Figure 10).
- In April 2013 groundwater extractions were increased in response to a short-term shutdown of the Lopez Lake delivery system for maintenance. At that time water levels in several sentry wells remained below normal for several weeks, and below sea level in sentry well 30F03 (Highway 1 deep well). The brief shutdown of Lopez Lake deliveries and increased groundwater pumping resulted in a short (one month) period when the deep well index was below the index standard of 7.5 feet. The index value recovered by late May 2013, but dipped below the 7.5-foot index again by late July 2013, where it remained until late December. As discussed previously, maintaining water levels above the 7.5-foot index is considered to create a sufficient gradient to avoid sea water intrusion.
- Water quality in most wells remains similar to historic measurements but more importantly, showed no indication of the effects of seawater intrusion after the April pumping event or from the approximately 5-month month period when water levels were below the 7.5-foot deep well index.

4.1.3.3 **Measures to Avoid Seawater Intrusion**

In recognition of the risk of seawater intrusion, the Northern Cities have developed and implemented a water quality monitoring program for the sentry wells and Oceano CSD observation wells, as described above. The Northern Cities, SLOFCWCD, and State of California have also worked cooperatively toward the protection of the sentry wells as long-term monitoring sites. Several measures are employed by the Northern Cities to reduce the potential for seawater intrusion. Specifically, the Northern Cities have voluntarily reduced coastal groundwater pumping, decreased overall water use via conservation, and initiated plans, studies and institutional arrangements to secure additional surface water supplies. As a result, each of the four major municipal water users reduced groundwater use between 25 and 90 percent between 2007 and 2010. In 2013, groundwater use ranged between 3 and 68 percent of the groundwater use in 2007.

The deepening pumping depression within the NMMA appears to have reduced or eliminated the groundwater divide between the NCMA and NMMA. With the loss of this divide there has been a reversal of groundwater gradients and the development of a landward gradient in the southern portion of the NCMA. This landward gradient creates conditions favorable for

seawater intrusion in the NCMA and NMMA. To limit further increases in the risk of seawater intrusion, immediate measures must be made to reduce demand in the NMMA. Additionally, the County of San Luis Obispo, which possesses land use authority, must restrict any future development that increases water demand in the NMMA.

4.1.3.4 **Change in Groundwater Recharge along NMMA Boundary**

Groundwater recharge to the NCMA includes subsurface flow from adjacent areas into the aquifers that supply water wells serving the NCMA. Historically an important source of subsurface recharge has been in-flow to the NCMA from the NMMA along the southeast boundary of the NCMA, previously estimated to be 1,300 AFY (DWR 2002). However, it appears that this inflow from the NMMA has been reduced to "something approaching no subsurface flow" due to lower groundwater levels in the NMMA (*NMMA 2nd Annual Report CY 2009*, page 43). This condition has continued to worsen through continued deepening and expansion of the depression in water level elevations in the inland portion of the NMMA. Contour maps prepared by DWR for spring 1975, 1985, 1995 and 2000 as well as Figures 6-5 and 6-6 from NMMA Annual Reports for Calendar Years 2010, 2011, and 2012, indicate a growing depression in water level elevations in the NMMA as a result of increased groundwater extractions, and recent data indicates that the depression continued to expand and deepen in 2013.

The pumping depression creates a "transient groundwater divide" between the inland portion of the NMMA and the NCMA. As the groundwater depression continues to deepen and expand to the west and north, "the groundwater divide may dissipate, resulting in a lack of groundwater gradients from the inland portion of the NMMA toward the coast" (*NMMA 5th Annual Report CY 2012*). This potential reversal of groundwater gradients and the development of a landward gradient creates a condition favorable for seawater intrusion as well as reduces or eliminates a significant source of recharge to the NCMA water-producing zones.

The *NMMA 5th Annual Report CY 2012* (Figures 6-5 and 6-6) describes the presence of a persistent northwest/southeast-trending depression in water level contours in the northern portion of the NMMA. The NMMA 4th and 5th Annual Reports indicate that "there are a number of direct measurements that indicate that demand exceeds the ability of the supply to replace water pumped from the aquifers" (*NMMA 4th Annual Report CY 2011* Finding 4, *NMMA 5th Annual Report CY 2012*, Finding 3).

The NMMA projects an increasing water demand and groundwater use in the management area (*NMMA 5th Annual Report CY 2012*, page 32) and a growing deficit between supply and demand. Based on the reported groundwater extractions in the NMMA, it appears that groundwater pumping significantly exceeds the apparent dependable yield. Due to the ongoing imbalance between extraction and replenishment of aquifers in the NMMA, increased groundwater demand may lower water level elevations along the NMMA and NCMA boundary below current levels. Currently, the NMMA reports that the groundwater elevations near the "saddle" or transient divide between the NMMA and the NCMA are in the "range of several feet higher than adjacent areas" (*NMMA 5th Annual Report CY 2012*, page 40). However, water level data from County Monitoring Well #3 (32N03) shows that water levels in the area are declining, perhaps as much as 10 to 15 feet. As the historical subsurface inflow recharge from the NMMA to the NCMA declines (or is reversed), the agricultural users in the southeastern portion of the NCMA may see declining water levels, declining production capability, and conditions favorable

for seawater intrusion, as noted above (*NMMA 5th Annual Report CY 2012*). Although clearly exacerbated by the drought, the harbinger of these conditions was already observed in the water level data in the NCMA in October 2013, when water levels continued to decline in Monitoring Well #3 (32N03) and a pumping depression, with some water levels below sea level, appeared in the southeastern agricultural production area of the NCMA (Figure 10).

4.2 WATER DEMAND

Water demand refers to the total amount of water used to satisfy various needs. In the NCMA, water is primarily used to satisfy urban demand and applied irrigation demand. The third category, rural demand, includes small community water systems, domestic, recreational and agriculture-related businesses, and has historically comprised a relatively minor component of the overall demand of the area. Table 6 (following page) presents water demands for urban uses, applied irrigation, and rural uses.

Table 6. Total Water Demand (Groundwater and Surface Water, AFY)

Year	Arroyo Grande	Grover Beach	Pismo Beach	Oceano CSD	Total Urban	Applied Irrigation	Rural Water	Total Demand
2005	*3,460*	*2,082*	*2,142*	*931*	*8,615*	*2,056*	*36*	**10,707**
2006	*3,425*	*2,025*	*2,121*	*882*	*8,453*	*2,056*	*36*	**10,545**
2007	*3,690*	*2,087*	*2,261*	*944*	*8,982*	*2,742*	*36*	**11,760**
2008	*3,579*	*2,051*	*2,208*	*933*	*8,771*	*2,742*	*36*	**11,549**
2009	*3,315*	*1,941*	*2,039*	*885*	*8,180*	*2,742*	*36*	**10,958**
2010	*2,956*	*1,787*	*1,944*	*855*	*7,542*	*2,056*	*38*	**9,636**
2011	*2,922*	*1,787*	*1,912*	*852*	*7,473*	*2,742*	*38*	**10,253**
2012	*3,022*	*1,757*	*2,029*	*838*	*7,646*	*2,742*	*41*	**10,429**
2013	*3,111*	*1,792*	*2,148*	*888*	*7,939*	*2,742*	*42*	**10,722**

4.2.1 Urban Demand

Urban water demands are presented in Table 6 for each of the Northern Cities from 2005 through 2013. These demand values reflect reported Lopez Lake and State Water Project (SWP) purchases and groundwater production data, and represent all water used within the service areas of the four agencies comprising Northern Cities, including the portions of Arroyo Grande and Pismo Beach that extend outside the NCMA (see Figure 2). The urban demand data include water delivered to municipal customers and all other water used by the respective municipal agency as well as system losses. Urban demand declined from 2010 to 2011, but has increased slightly each year for the past three years. Current urban demand is significantly below the demand levels experienced from 2005 through 2009.

4.2.2 Applied Irrigation Demand

Applied Irrigation Demand (Table 6) is an in-direct measurement that requires a method for estimating Annual Gross Irrigation Water Requirement (AGIR). The San Luis Obispo County

Water Master Report uses a crop-specific method for calculating AGIR in acre-feet per year per acre (AFY/acre), based on crop ET, effective rainfall, leaching requirements, irrigation efficiency, and frost protection. Calculation of the AGIR, which is then used to estimate the applied water for irrigation for an aggregated area, is described in the following equation:

AGIR (Ft) = [(Crop ET – Effective Rainfall) / ((1-Leaching Requirement) x Irrigation Efficiency)] + Frost Protection Water

The calculated crop-specific applied water is multiplied by the specific crop acres to obtain the irrigation demand for a given crop type. The individual crop demands are then summed for the agricultural area of interest.

In the NCMA, representative land use survey information that was utilized in the initial NCMA annual reports for calendar years 2008 and 2009 contained an estimate of agriculture water use based on acres aggregated by crop type. Recently, the San Luis Obispo County Agricultural Commissioners office (ACO) compiled an estimate of irrigated acres with spatial information, compatible for use in GIS. A view displaying the irrigated agriculture land for 2012 is presented as Figure 22; the 2012 compilation of irrigated lands for 2012 is considered representative of irrigated land conditions for 2013 because significant changes in agricultural land use have not occurred. The 2012 irrigated acres totaled 1,485 acres, about 7-percent less that reported in the *NCMA 2008 Annual Monitoring Report*. A visual observation comparing the views indicates the slightly lower amount of irrigated acres in 2012/2013 versus 2008/2009 is because the most recent survey recognizes roads and farmsteads within the agriculture area as unfarmed areas , thus, the total irrigated acreage is less.

For comparison to the past reports, the water use in the *NCMA 2012 Annual Monitoring Report* was estimated based on the 1,485 acres identified by the ACO as irrigated land in 2012, multiplied by a representative annual water use value of (21.86 inches). The annual water use value was obtained from tables for Miscellaneous Field Crops and Strawberries, drip irrigation method, and a dry year, published by the Irrigation and Training Research Center (ITRC) in Cal Poly. In comparison, the two estimates differ by slightly more than 1-percent.

The estimate based on the ACO acres and ITRC water use: 1,485 acres x 21.86 inches = 2,705 acre-feet. In comparison, the estimate based on the method used in the Todd (2007) report for a dry year was 2,742 acre-feet.

Based on this comparison made in the *NCMA 2012 Annual Monitoring Report*, the method used to estimate agricultural water use for 2013 remains the same as for the previous annual report. The annual irrigation demand for the NCMA is represented by the aggregate of the crop acres by category multiplied by the estimated gross irrigation requirements per acre from the San Luis Obispo County Water Master Report (WMR).

The WMR estimate of gross irrigation requirements varies by precipitation year type, including low, average, and high estimates of irrigation demand by crop type for each of the Water Planning Areas (WPAs) in the County. The range in estimated irrigation demands is based upon climatic conditions and average irrigation efficiency, and includes double cropping for the category truck crops. Because the WMR does not include gross irrigation requirements for turf grass, the values for pasture grass were applied to turf grass areas in the NCMA to estimate their applied

irrigation demand. The representative gross irrigation requirements for crop groups are presented in Table 7 (following page).

As stated in the previous Annual Report, the areal extent of cultivated agricultural areas in the NCMA was quantified using a past land use survey by the ACO. Based on observation of the agricultural land use in views developed with recent land use survey information, the agriculture land use in the NCMA for 2013 has remained the same, consistent with previous years. Given this observation, the estimated agriculture acreage remains based on agriculture land use survey data and the previously applied methods. The areas with irrigated turf grass have been previously identified by public works personnel within the Northern Cities. The acreages of these areas have been measured from publically available aerial photographs using GIS software tools.

Table 7. Gross Irrigation Requirement for WPA 5 by Crop Group

Crop Type	Low Annual Demand (AFY/acre)	Average Annual Demand (AFY/acre)	High Annual Demand (AFY/acre)
Alfalfa	2.5	2.9	3.3
Nursery	1.4	1.7	2.1
Pasture	2.6	3.0	3.5
Turf Grass	2.6	3.0	3.5
Citrus	1.3	1.6	1.9
Deciduous	2.6	2.9	3.2
Truck (vegetable)	1.2	1.4	1.6
Vineyard	0.9	1.1	1.4

In the previous year estimates there were about 1,600 acres of irrigated agriculture within the NCMA of which approximately four acres are in nursery crops, and the remainder is truck crops such as broccoli, onions, and strawberries. Also identified was a combined total of 44 acres of irrigated turf grass at the Oceano Elementary School, Arroyo Grande High School, Harloe Elementary School, and the Le Sage Riviera Golf Course.

For this evaluation, average irrigation efficiencies are assumed for the NCMA. Therefore, the annual irrigation demand for each crop type is assumed to be dependent only on that year's precipitation and ET. For 2013, the annual precipitation and ET conditions indicate a Dry Year. The assigned year type for the demand estimates for all applied irrigation uses since 2004 are as follows:

- Wet years: 2,056 AFY (2005, 2006, and 2010)
- Average years: 2,397 AFY (2004)
- Dry years: 2,742 AFY (2007, 2008, 2009, 2011, 2012, and 2013)

4.2.3 Rural Demand

In the NCMA, rural water demand refers to uses not designated as urban demand or applied irrigation demand and includes small community water systems, individual domestic water systems, recreational uses, and agriculture-related business systems. Small community water systems using groundwater in the NCMA were identified initially through review of a list of water purveyors compiled in the 2007 San Luis Obispo County Integrated Regional Water Management Plan (IRWMP). These include the Halcyon Water System, Ken Mar Gardens, and Pacific Dunes RV Resort. The Halcyon Water System serves 35 homes in the community of Halcyon, while Ken Mar Gardens provides water supply to 48 mobile homes on South Halcyon Road. The Pacific Dunes RV Resort, with 215 RV sites, provides water supply to a largely transitory population as well as a nearby riding stable. In addition, about 25 homes and businesses have been identified as served by private wells through inspection of aerial photographs of rural areas within NCMA. Irrigation of schools and parks from privately operated wells is included in the applied irrigation demand section. Two mobile home communities, Grande Mobile and Halcyon Estates, are served by Oceano CSD through the distribution system of Arroyo Grande, thus the demand summary of Oceano CSD includes these two communities. Based on prior reports, it is assumed that the number of private wells is negligible within the service areas of the four Northern Cities. The estimated rural water demand is shown in Table 8.

Table 8. Estimated Rural Water Demand

Groundwater User	No. of Units	Estimated Water Demand, AFY per Unit	Estimated Water Demand, AFY	Notes
Halcyon Water System	35	0.40	14	*1*
Ken Mar Gardens	48	0.25	11.7	*2*
Pacific Dunes RV Resort	215	0.03	6	*3*
Rural Users	25	0.40	10	*1*
Current Estimated Rural Use			**41.7**	

1 - Water demand/unit based on 2000 and 2005 Grover Beach water use per connection, 2005 UWMP.

2 - Demand based on metered water usage.

3 - Water demand/unit assumes 50 percent annual occupancy and 0.06 AFY per occupied site.

4.2.4 Changes in Water Demand

In general, urban water demand has ranged from 7,473 AF (2011) to 8,982 AF (2007), with an average annual water use from 2005 to 2013 of 8,178 AFY (Table 6). The years 2009 through 2013 have been consistently at or below the average which may be attributed to the relatively slower economy and conservation activities implemented by the Northern Cities. In the applied irrigation category, agricultural acreage has remained fairly constant. Thus, annual water demand for applied irrigation varies mostly with weather conditions. Acknowledging the variability due to weather conditions (see Table 6), applied irrigation water demand is not expected to

change significantly given the relative stability of applied irrigation acreage and cropping patterns in the NCMA south of Arroyo Grande Creek. Changes in rural demand have not been significant.

5.0 COMPARISON OF WATER SUPPLY V. WATER DEMAND

Table 4 (page 10) shows the Available Urban Water Supplies for each of the Northern Cities, with a total available urban water supply of 10,769 AFY. As discussed in Section 4, the 2002 Management Agreement estimated that the historical safe yield from the groundwater basin was 9,500 AFY. Because all of the irrigation applied water demand is supplied by groundwater, the total available applied irrigation supply is a portion of the estimated groundwater safe yield; this portion was allocated as 5,300 AFY for agricultural and rural use. The agricultural conversion of 330 AFY reduces this allocation to 4,970 AFY. Of the estimated safe yield of 9,500 AFY, other than what is allocated for applied irrigation and rural use, the remaining 4,200 AFY is allocated for urban water use (4,000 AFY) along with an estimated 200 AFY to subsurface outflow to the ocean.

In 2012, the total urban water demand was 7,938.5 AF (Table 6), compared to the available urban water supply of 10,769 (assuming full delivery of SWP allocation). The estimated 2013 applied irrigation water use is 2,742 AF, and rural water use is estimated at 41.7 AF.

The total estimated 2013 NCMA water demand was 10,722.2 AF (Tables 6 and 9). The water demand, by source, of each city and agency in 2013 is shown in Table 9.

Table 9. 2013 Water Demand by Source (AF)

Urban Area	Lopez Lake	State Water Project	Groundwater	Transfers	Other Supplies	Total
Arroyo Grande	*2,722.3*	*0.0*	*268.4*	*0.0*	*120.2*	3,110.9
Grover Beach	*802.7*	*0.0*	*988.8*	*0.0*	*0.0*	1,791.5
Pismo Beach	*1,457.4*	*618.0*	*73.0*	*0.0*	*0.0*	2,148.4
Oceano CSD	*44.9*	*750.0*	*92.8*	*0.0*	*0.0*	887.7
Urban Water Use Total	**5,027.3**	**1,368.0**	**1,423.0**	**0.0**	**120.2**	**7,938.5**
Applied Irrigation	*0.0*	*0.0*	*2,742.0*	*0.0*	*0.0*	2,742.0
Rural Water Users	*0.0*	*0.0*	*41.7*	*0.0*	*0.0*	41.7
Total	**5,027.3**	**1,368.0**	**4,206.7**	**0.0**	**120.2**	**10,722.2**

Urban water demand in 2013 to the NCMA was supplied from 5,027 AF of Lopez Lake water, 1,368 AF of State Water Project water, and 1,423 AF of groundwater. The 120 AF of "Other Supplies" delivered to Arroyo Grande consists of groundwater pumped from the Pismo Formation, which is located outside of the shared groundwater basin.

Based on the estimated groundwater safe yield, the total available supply for all uses is 15,699 AFY, which is the sum of 10,729 AFY for urban plus the allocation for applied irrigation and rural area of 4,970 AFY. Total 2013 NCMA water demand is estimated at 10,722 AF.

6.0 MANAGEMENT ACTIVITIES

The NCMA and overlying private well users have actively managed surface water and groundwater resources in the Northern Cities area for more than 30 years. Management objectives and responsibilities were first established in the 1983 Gentlemen's Agreement and updated in the 2002 Management Agreement. The responsibility and authority of the Northern Parties for NCMA groundwater management was formally established through the 2002 Settlement Agreement, 2005 Stipulation, and 2008 Judgment. Throughout the long history of collaborative management, which was formalized through the Agreement, Stipulation, and Judgment, the overall management goal for the Northern Cities is to preserve the long-term integrity of water supplies in the NCMA portion of the Santa Maria Groundwater Basin (SMGB).

6.1 MANAGEMENT OBJECTIVES

Seven basic objectives have been established for ongoing NCMA groundwater management. Under each objective, the NCMA technical group has identified a number of strategies to meet the objectives. These strategies are listed and then discussed under each of the seven objectives listed below along with the history and rationale. Other potential objectives are outlined in the final section.

The Northern Cities, both individually and jointly, are engaged in water resource management projects, programs, and planning efforts that address water supply and demand issues, particularly efforts to assure a long-term sustainable supply. Each section discusses major management activities during 2013.

6.1.1 Share Groundwater Resources and Manage Pumping

Strategies:

- Continued reduction of groundwater pumping, maintain below safe yield.
- Coordinated delivery of Lopez Lake surplus water to maximize surface water supplies.
- Continue to import State Water Project supplies to Oceano CSD and Pismo Beach.
- Perform capacity assessments on the Lopez Lake and Coastal Branch pipelines to allow maximum current and future surface water imports.
- Maintain surface water delivery infrastructure to maximize capacity.

Discussion:

A longstanding objective of water users in the NCMA has been to cooperatively share and manage groundwater resources. In 1983 the Northern Parties mutually agreed on an initial safe yield estimate (defined by DWR) and an allotment of pumping between the urban users and applied irrigation users of 57 percent and 43 percent, respectively. In this agreement the Northern Cities also established pumping allotments among themselves. Subsequently, the 2002 Management Agreement included provisions to account for changes such as ag land conversions. The agreements provide that any increase or decrease in the safe yield based on ongoing assessments would be shared on a pro rata basis. Pursuant to the stipulation the Northern Cities conducted a water balance study to update the safe yield estimate (Todd 2007).

Among other results, the parties agreed to maintain the existing pumping allotment among the urban users and established a consistent methodology to address agricultural land use conversion.

In addition to cooperatively sharing and managing groundwater resources, the Northern Cities have coordinated delivery of water from Lopez Lake and have continued to import SWP water to maximize use of available surface water supplies. In 2013, Oceano CSD received its full allotment of SWP water and Pismo Beach imported nearly 50% of its allotment. These activities allow the Northern Cities, as a whole, to actively and effectively manage the groundwater resource. Although groundwater use in the NCMA has steadily, but slowly, increased since 2010, 2013 groundwater pumpage is less than any year during the 11-year period from 1999 through 2009.

The water balance study (Todd 2007) highlighted the threat of seawater intrusion as the most important potential adverse impact to consider in managing the basin. Seawater intrusion, a concern since the 1960s, would degrade the quality of water in the aquifer and potentially render portions of the basin unsuitable for groundwater production (DWR 1970). A deep sentry well index of 7.5 feet (NAVD 88) has been recognized as the index, above which it is thought that there is sufficient fresh water (groundwater) outflow to prevent seawater intrusion. From late 2009 to April 2013, the Northern Cities management of groundwater levels and groundwater pumpage maintained the sentry well index above the 7.5-foot. level. However, for several weeks in April and May, and then again from early July through mid-December 2013, the index value dropped below the target.

Another potential adverse impact of localized pumping includes reduction of flow in local streams, notably Arroyo Grande (Todd 2007). The Northern Cities (as Zone 3 contractors) have participated with SLOFCWCD in preparation of the Arroyo Grande Creek Habitat Conservation Plan (HCP) that addresses reservoir releases to maintain both groundwater levels and habitat diversity in the creek. Additional studies to finalize the HCP are scheduled for 2014.

6.1.2 Monitor Supply and Demand and Share Information

Strategies:

- Share groundwater pumping data at monthly NCMA Technical Group meetings.
- Evaluate future water demands through comparison to UWMP projections.
    - Arroyo Grande 2010 UWMP
    - Pismo Beach 2010 UWMP
    - Grover Beach 2010 UWMP
    - Due to population, OCSD is not required to prepare an UWMP

Discussion:

Regular monitoring of activities that affect the groundwater basin, and sharing that information, has occurred for many years. The monitoring efforts include gathering data on hydrologic conditions, water supply and demand, and groundwater pumping, levels, and quality. The current monitoring program is managed by the Northern Cities in accordance with the 2005

Stipulation and 2008 Judgment, guided by the July 2008 Monitoring Program for the NCMA. The monitoring data and a summary of groundwater management activities are summarized in the Annual Reports. Arroyo Grande, Grover Beach, and Pismo Beach have each evaluated their future water demands as part of their respective 2010 UWMP updates. The NCMA shares information with the two other management areas (NMMA and SMVMA) through data exchange and regular meetings throughout the annual report preparation cycle. The sharing of information has expanded as the management areas continue to work together.

6.1.3 Manage Groundwater Levels and Prevent Seawater Intrusion

Strategies:

- Utilize storm-water ponds to capture storm-water run-off and recharge the groundwater basin.
- Install transducers in key monitoring wells to provide continuous groundwater elevation data; the following wells have transducers:
    - 24B01
    - 24B03
    - 30F03
    - 30N02
    - County Monitoring Well #3
- Collect and evaluate daily municipal pumping data to determine impact on local groundwater elevation levels.
- Continue to pursue IRWM Planning grant funding and other potential revenue sources to characterize the SMGB as basis for developing a groundwater flow model.

Discussion:

Prevention of seawater intrusion through the management of groundwater levels is essential to protect the shared resource. The NCMA agencies both increase groundwater recharge with stormwater infiltration as well as closely monitoring groundwater levels and water quality in sentry wells along the coast.

Arroyo Grande and Grover Beach each maintain storm water retention ponds within their jurisdiction; the SLOFCWCD maintains the storm water system, including retention ponds, in Oceano. These ponds collect storm water runoff, allowing it to recharge the underlying aquifers. There are approximately 140 acres of detention ponds in Arroyo Grande and 48 acres of detention ponds in Grover Beach. The storm water detention pond in Oceano CSD is approximately one-half acre. Grover Beach modified its storm water system in 2012 to direct additional flow into one of its recharge basins.

While closely related to the objectives to manage pumping, monitor supply and demand, and share information, this objective also specifically recognizes the proximity of production wells to the coast and the threat of seawater intrusion. The Northern Cities and SLOFCWCD have long cooperated in the monitoring of groundwater levels, including quarterly measurement by the

NCMA of groundwater levels in sentry wells at the coast. Upon assuming responsibility for the coastal monitoring wells, the NCMA became aware of the need to upgrade their condition. In July 2010 the well-heads (surface completions) at four sentry monitoring well clusters within the Northern Cities Management Area were renovated (Todd 2010). The modifications occurred at well clusters:

- 32S/12E-24B01, B02, B03;
- 32S/13E-30F01, F02, F03;
- 32S/13E-30N01, N02, N03; and
- 12N/36W-36L01, L02.

The renovations included raising the elevations of the top of each individual well casing by two to three feet in order to reduce the risk of surface water entering the wells. Because the top of the well casing is used as the reference point for all depth to water measurements, the new surface completions were surveyed relative to the NAVD 88 standard in late September 2010 (Wallace Group 2010). The individual well casings have been raised above ground surface and protective locking steel risers now enclose each cluster. As a result of this work, the sentry wells within the NCMA are now protected from surface contamination and tampering.

Quarterly measurement of groundwater levels aids in assessing the risk of seawater intrusion along the coast; to enhance the data collection and assessment efforts, the NCMA installed transducers in five of the key sentry monitoring wells to provide continuous groundwater levels at key locations. By combining this with the collection and evaluation of daily municipal pumping data, the NCMA is better able to determine the response of local groundwater levels to extractions and therefore better manage the basin. The fruits of these efforts with respect to observation of short-term responses to applied stresses in the basin through the collection of continuous groundwater levels are illustrated by the recognition of the sharp decline in groundwater levels at the coast in response to increased groundwater pumpage when Lopez Lake deliveries were temporarily suspended (see Section 4.1.2.2 and Figures 15-17). This short-term water level decline would not typically have been observed in the past when water levels were measured on a semi-annual or quarterly basis.

In order to gain insight into water level fluctuation and water quality variation in the area between the NCMA and NMMA, a continuous monitor was installed in Well 32C03 (County Well #3). Well 32C03 was constructed and is owned by the County of San Luis Obispo and is part of their county-wide groundwater monitoring network. Well 32C03 is completed to 170 feet with a screened interval from 90 to 170 below ground surface and is constructed of 5-inch diameter polyvinyl chloride (PVC) casing. To provide more detail regarding seasonal and other groundwater level changes in the area between the NCMA and NMMA, detailed water level monitoring was initiated in April 2012. Sensors were installed to document long- and short-term changes in water level, temperature and specific conductance. The results from detailed monitoring of Well 32C03 are provided in Figure 18.

Additional studies to enhance basin management efforts that have been discussed by the NCMA TG include:

- Implement a monthly water level elevation data analysis of the sentry wells during periods when the deep well index value is below the index target of 7.5 feet.
- Implement a monthly analysis of electrical conductivity (EC) data from the wells with downhole transducers (24B01, 24B03, 30F03, 30N02, County Well #3) during periods when the deep well index value is below the index target of 7.5 feet to track potential water quality degradation. If EC data suggests water quality degradation, implement a monthly sampling and monitoring program.
- Assess the potential impacts on sentry well water level elevations from extended periods of increased groundwater pumping by conducting analytical modeling analyses to predict water level responses given certain pumping scenarios. These analyses may prove fruitful as scenarios unfold regarding decreased SWP deliveries or short-term emergency cuts to Lopez Lake deliveries.

Lastly, the 2005 Settlement requires NCSD and the other Mesa parties to import 2500 AFY to mitigate overpumping that has impacted groundwater inflow to the NCMA, and thus may facilitate seawater intrusion in both NCMA and NMMA. Although considerable progress in importing water has been made, overpumping on the Mesa continues and the terms and requirements of the Settlement have not been fulfilled.

6.1.4 Protect Groundwater Quality

Strategies:

- Perform quarterly water quality monitoring at all sentry wells and County Well #3.
- Gather temperature and electrical conductivity data from five monitoring wells to continuously track water quality indicators for seawater intrusion.
- Use IRWM Planning grant opportunities to characterize the groundwater basin as a basis for the development of a Salt and Nutrient Management Plan pursuant to State policy.
- Utilize IRWM Planning grant funding to investigate alternatives for utilizing recycled water from the Pismo Beach and the South San Luis Obispo County wastewater treatment plants, including:
    - Development of a seawater intrusion barrier.
    - Recharge groundwater basin for indirect potable re-use.
    - Offset potable water pumping through agriculture/landscape irrigation.
    - Augment stream flow in Arroyo Grande creek.

Discussion:

The objective to protect groundwater quality is closely linked with the objective for monitoring and data sharing. To meet this objective all sources of water quality degradation, including the threat of seawater intrusion, need to be recognized. Water quality threats and possible degradation affect the integrity of the groundwater basin, potentially resulting in loss of use or expensive water treatment processes. Sentry wells are monitored quarterly and data from other NCMA production wells are assessed annually. The monitoring program includes

evaluation of potential contaminants in addition to those that might indicate seawater intrusion. Temperature and electrical conductivity probes have been installed in five monitoring wells to provide continuous water quality tracking for early indication of seawater intrusion. Additionally, NCMA efforts in conjunction with the NMMA have resulted in the ongoing efforts to characterize the groundwater basin in preparation for the possible development of a Salt and Nutrient Management Plan.

6.1.5 Manage Cooperatively

Strategies:

- Include the Santa Maria Valley Management Area (SMVMA) in the Santa Maria Groundwater Basin Management Areas (SMGB MA) Technical Subcommittee.
- Coordinate groundwater monitoring data sharing and annual report preparation with the NCMA, NMMA and the SMVMA.

Discussion:

Since 1983, NCMA management has been based on cooperative efforts of the affected parties, including the Northern Cities entities, private agricultural groundwater users, San Luis Obispo County, the SLOFCWCD, and other local and state agencies. Specifically the NCMA agencies have limited their pumping and, in cooperation with SLOFCWCD, invested in surface water supplies so as to not exceed the safe yield of the NCMA portion of the SMGB. Other organizations participate, as appropriate. In addition to the efforts discussed in this report, cooperative management occurs through many other venues and forums, including communication by the Northern Cities in their respective public meetings, participation in the Water Resources Advisory Council (the County-wide advisory panel on water issues), and active participation in the ongoing IRWM Plan Update.

The NCMA agencies participated in preparation and adoption of the 2007 San Luis Obispo County Integrated Regional Water Management Plan (IRWMP). The IRWMP promotes integrated regional water management to ensure sustainable water uses, reliable water supplies, better water quality, environmental stewardship, efficient urban development, protection of agriculture, and a strong economy. The IRWMP integrates all of the programs, plans, and projects within the region into water supply, water quality, ecosystem preservation and restoration, groundwater monitoring and management, and flood management programs. The SLOFCWCD received a DWR grant to update the 2007 Plan.

Since the 2008 Judgment, the NCMA has taken the lead in cooperative management of its management area. The NCMA has also been a proactive participant in the Santa Maria Groundwater Basin Management Area technical subcommittee, which formed in 2010. These efforts continued throughout 2013. The NCMA Technical Group met monthly (at a minimum) throughout 2013. The group also met four times with the NMMA and SMVMA groups. The coordination among the management areas is leading to joint projects such as enhanced monitoring of groundwater levels and improved sharing of data.

The NCMA meetings also provide for collaborative development of joint budget proposals for studies and plans as well as shared water resources (as discussed in Section 6.1.1 and 6.1.4).

In addition, the monthly meetings provide a forum for discussing the data collected as part of the quarterly monitoring reports (as discussed in Sections 6.1.2 and 6.1.3).

A key water supply planning and management activity started in late 2013 by the NCMA is the initiation of joint Strategic Planning efforts for the purpose of providing the NCMA Technical Group with a framework for identifying common water resource planning goals and objectives, and to establish a 10-year work plan for implementation of those efforts. Several key objectives have been identified, including water supply reliability, increased outreach, and basin management. These efforts will continue throughout 2014

6.1.6 Encourage Water Conservation

Strategies:

- Share updated water conservation information
- Implement UWMPs

Discussion:

Water conservation, or water use efficiency, is linked to the monitoring of supply and demand and the management of pumping. Water conservation reduces overall demand on all sources, including groundwater, and supports management objectives to manage groundwater levels and prevent seawater intrusion. In addition, water conservation is consistent with State policies seeking to achieve significant water use reductions by the year 2020. Water conservation activities in the NCMA are summarized in various documents produced by the Northern Cities, including the 2010 Urban Water Management Plans of Arroyo Grande, Grover Beach, and Pismo Beach. Due to the population of its service area, Oceano CSD is not required to prepare an UWMP or reduce water consumption by 20% by 2020; however the OCSD encourages water conservation and the installation of low flow fixtures.

The Northern Cities implement water conservation activities to reduce water use and thus reduce groundwater demand. The Cities participate in a wide range of water conservation activities designed to educate the public on ways to reduce water use.

City of Arroyo Grande

The City of Arroyo Grande supports a part time water conservation coordinator staff position to manage existing conservation activities, encourage public participation, and create new conservation programs for the community. In the last 10 years, Arroyo Grande spent over $1,400,000 on water conservation efforts. Arroyo Grande is implementing the following water Demand Management Measures (DMMs):

- Water Survey Programs (Equivalent program elements)
- Residential Plumbing Retrofits
- Water System Audits
- Metering with Commodity Rates
- Large Landscape Irrigation Programs
- High-efficiency washing machine rebate programs

- Public information programs.
- School education programs.
- Conservation programs for commercial and institutional accounts.
- Conservation pricing.
- Water conservation coordinator.
- Water waste prohibition.
- Residential ultra-low-flush toilet replacement programs.
- Cash for Grass.

The water conservation efforts of Arroyo Grande have been successful; the DMMs that have been implemented have decreased water use per residential connection from 190 gallons per capita per day (gpcd) to 160 gpcd. The target per capita usage for 2015 is 167 gpcd, while the target per capita usage for 2020 is 149 gpcd. Continued implementation of these DMMs will help Arroyo Grande to reach its per capita water use goals and indicates the commitment Arroyo Grande has to optimizing use of its water supply.

City of Pismo Beach

The City of Pismo Beach is a member of the California Urban Water Conservation Council, and as such has developed best management practices (BMPs) to reduce water consumption and ensure reliable future water supply. Included in BMPs implemented by Pismo Beach are activities and programs that promote water conservation and sustainable use of water resources. BMPs that Pismo Beach is implementing or has equivalent coverage for are:

- Water Survey Programs
- Residential Plumbing Retrofit
- Water System Audits
- Metering with Commodity Rates
- Landscape Irrigation Programs
- Conservation Pricing
- Water Conservation Coordinator
- Ultra Low Flush Toilet Replacement

The water conservation efforts of Pismo Beach have helped reduce residential water use from a high of 256 gpcd in 2007 to 226 gpcd in 2010. The 10-year baseline average water use is 236 gpcd. Continued implementation of these BMPs and implementation of other BMPs in the future will help Pismo Beach reach its per capita water use goals and indicates the commitment of Pismo Beach to optimizing use of its water supply. The target water use for 2015 is 214 gpcd; the target water use for 2020 is 192 gpcd.

City of Grover Beach

As described in their 2010 Urban Water Plan, Grover Beach has developed and implemented Demand Management Measures to reduce water consumption and ensure a reliable future water supply. Included in the DMMs implemented by the Grover Beach are activities and programs that promote water conservation and sustainable use of water resources. DMMs that Grover Beach is implementing or has equivalent coverage are:

- Water survey programs for single-family residential and multifamily residential customers
- Residential plumbing retrofit
- System water audits, leak detection, and repair
- Metering with commodity rates for all new connections and retrofit of existing connections
- Large landscape conservation programs and incentives
- High-efficiency washing machine rebate programs
- Public information programs
- School education programs
- Conservation programs for commercial, industrial, and institutional accounts
- Conservation pricing
- Water conservation coordinator
- Water waste prohibition
- Residential ultra-low-flush toilet replacement programs

Grover Beach has implemented or is planning to implement all applicable demand management measures as part of the Water Conservation Program. The ongoing water conservation activities of Grover Beach include a "Cash for Grass" rebate, a water-efficient washing machine rebate program, and smart irrigation controller and sensor rebate program. The 10-year baseline average water use for Grover Beach is 140.7 gpcd. The target water use for 2015 is 127 gpcd, while the target water use for 2020 is 113 gpcd.

6.1.7 Evaluate Alternative Sources of Supply

Strategies:

- Evaluate expanded use of recycled water;
- Analyze capacity of the Lopez Lake and Coastal Branch pipelines to maximize deliveries of surface water. The following analyses have been completed:
    - Lopez Pipeline Capacity Evaluation
    - Lopez Pipeline Capacity Re-Evaluation
    - Coastal Branch Capacity Assessment

Discussion:

The Northern Cities continue to evaluate alternative sources of water supply which could provide a more reliable and sustainable water supply for the NCMA. An expanded portfolio of water supply sources will support sustainable management of the groundwater resource and help to reduce the risk of water shortages. These alternative sources include:

State Water Project

Oceano CSD and Pismo Beach are currently SWP customers and could utilize additional water deliveries. Pismo Beach has increased its SWP allocation by securing a "drought buffer" to increase the availability of supply during periods of SWP shortfalls. Grover Beach and Arroyo Grande are not SWP customers.

Water Recycling

In 2010, the South San Luis Obispo County Sanitation District (SSLOCSD) updated their 2001 evaluation of recycled water opportunities. The new evaluation included an evaluation of using disinfected secondary treated water to irrigate landscaping and the potential use of recycled water if the SSLOCSD Waste Water Treatment Plant (WWTP) were upgraded to provide tertiary treatment. By providing tertiary treatment, as much as 189 AFY of potential demand could be satisfied.

The City of Pismo Beach also has evaluated use of recycled water. As described in the 2010 UWMP, "the City may begin regional planning efforts regarding recycled water within the next five years". The City of Pismo Beach is considering plans to upgrade its waste water treatment plant to provide an anticipated recycled water supply of up to an estimated 1,558 AFY in 2015. This estimate provides an idea of the amount of recycled water that could be available. The City of Pismo Beach UWMP anticipates that the recycled water not used for irrigation near the WWTP and in the Price Canyon development area "may be applied towards groundwater recharge operations."

New funding through the county IRWM Plan update will allow additional progress in water recycling in the NCMA.

Lopez Lake Expansion

In 2008, San Luis Obispo County sponsored a preliminary assessment of the concept of installing an inflatable rubber dam at the Lopez Dam spillway. Subsequently, the SLOFCWCD Service Area 12 and the Cities of Arroyo Grande, Grover Beach and Pismo Beach funded a study to further analyze the feasibility of increasing the yield of Lopez Lake by raising the spillway height with an inflatable dam or permanent extension. The study was finalized in 2013 and identified the potential to increase the annual yield from the lake by 500 AFY with a spillway height increase by 6 ft (Stetson 2013). The NCMA agencies are continuing to evaluate other aspects of the project, including pipeline capacity and impacts on the HCP process (Stetson. 2013).

Desalination

In 2006, Arroyo Grande, Grover Beach, and Oceano CSD utilized Prop 50 funds to complete a feasibility study on desalination as an additional water supply option for the NCMA. This alternative supply is not considered to be a viable option at this time.

Nacimiento Pipeline Extension

In 2006, Arroyo Grande, Grover Beach, and Oceano CSD completed a Nacimiento pipeline extension evaluation to determine the feasibility of delivery water from the Nacimiento reservoir to the NCMA. This alternative supply is not considered to be a viable option at this time.

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FIGURES

Legend

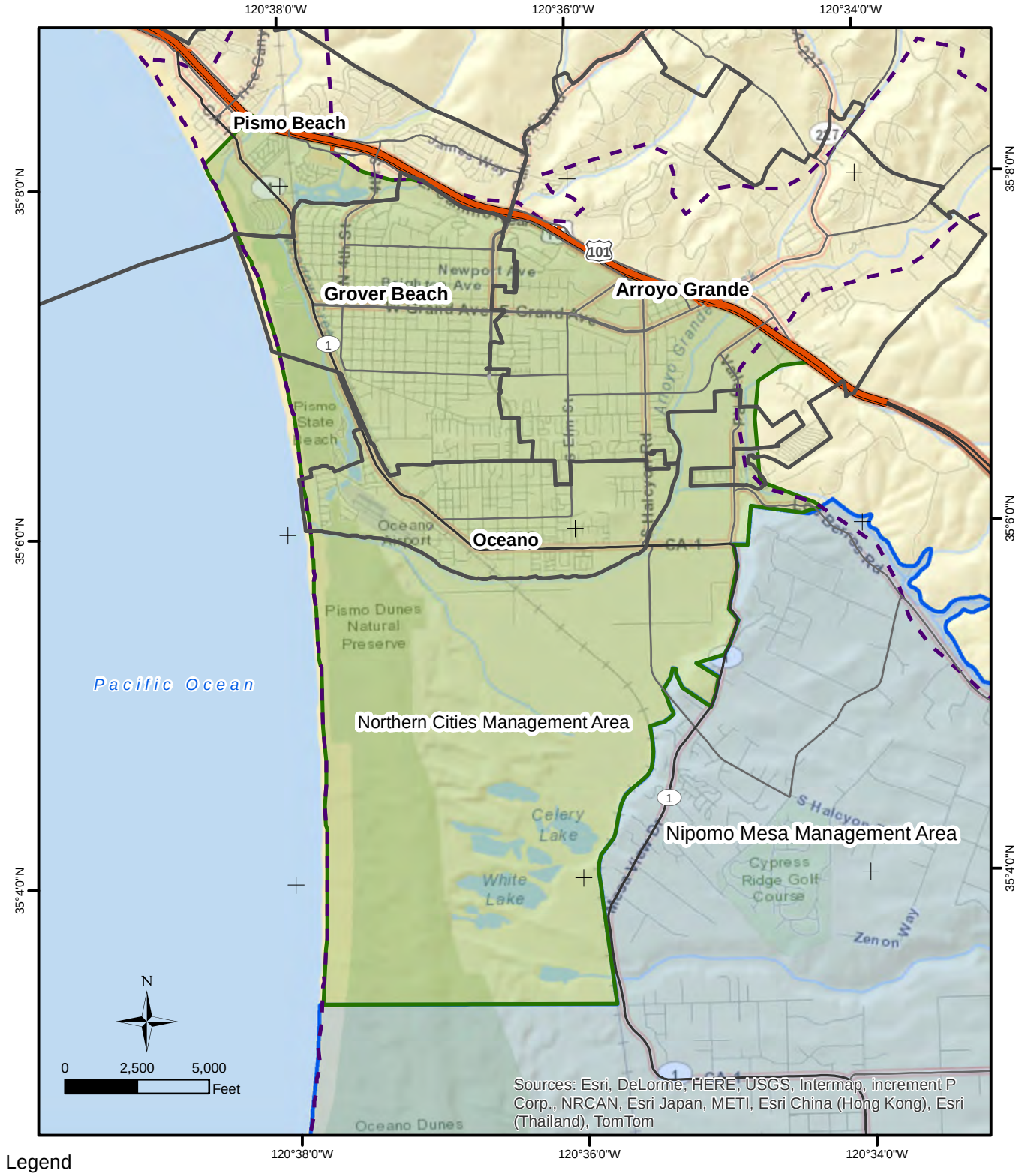
- Northern Cities Management Area
- Adjudication Area Boundary
- Santa Maria Groundwater Basin

SANTA MARIA GROUNDWATER BASIN

Northern Cities Management Area
San Luis Obispo County, California

FIGURE 1

N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangAreaOutputs\2014_NCMA_2013_Annual_Monitoring_Report\mxd\Figure 1 SantaMariaGroundwaterBasin.mxd, 3/21/2014, tnicely



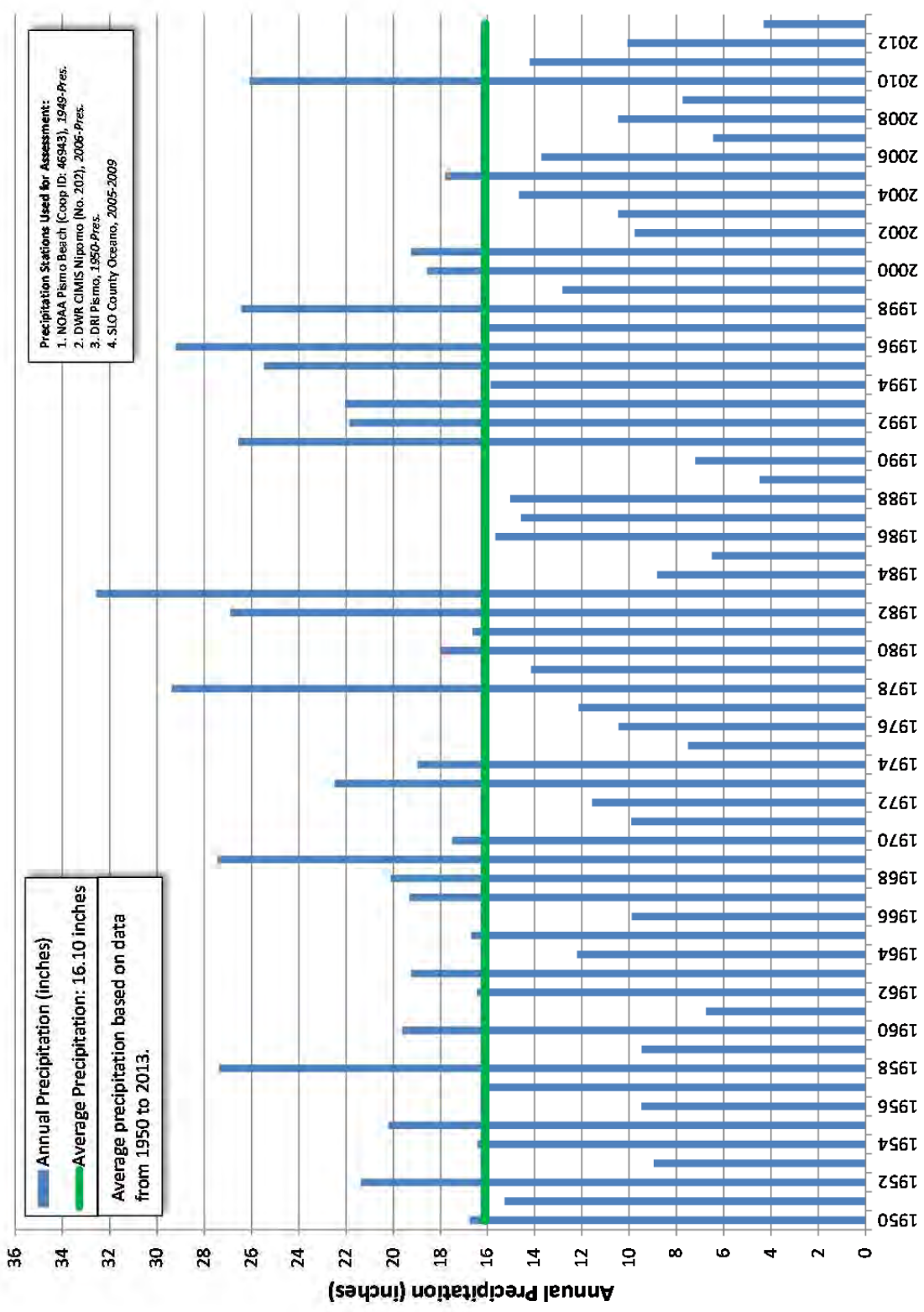
Legend

- City Limits
- Santa Maria Groundwater Basin
- Northern Cities Management Area
- Nipomo Mesa Management Area

NORTHERN CITIES MANAGEMENT AREA
Northern Cities Management Area
San Luis Obispo County, California

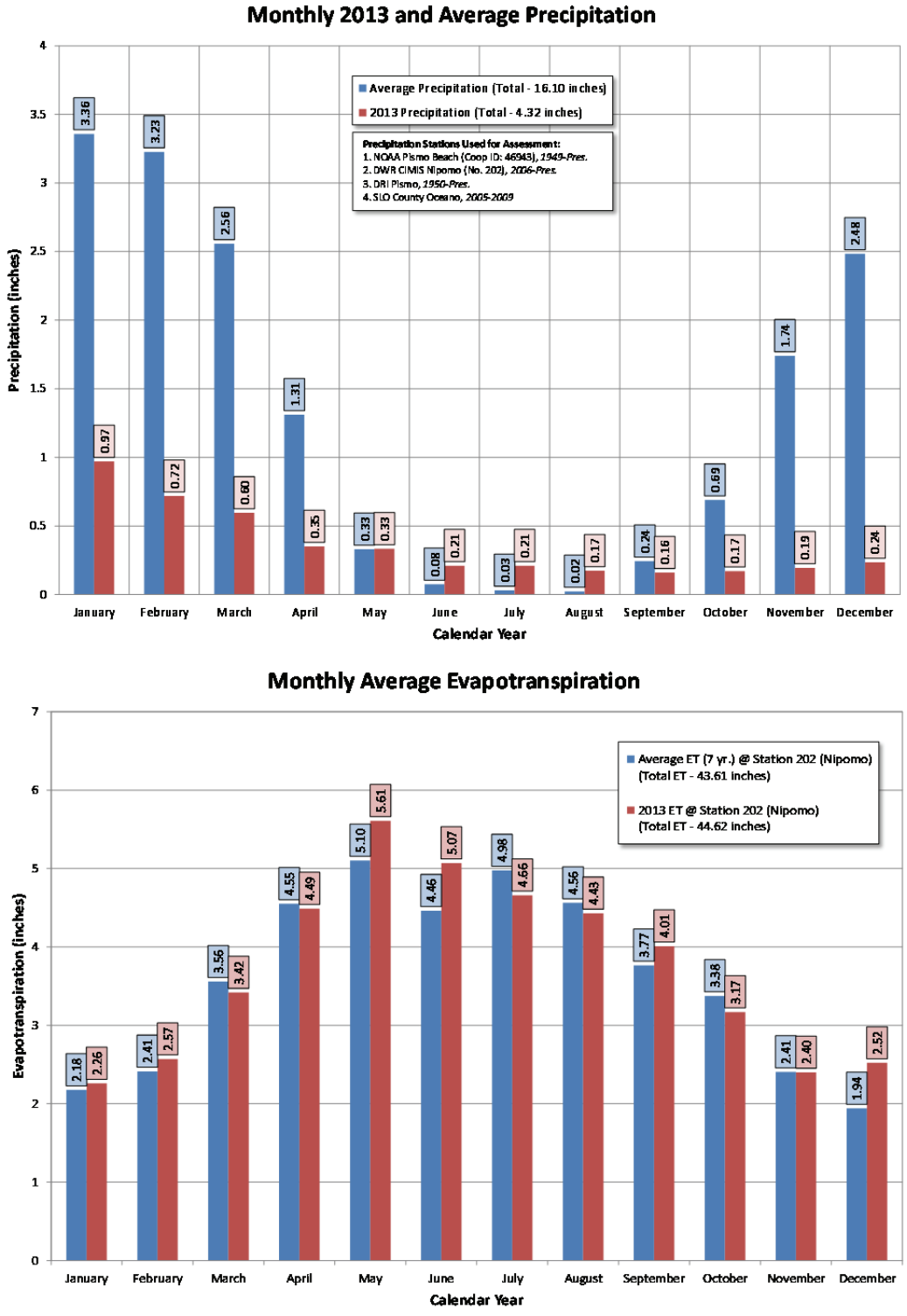
FIGURE 2

N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangAreaOutputs\2014_NCMA_2013_Annual_Monitoring_Report\mxd\Figure 2 Northern Cities Management Area.mxd, 3/21/2014, tnicely



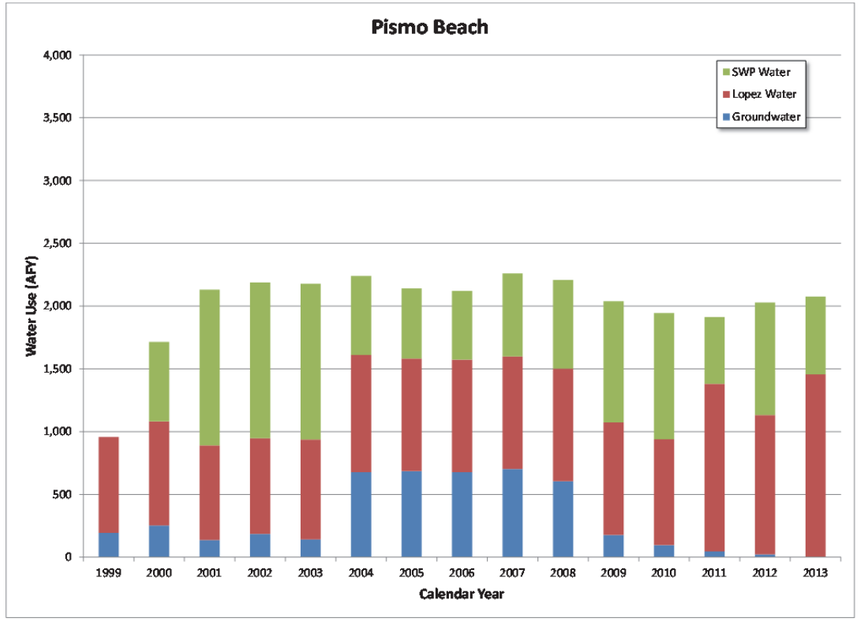
ANNUAL PRECIPITATION 1950 TO 2013
Northern Cities Management Area
San Luis Obispo County, California

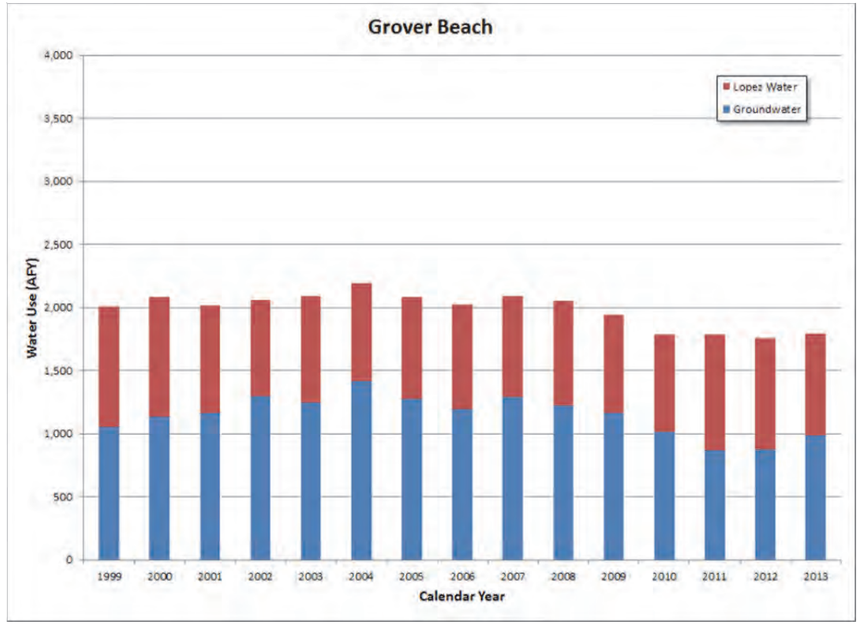
FIGURE 3

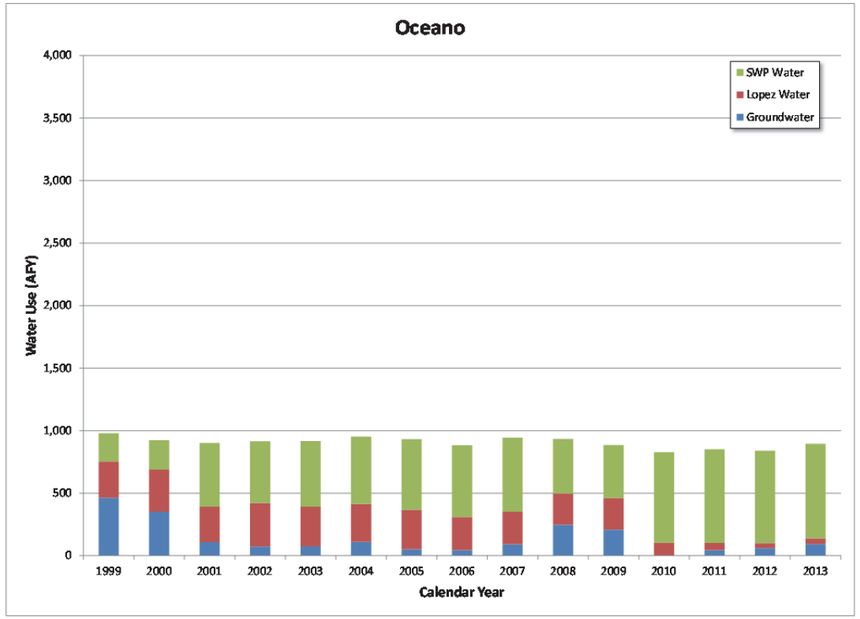


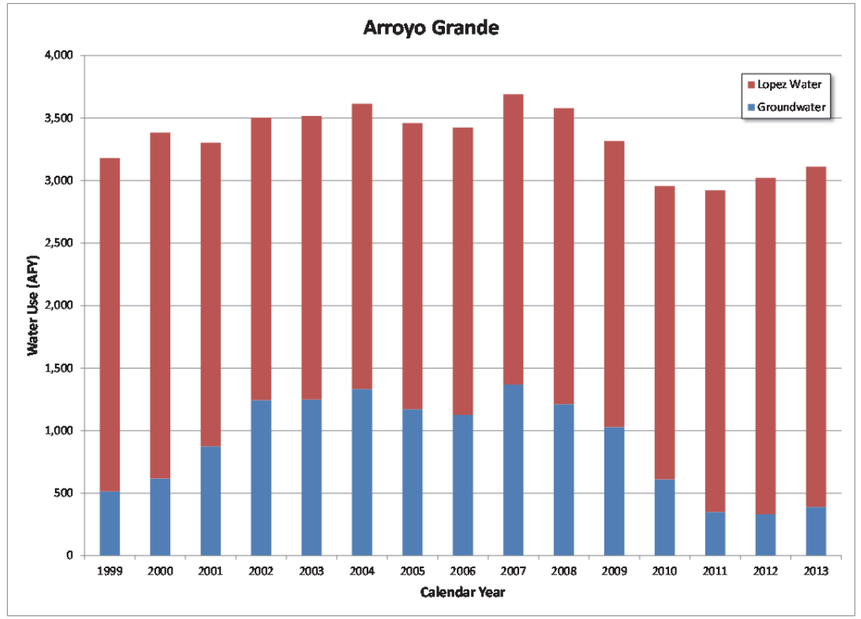
MONTHLY 2013 AND AVERAGE PRECIPITATION AND EVAPORATION
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 4



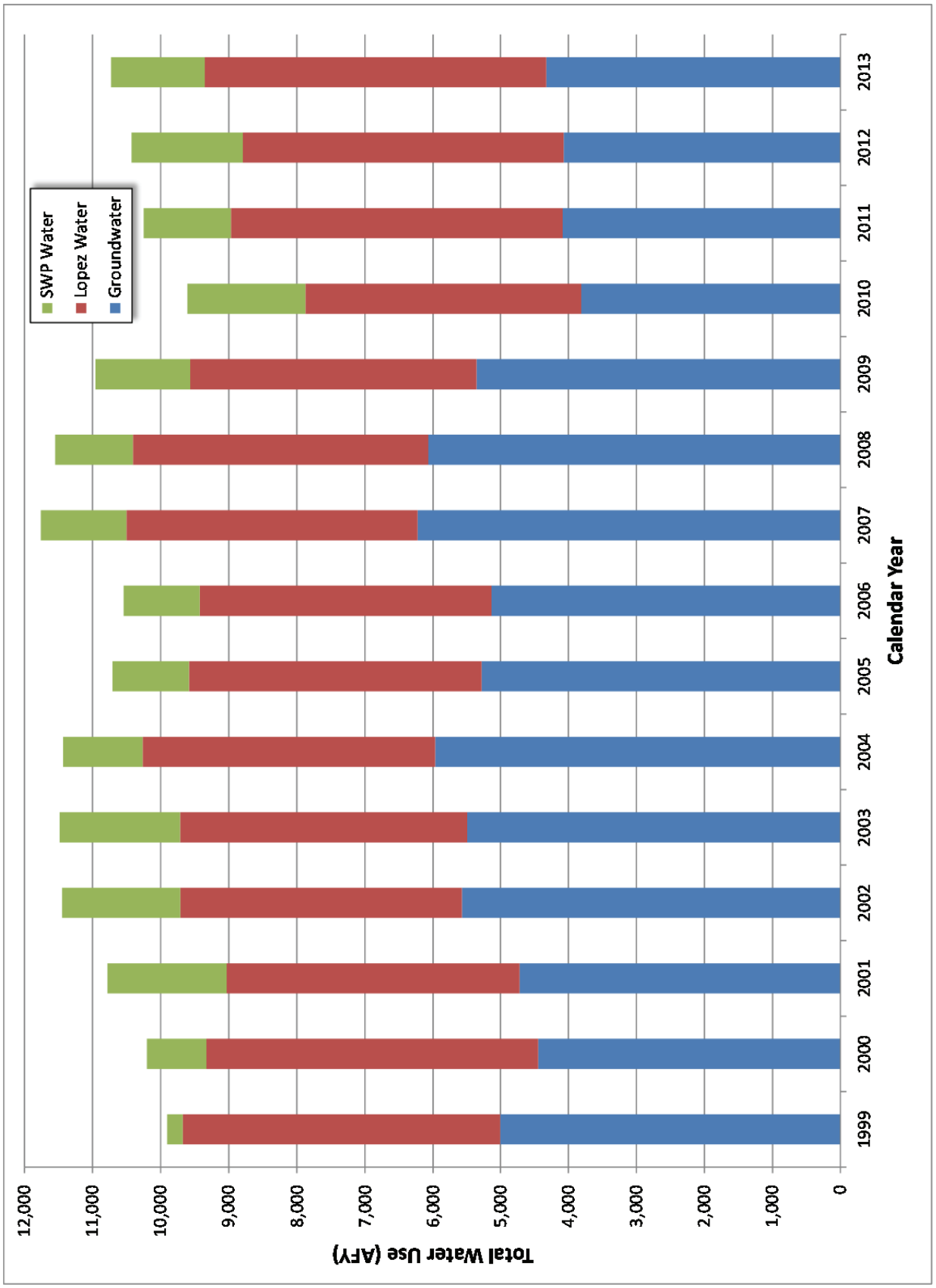






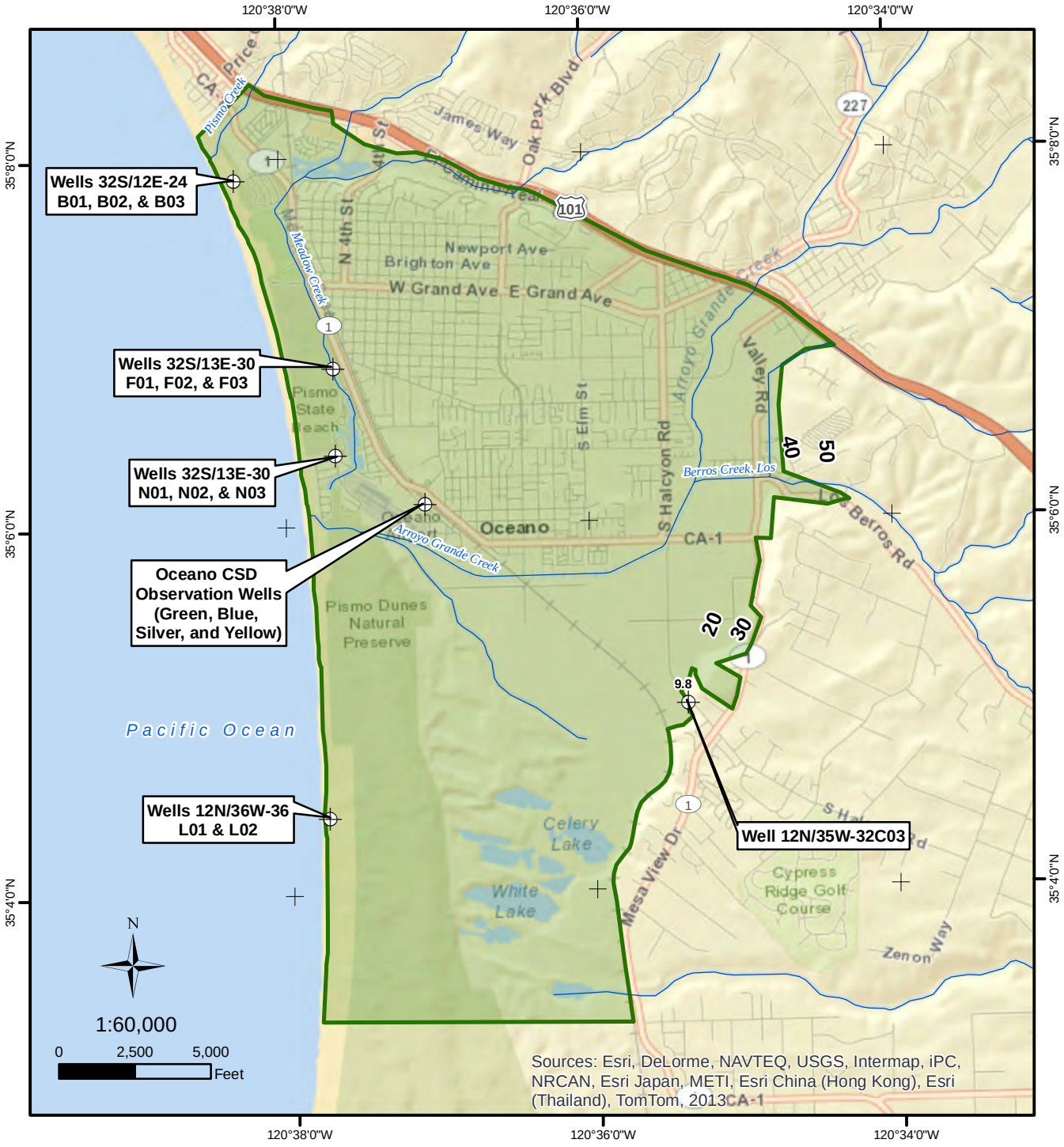
MUNICIPAL WATER USE BY SOURCE
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 5



TOTAL WATER USE BY SOURCE
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 6



Legend

NCMA Sentry Wells

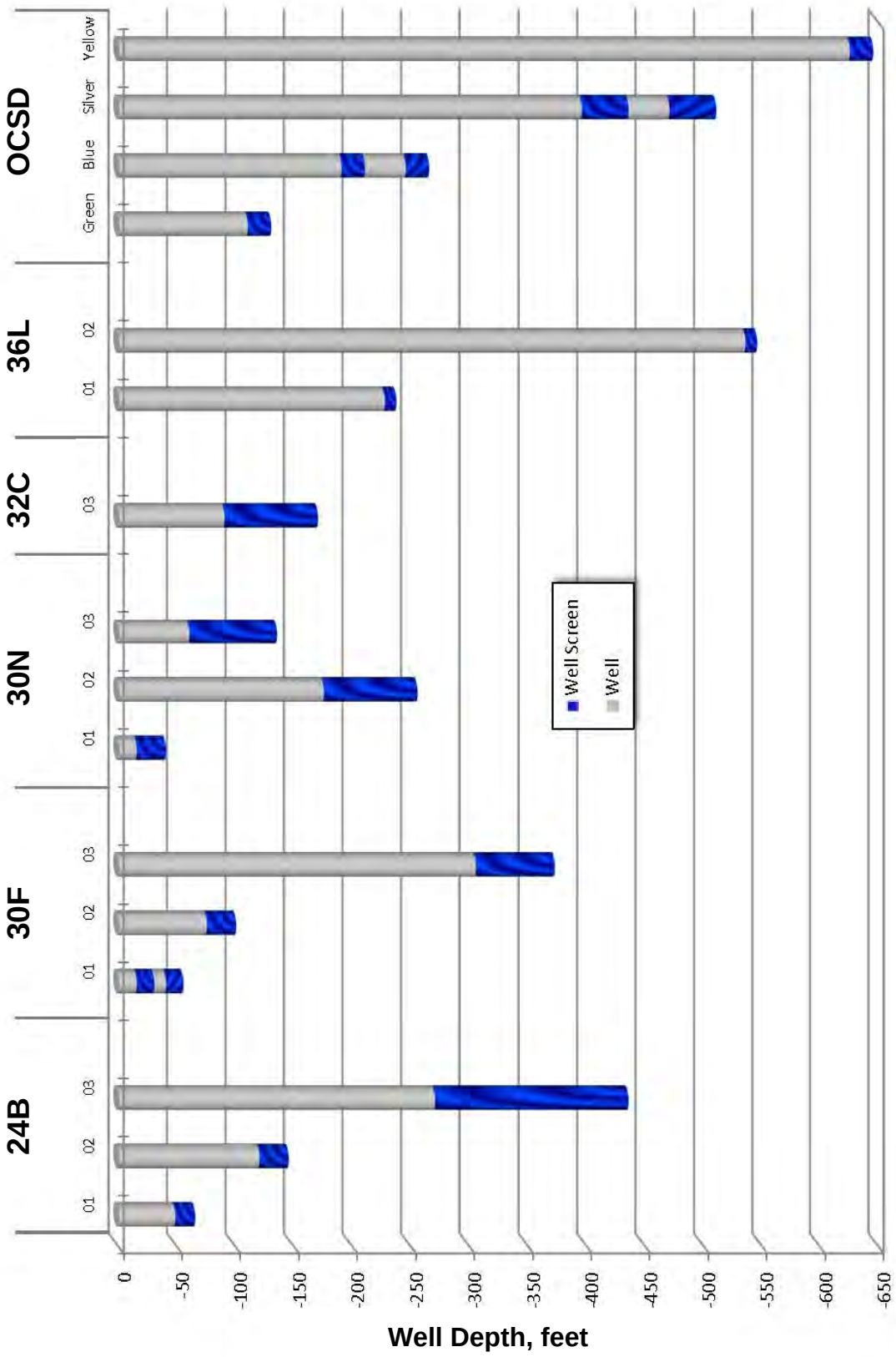
Northern Cities Management Area

Creeks

LOCATION OF SENTRY WELLS
Northern Cities Management Area
San Luis Obispo County, California

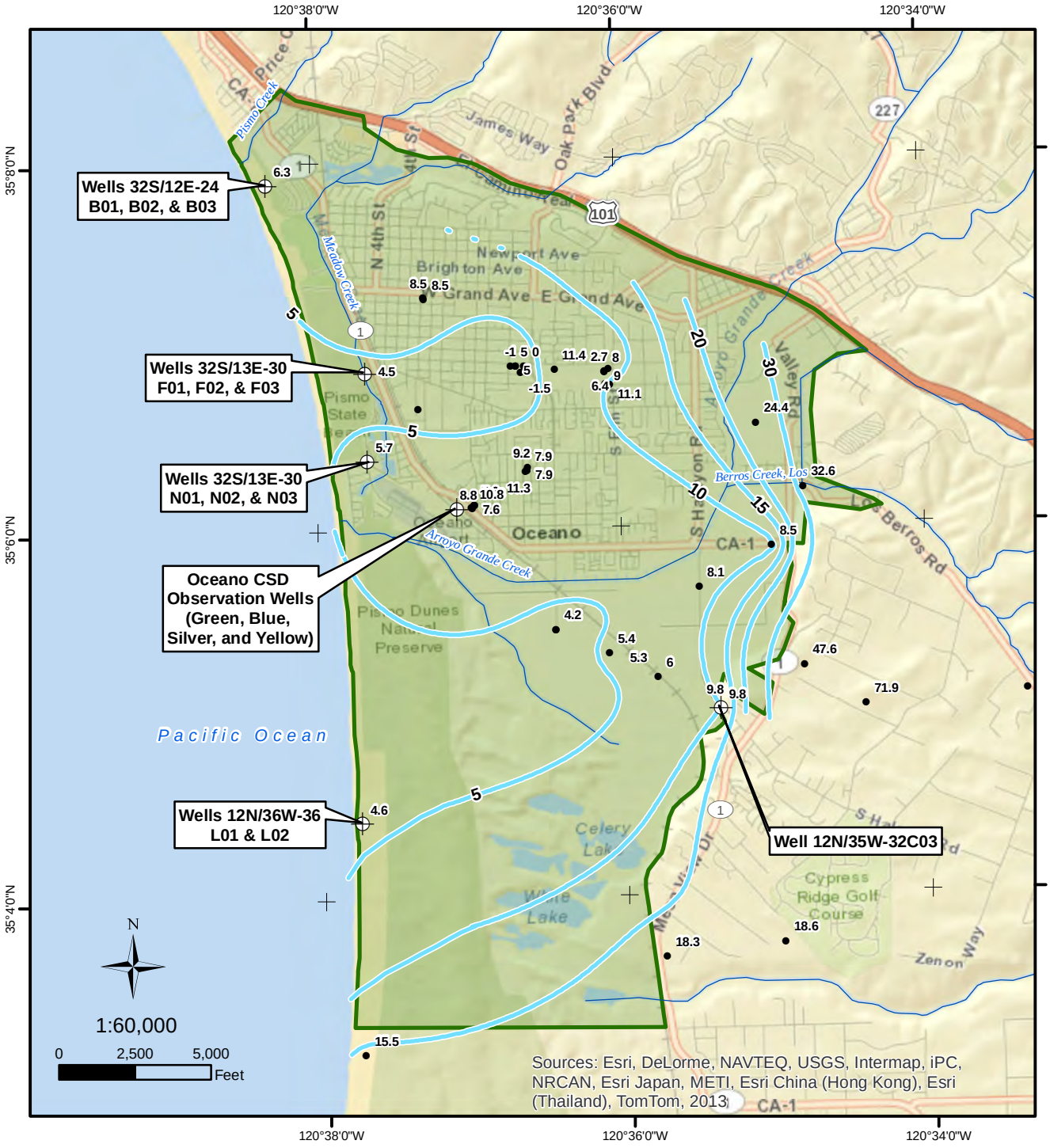
FIGURE 7

N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangArea\Outputs\2014_01_06_AnnualReport\mxd\Plate-9a_2013 April NCMA Contours.mxd, 1/29/2014, CDean



DEPTHS OF SENTRY WELLS
Northern Cities Management Area
San Luis Obispo County, California

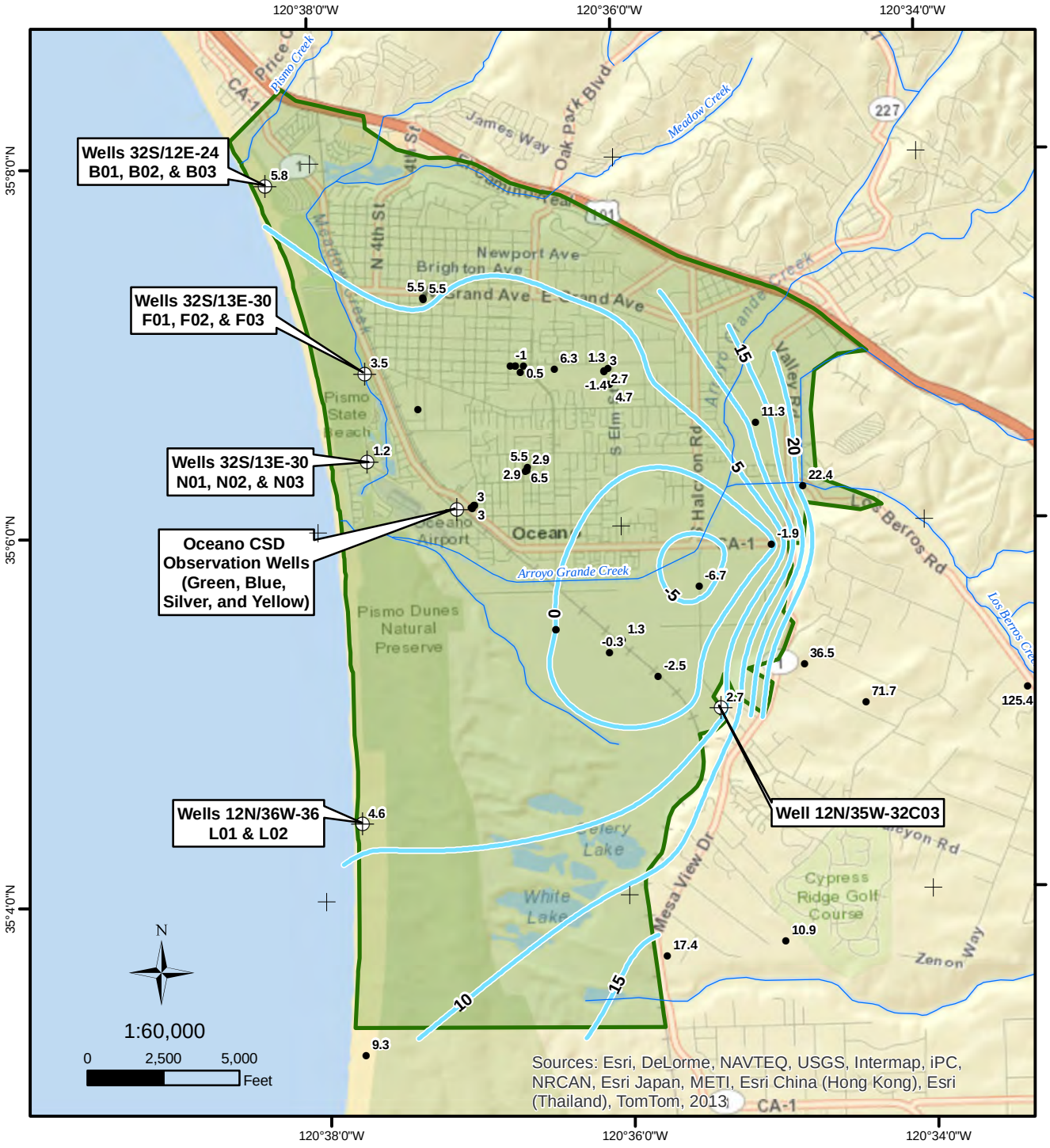
FIGURE 8



WATER LEVEL CONTOURS, APRIL 2013
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 9

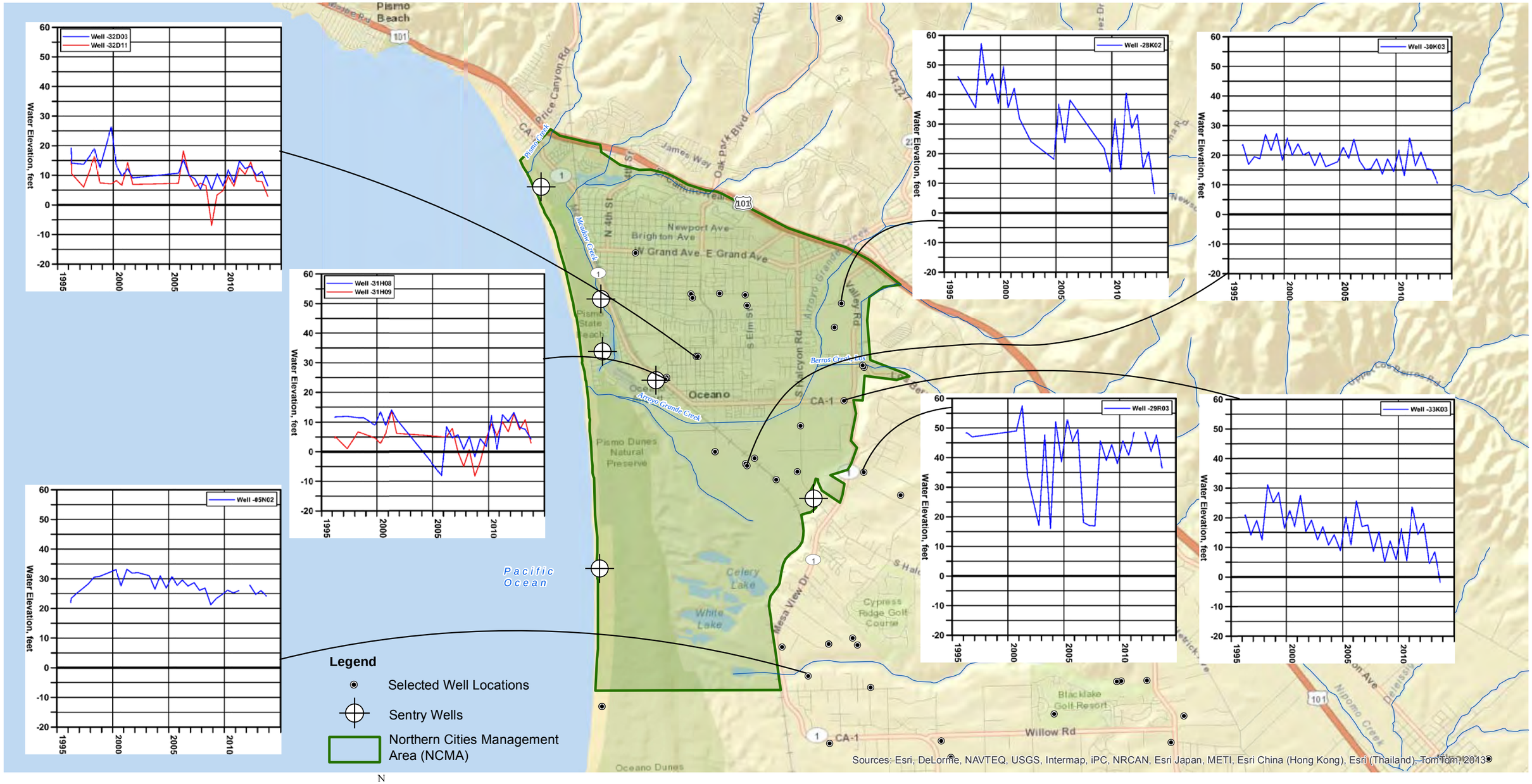
N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangAreaIOutputs\2014_NCMA_2013_Annual_Monitoirng_Report\mxd\Figure 9_2013 April NCMA Contours.mxd, 02/24/14, TNicely



WATER LEVEL CONTOURS, OCTOBER 2013
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 10

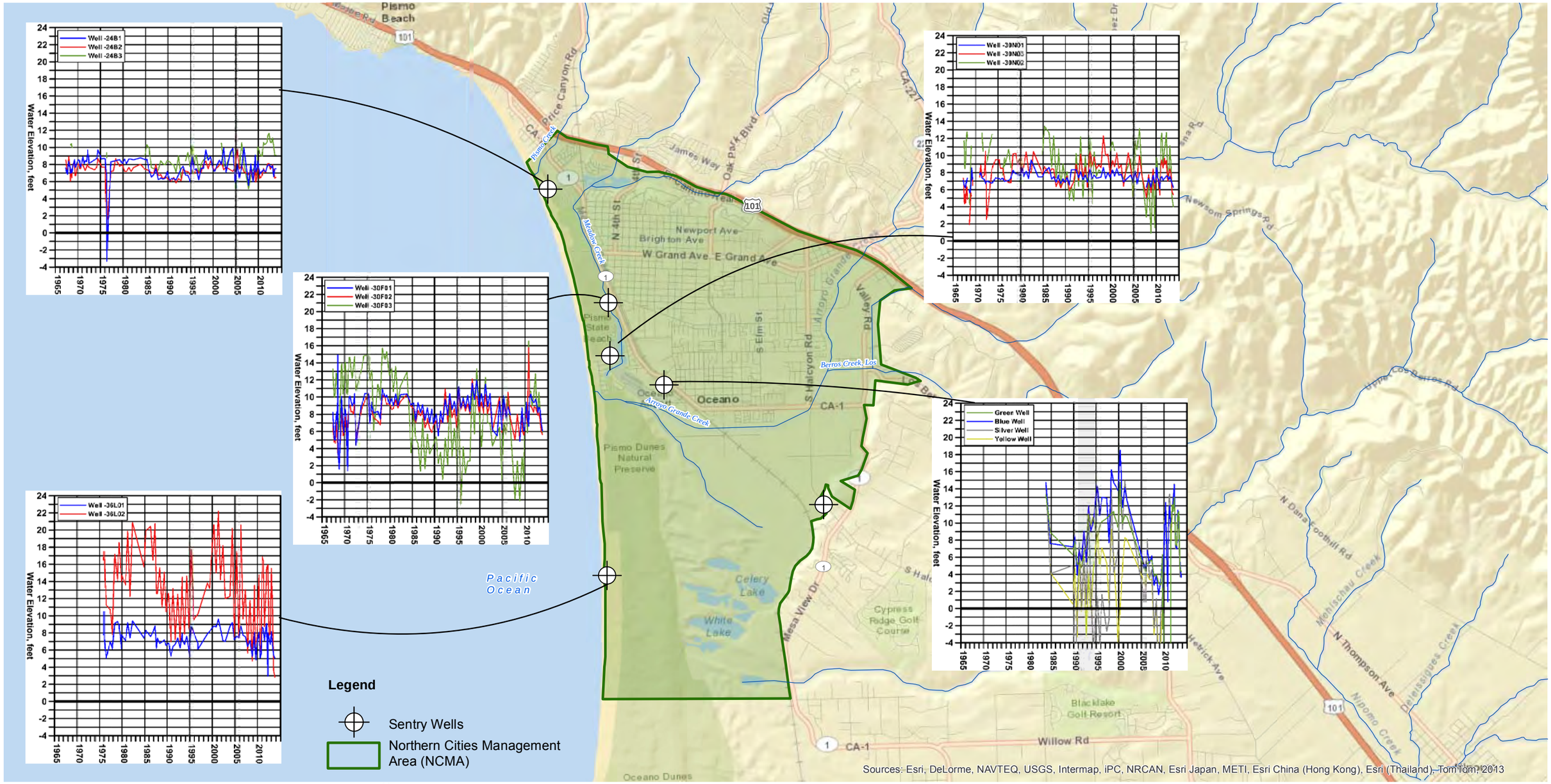
N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangAreaUpdate\Outputs\2014_NCMA_2013_Annual_Monitoirng_Report\mxd\Figure 9_2013 October NCMA Contours.mxd, 02/24/14, TNicely



SELECTED HYDROGRAPHS
Northern Cities Management Area
San Luis Obispo County, California

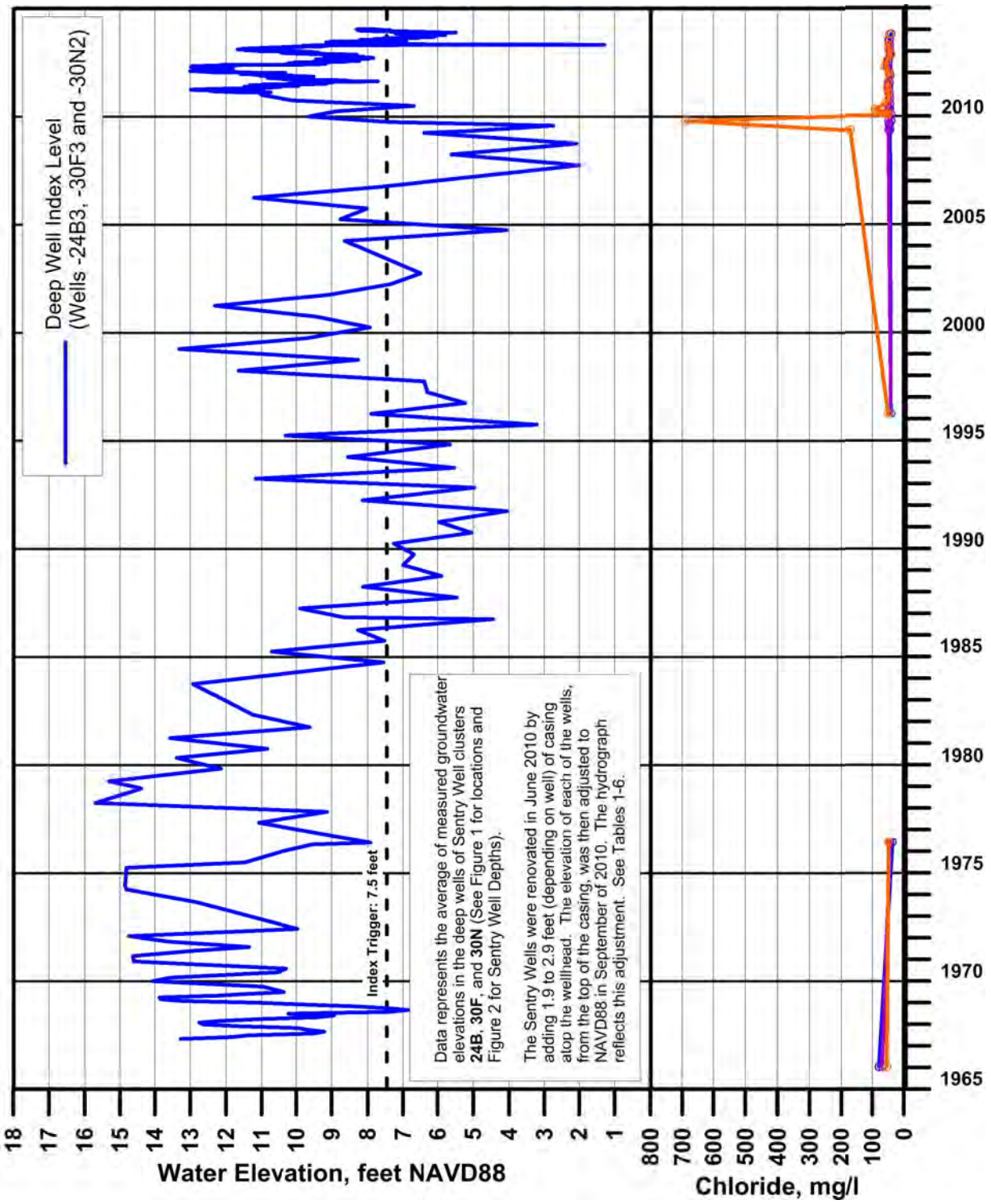
FIGURE 11

\\venwest10\data5\Projects\04_2013\04_6213_0129_NorthernCitiesMangArea\Outputs\2014_NCMA_2013_Annual_Monitoimg_Report\mxd\[Figure 11 Selected Hydrographs.mxd, 2/24/2014, evonthury



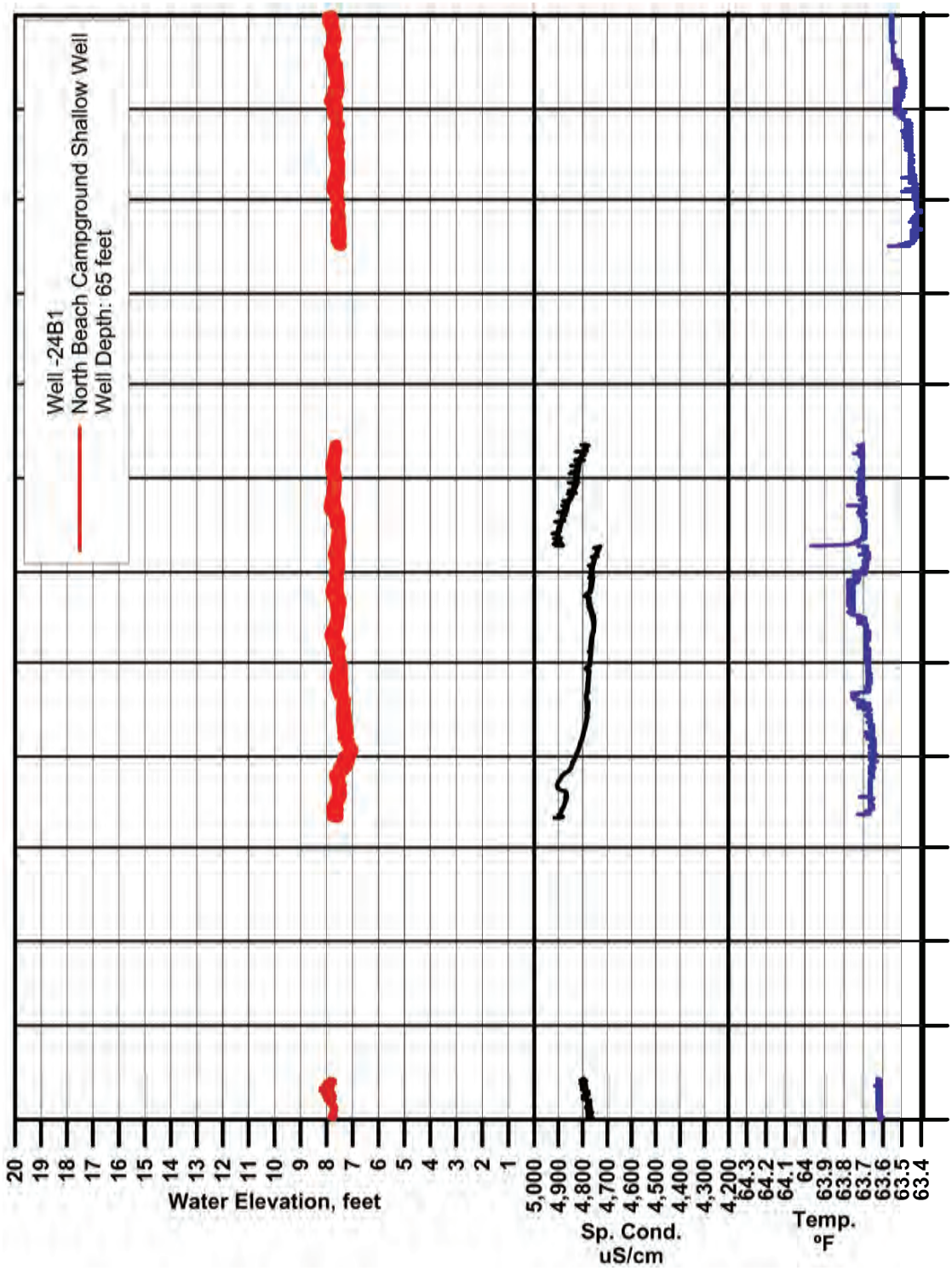
SENTRY WELL HYDROGRAPHS
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 12



HYDROGRAPH OF AVERAGE DEEP SENTRY WELL ELEVATIONS
Northern Cities Management Area
San Luis Obispo County, California

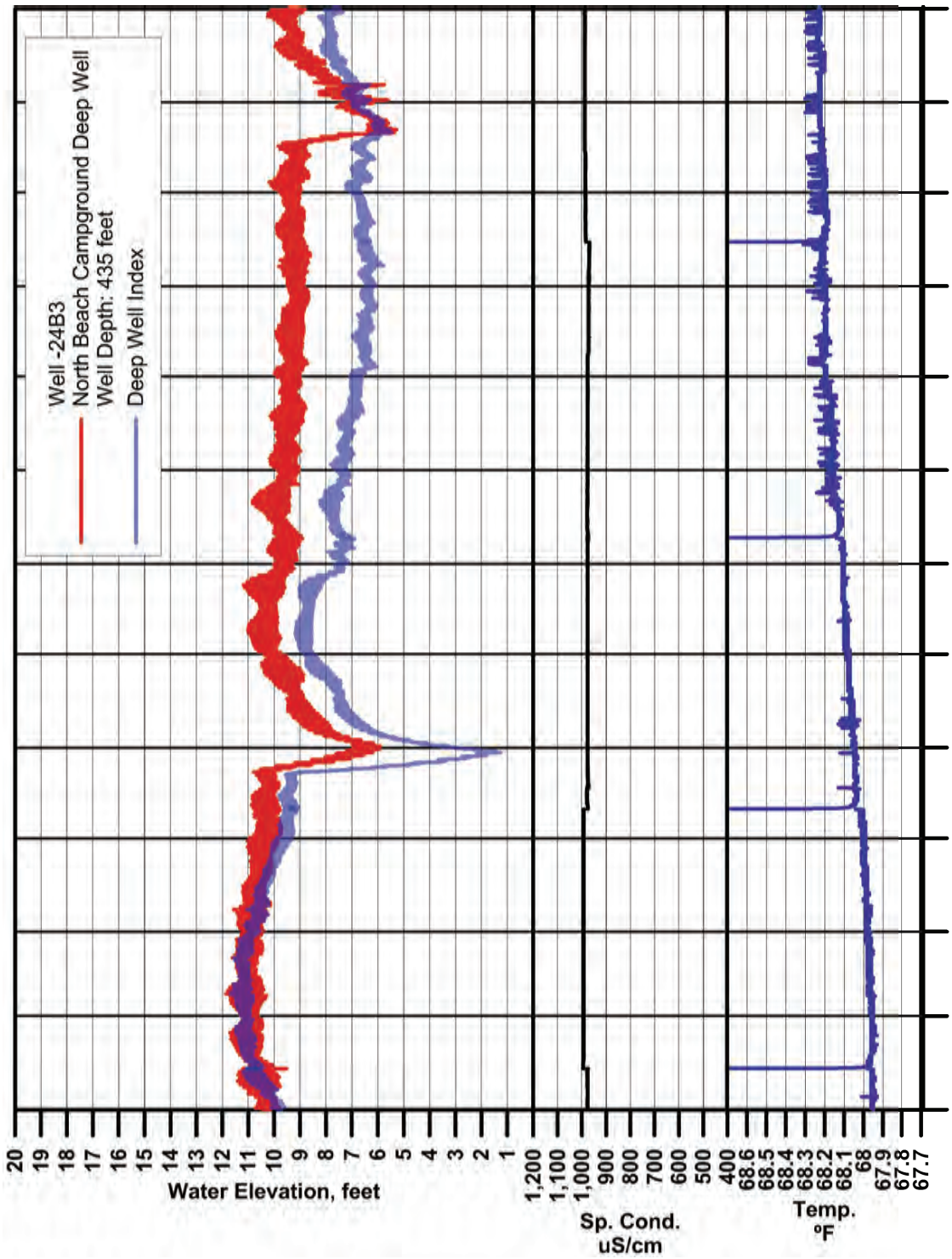
FIGURE 13



WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 24B01

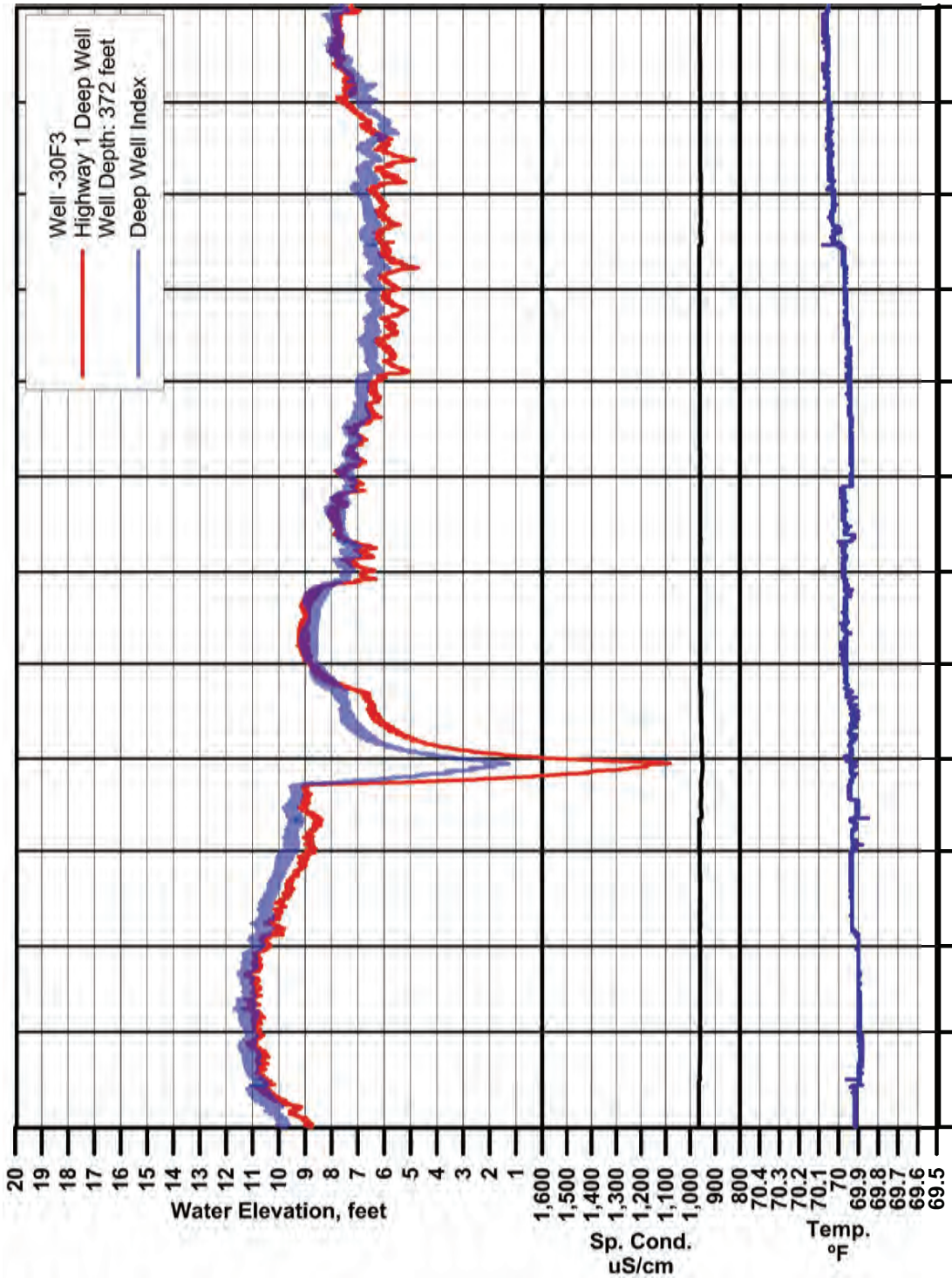
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 14



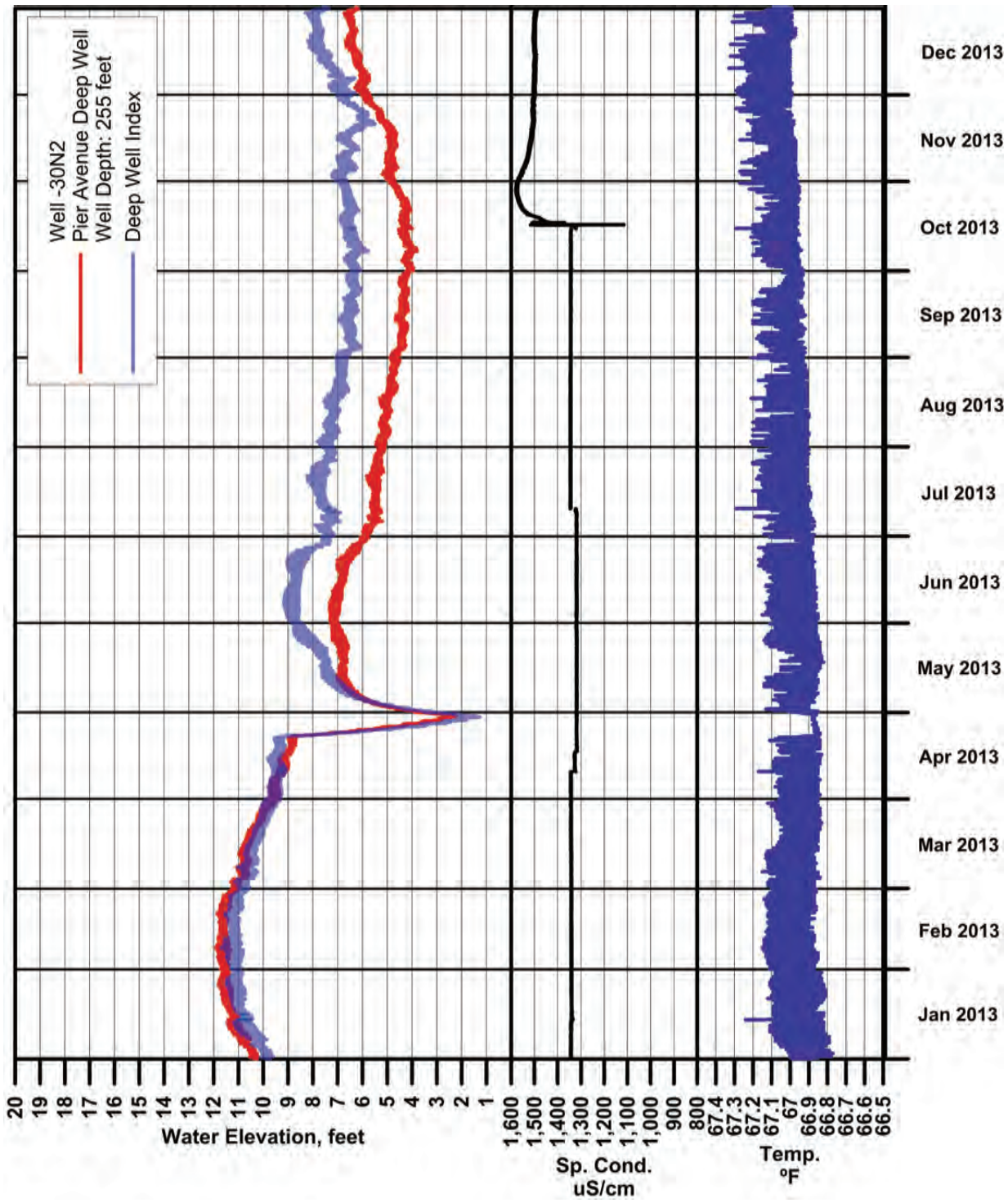
WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 24B03
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 15



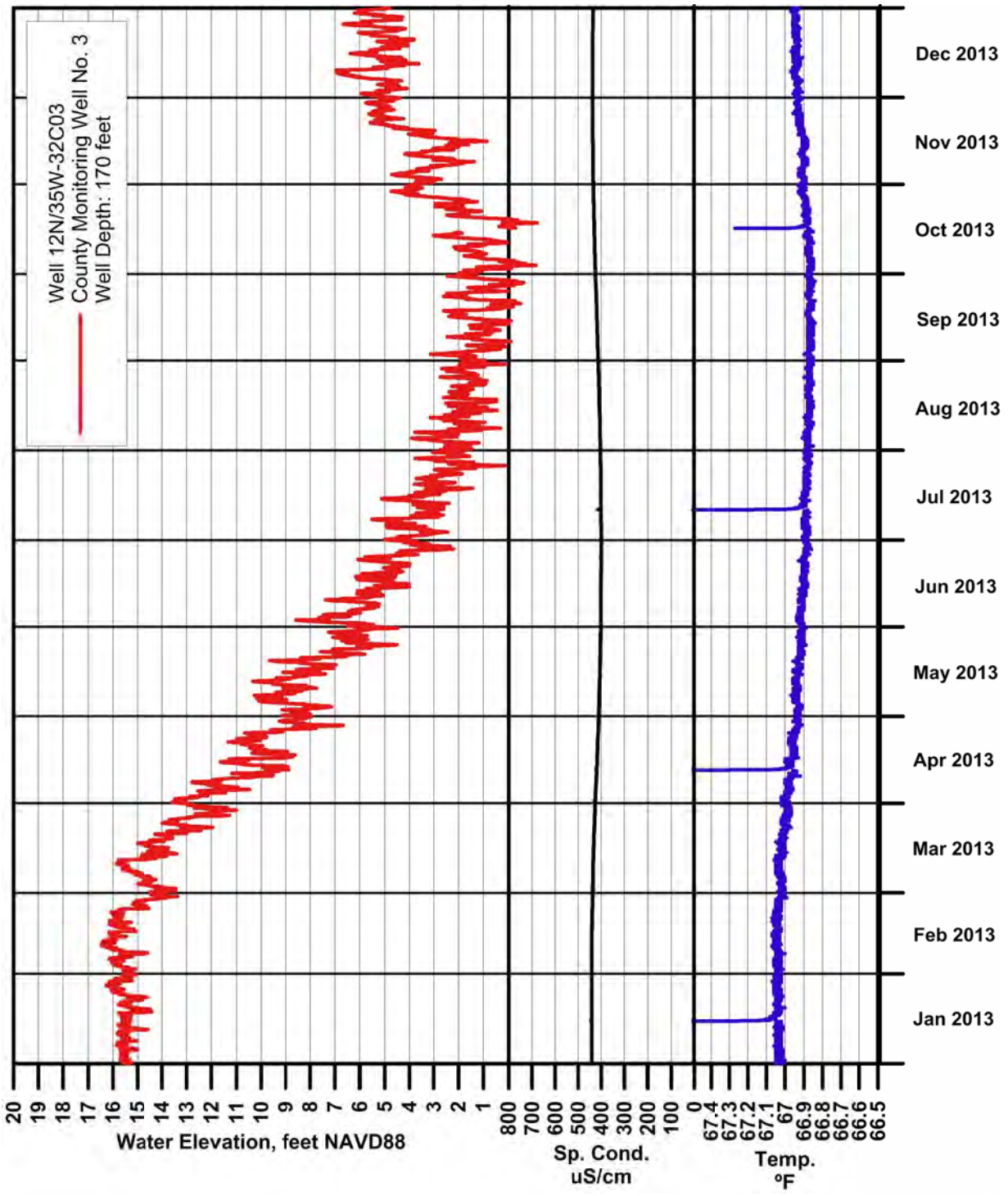
WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 30F03
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 16



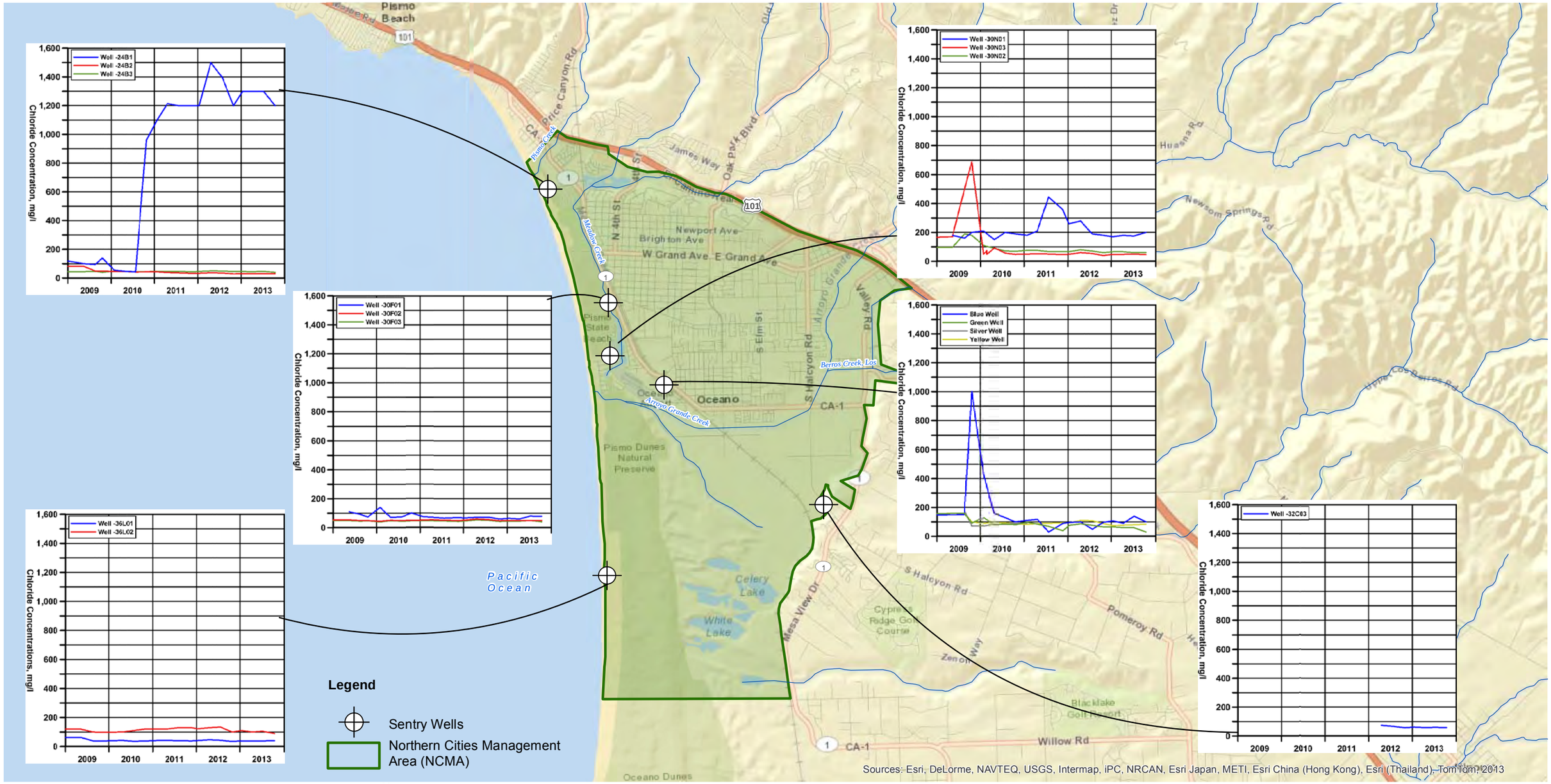
WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 30N02
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 17



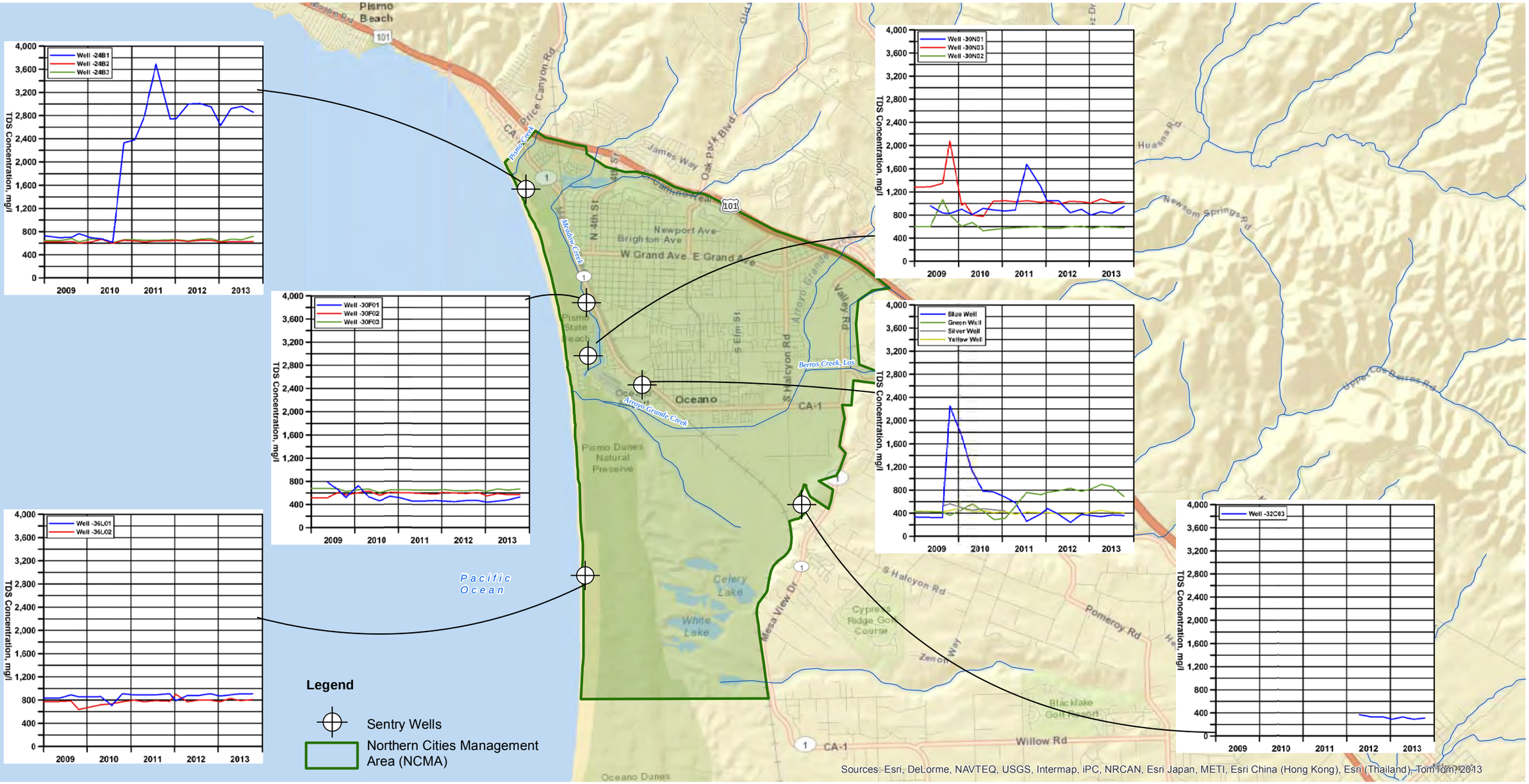
WATER ELEVATION, CONDUCTIVITY, AND TEMPERATURE, WELL 32C03
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 18



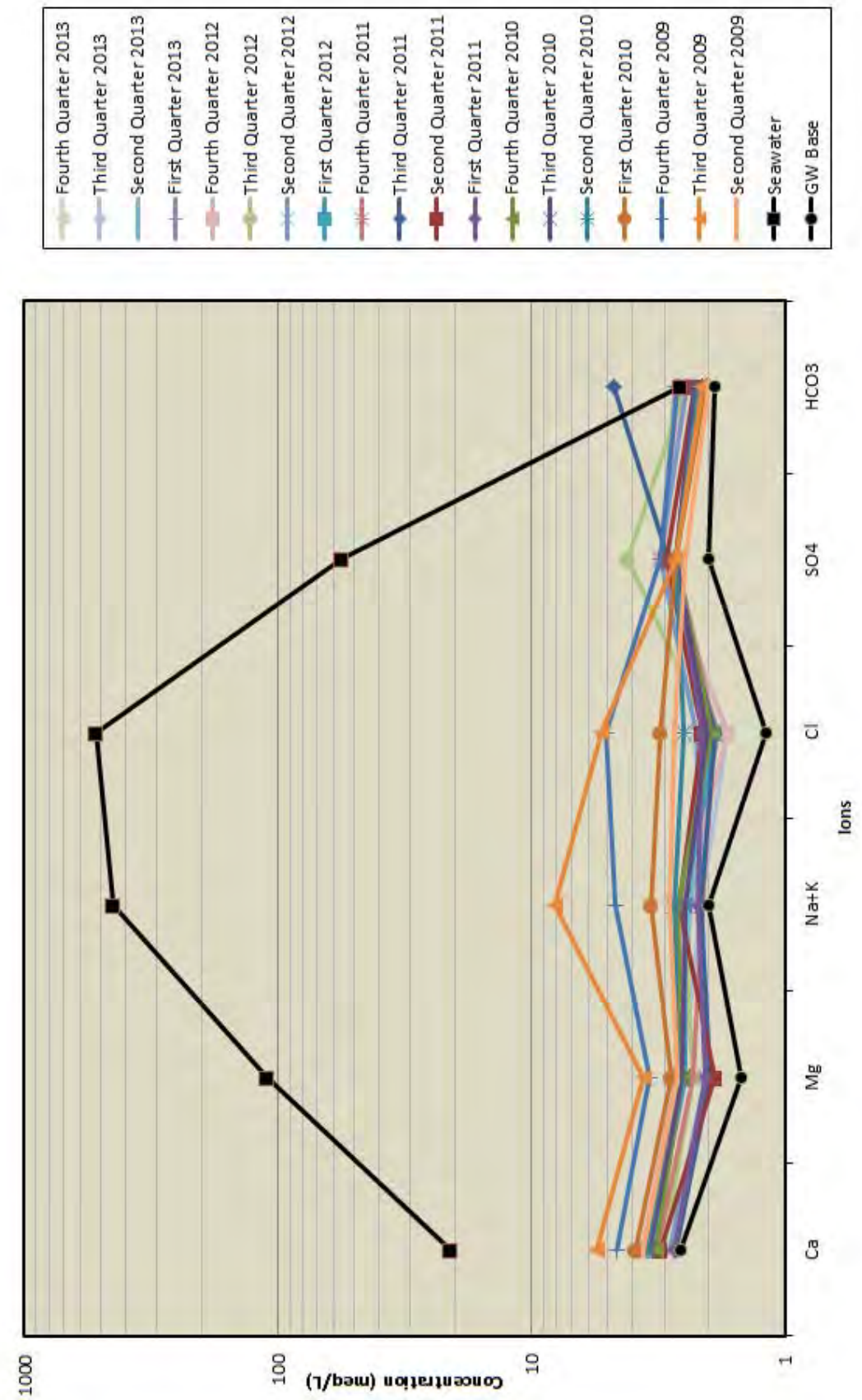
CHLORIDE CONCENTRATIONS IN SENTRY WELL
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 19



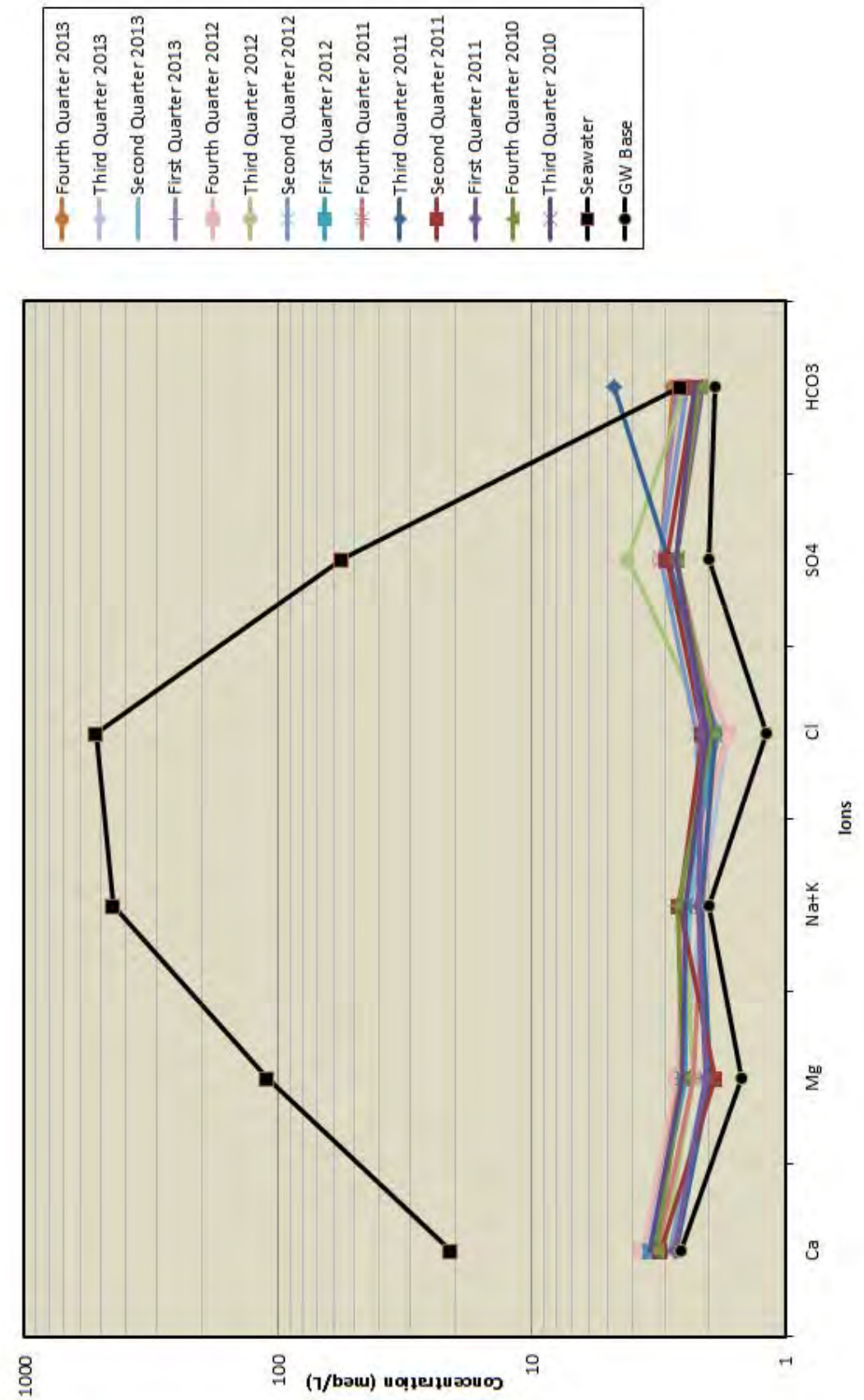
TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN SENTRY WELL
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 20



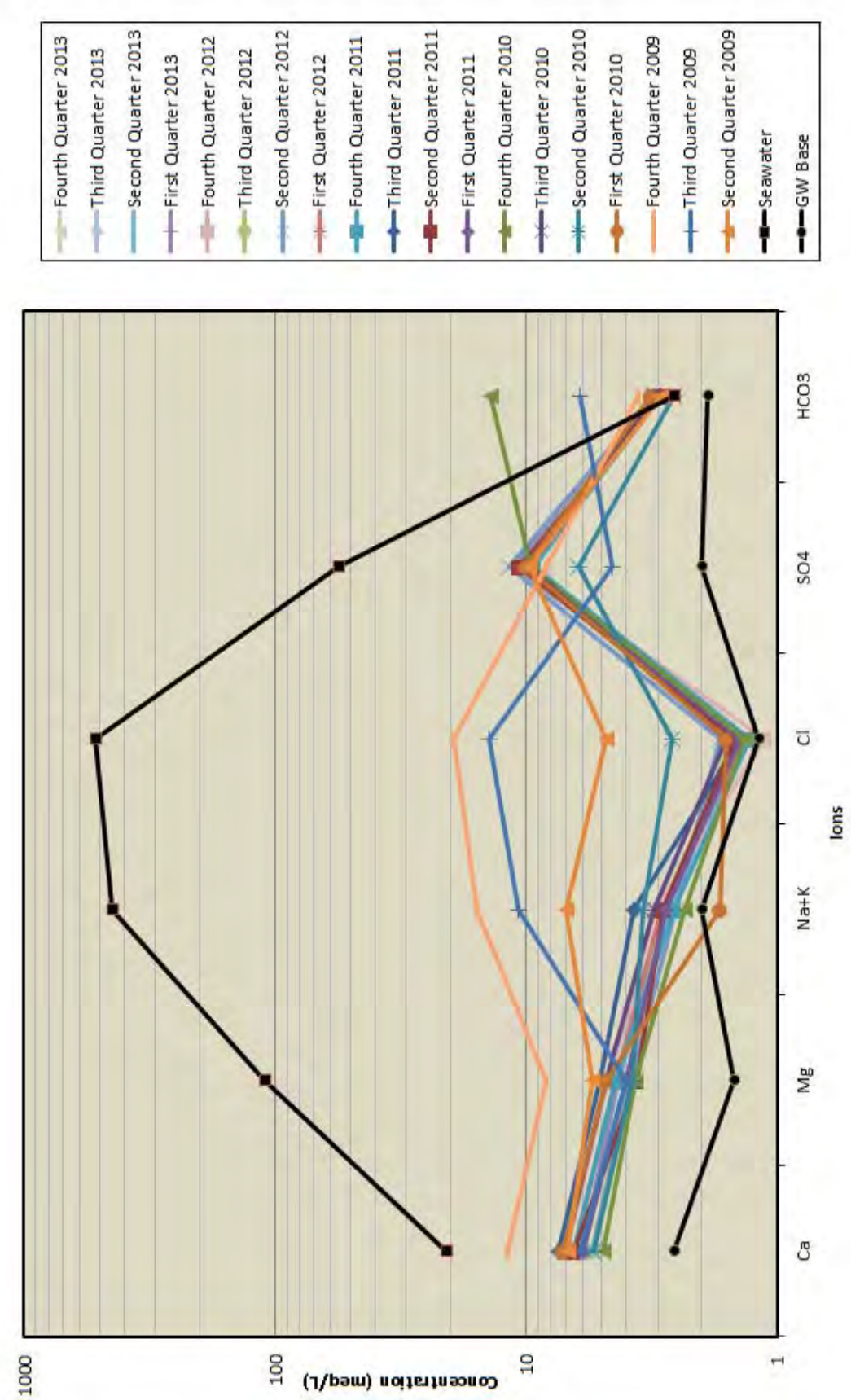
SCHOELLER DIAGRAM SENTRY WELL 30N03 (MAY 2009 – OCTOBER 2013)
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 21



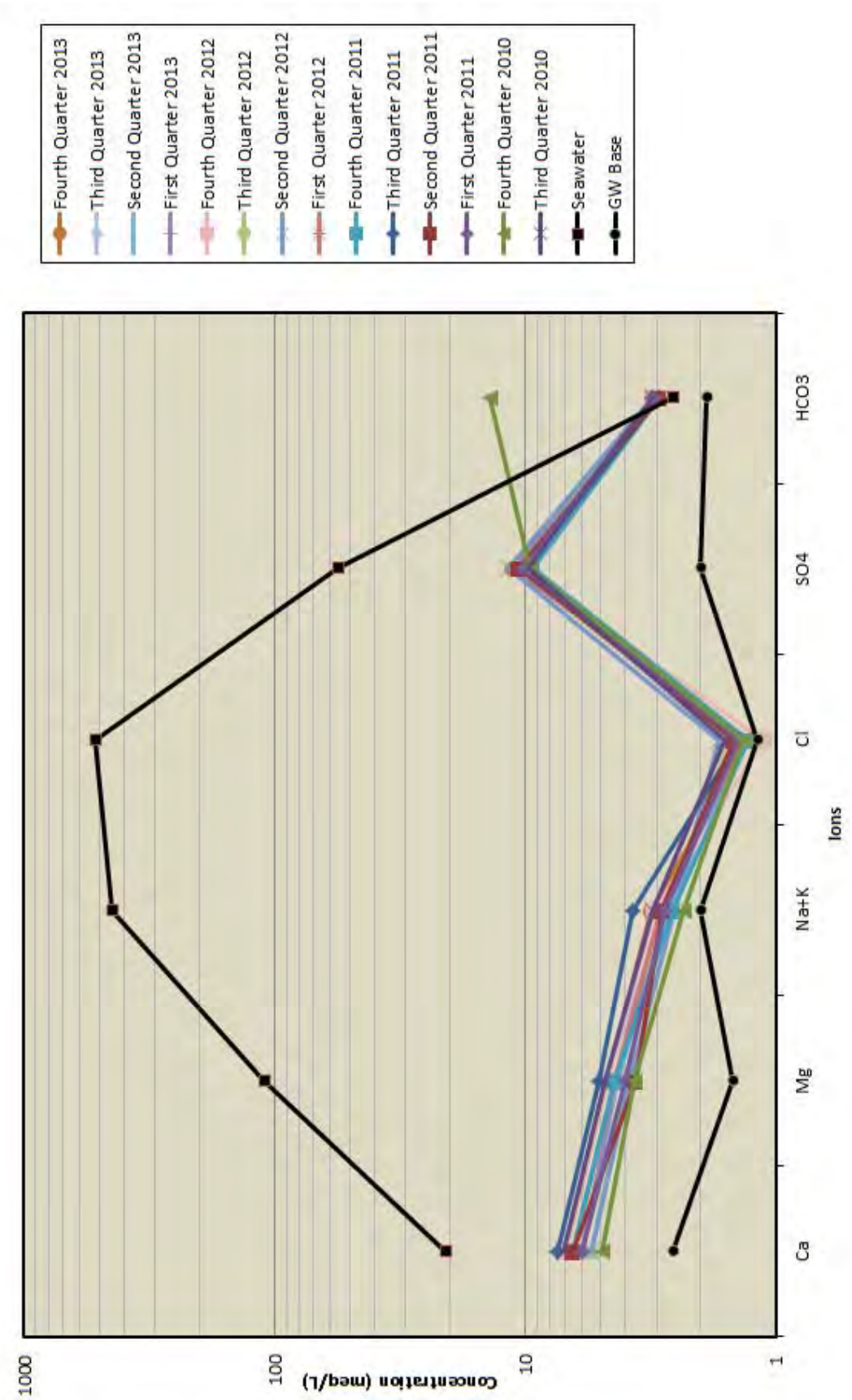
SCHOELLER DIAGRAM SENTRY WELL 30N03 (OCTOBER 2010 – OCTOBER 2013)
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 22



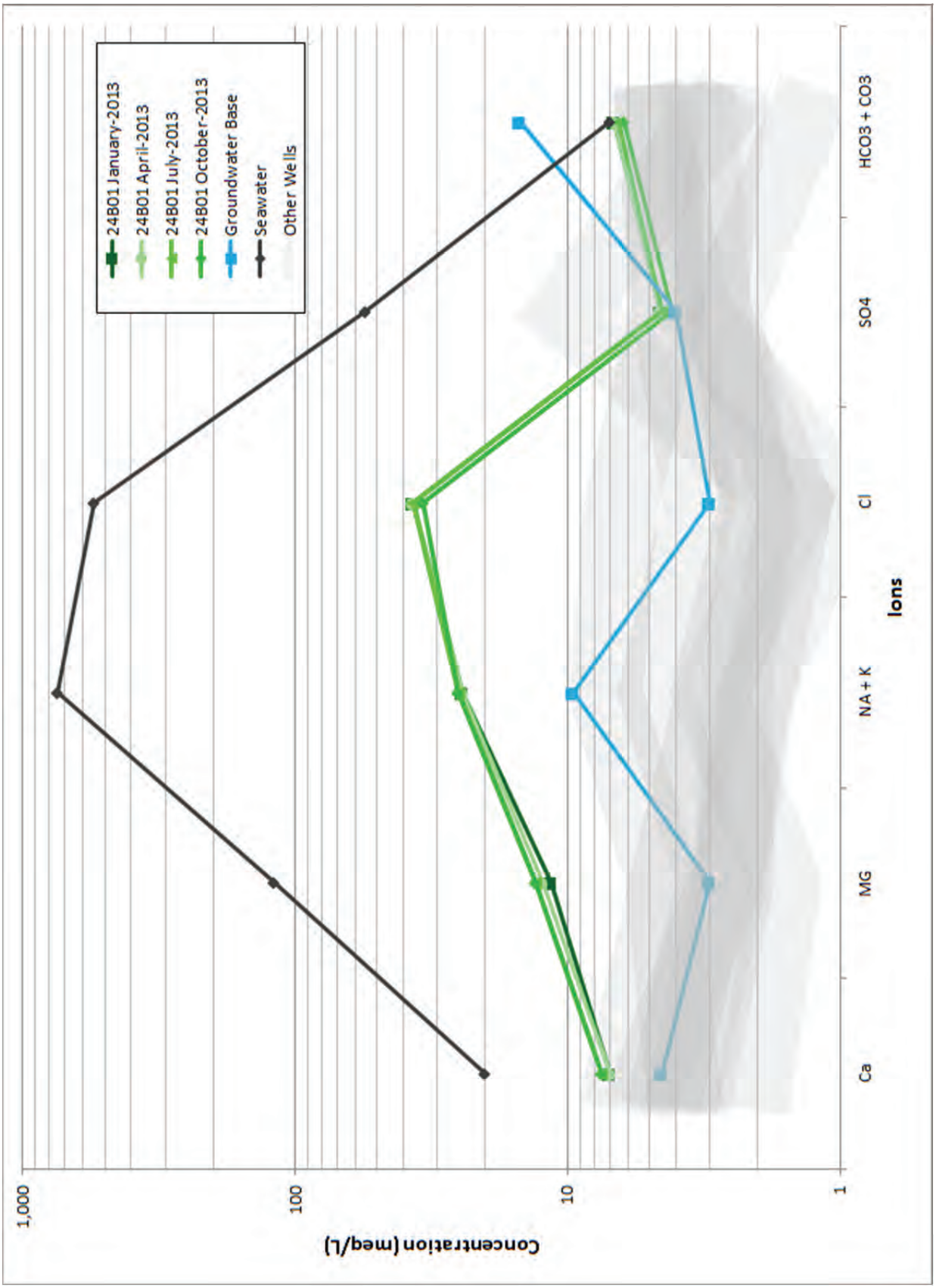
SCHOELLER DIAGRAM SENTRY WELL 30N02 (MAY 2009 – OCTOBER 2013)
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 23



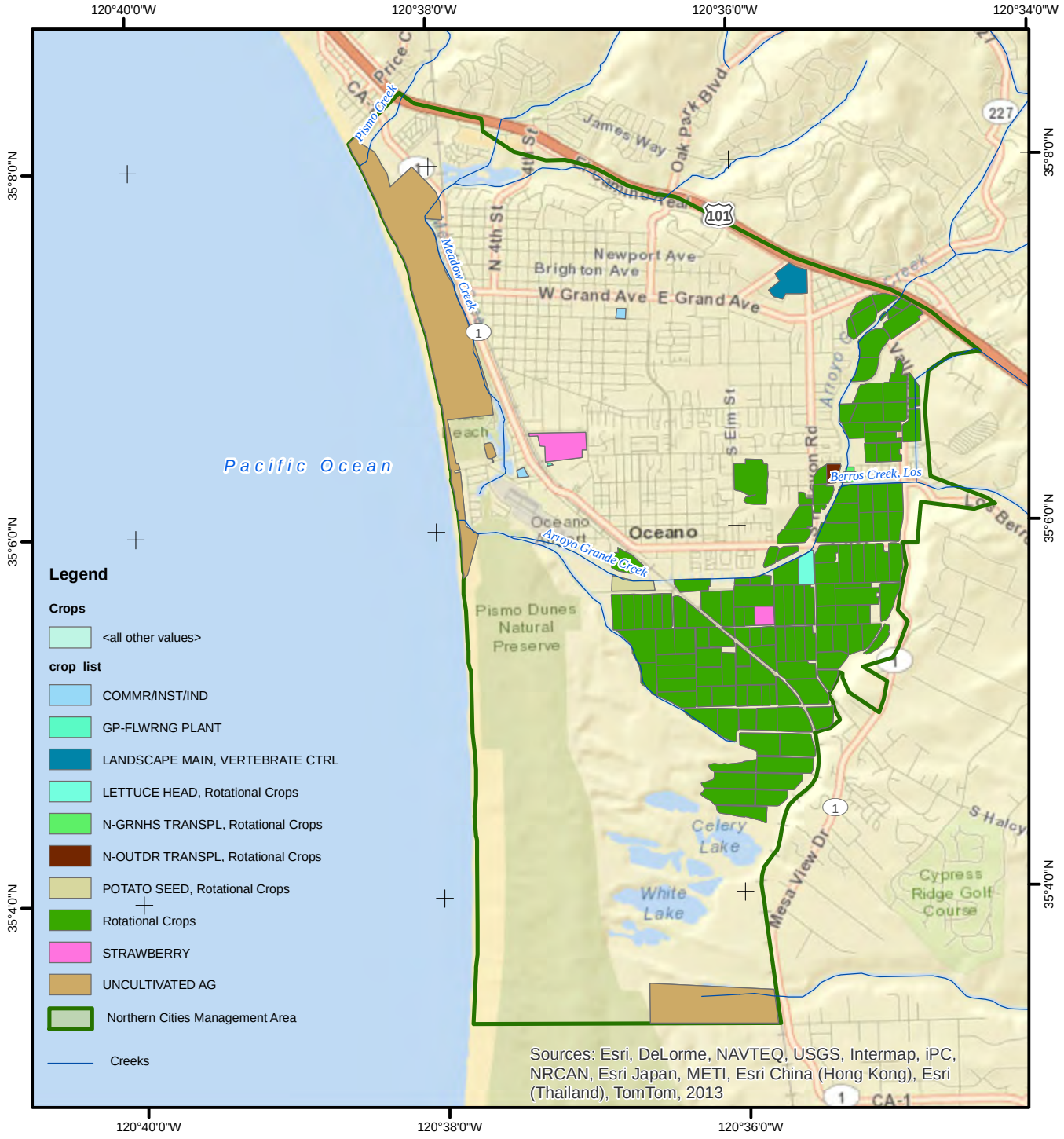
SCHOELLER DIAGRAM SENTRY WELL 30N02 (OCTOBER 2010 – OCTOBER 2013)
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 24



SCHOELLER DIAGRAM FOR SENTRY WELL 24B01
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 25



NCMA AGRICULTURAL LAND 2013
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 26

N:\Projects\04_2013\04_6213_0129_NorthernCitiesMangAreaUtputs\2014_NCMA_2013_Annual_Monitoirng_Report\mxd\Figure 21 NCMA Agricultural Land 2013.mxd, 02/04/14, tnicely

APPENDIX A

A-1. NCMA Sentry Well Water Level and Water Quality Data
Well 24B01, North Beach Campground, Shallow

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/12E-24B01	Screened from 48-65' - 2-inch diameter	**13.58**										
Height of steel casing added to the concrete pad elevation		2.88	1/15/2014	NA	NA	2,870	1300	540	30	140	160	380
Pad elevation NAVD 88		10.70	1/14/2014	5.75	7.83	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		10.7	10/15/2013	NA	NA	2,860	1200	560	31	150	160	380
			10/14/2013	6.07	7.51	NA	NA	NA	NA	NA	NA	NA
			7/9/2013	6.09	7.49	2,960	1300	560	32	150	160	395
			4/10/2013	7.00	6.58	2,920	1300	540	30	140	150	410
			1/14/2013	5.72	7.86	2,630	1300	540	30	140	140	410
			10/29/2012	5.92	7.66	2,950	1200	590	34	150	160	360
			7/23/2012	5.79	7.79	3,010	1400	530	30	120	130	397
			4/18/2012	5.58	8.00	3,000	1500	450	27	120	120	400
			1/11/2012	5.72	7.86	2,750	1200	520	30	140	140	400
			11/21/2011	5.80	7.78	2,740	1200	410	25	130	120	380
			7/26/2011	6.38	7.20	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	3,690	1199.9	530	33	140	150	380
			4/20/2011	6.40	7.18	2,810	1214	500	27	140	130	400
			1/24/2011	5.78	7.42	2,380	1100	370	24	110	120	380
			10/28/2010	NA	NA	2,330	960	390	25	140	140	350
			10/21/2010	6.37	7.21	NA	NA	NA	NA	NA	NA	NA
			7/27/2010	6.48	7.1	616	43	52.5	6.21	115	44.7	341
			4/27/2010	3.84	6.86	676	47	54.7	4.60	107	43.6	327
			1/27/2010	3.13	7.57	694	55	56.2	6.80	123	43.2	340
			10/19/2009	2.28	8.42	766	140	121	16.7	111	52.4	303
			8/20/2009	3.25	7.45	705	94	86.8	11.7	116	35.6	286
			5/12/2009	3.58	7.12	695	100	82.1	13.2	108	45	288
			3/26/1996	NA	NA	1,870	773	380	24.0	125	95	427
			6/9/1976	NA	NA	1,706	667	400	16.2	94	95	474
			1/17/1966	NA	NA	1,700	652	406	20.0	95	83	440

A-1 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 24B01, North Beach Campground, Shallow

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	214	<0.25	2.4	0.17	<0.5	<0.01	1.0	3.0	380	<10	<10	4,800	0.71	0.0023	433
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	200	<0.25	2.2	0.13	<0.5	<0.01	1.0	3.0	380	<10	<10	4,810	0.75	0.0025	400
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/9/2013	215	<0.25	2.4	0.16	<0.5	<0.01	1.1	2.0	395	<10	<10	4,850	0.81	0.0015	650
4/10/2013	220	<0.25	1.9	0.16	<0.1	<0.01	1.00	3.5	410	<10	<10	4,830	0.67	0.0027	371
1/14/2013	220	<0.05	2.7	0.15	<0.1	<0.01	0.96	2.8	410	<10	<10	4,790	0.72	0.0022	464
10/29/2012	200	<0.25	2.4	0.18	<0.5	<0.01	1.1	11	360	<10	<10	4,750	0.78	0.0092	109
7/23/2012	210	<0.05	2.1	0.15	<0.1	0.041	0.86	3	397	<10	<10	4,720	1.4	0.0021	467
4/18/2012	230	<0.1	2	0.13	0.13	<0.01	0.89	3.12	400	<10	<10	4,660	0.6	0.0021	481
1/11/2012	170	<0.1	4	0.18	0.1	0.033	0.94	3.2	400	<10	<10	4,560	0.55	0.0027	375
11/21/2011	200	<0.3	2.3	0.13	<0.6	0.053	0.9	2.73	380	<10	<10	4,470	0.7	0.0023	440
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	200.2	<0.05	1.8	0.14	<0.1	0.053	0.91	3.281	380	<5	<5	4,900	0.73	0.0027	366
4/20/2011	216	<0.05	1.7	0.24	0.18	0.067	0.95	3.3	400	<2.0	<2.0	4,430	NA	0.0027	368
1/24/2011	180	<0.15	1.8	0.16	<0.3	0.63	0.68	2.8	380	<2.0	<2.0	4,020	0.89	0.0025	393
10/28/2010	160	<0.1	3.9	0.15	<0.1	NA	0.75	2.6	350	<10	<10	3,860	1.3	0.0027	369
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/27/2010	160	< 0.10	2.9	0.063	< 0.10	0.11	0.274	0.18	341	< 1.0	< 1.0	1,000	9.34	0.0042	239
4/27/2010	140	< 0.10	0.98	0.0714	< 0.10	< 0.10	0.0458	0.18	327	< 1.0	< 1.0	990	4.06	0.0038	261
1/27/2010	150	0.40	1.7	0.12	< 0.10	0.33	0.875	0.19	340	< 1.0	< 1.0	1,000	16.6	0.0035	289
10/19/2009	150	0.25	2.8	0.0959	0.11	< 0.10	0.208	0.47	303	< 1.0	< 1.0	1,200	7.79	0.0034	298
8/20/2009	150	0.21	2.7	NA	< 0.10	0.12	0.248	0.38	286	< 1.0	< 1.0	1,000	7.15	0.0040	247
5/12/2009	150	NA	NA	NA	0.11	NA	0.66	0.29	288	< 1.0	< 1.0	1,100	23.9	0.0029	345
3/26/1996	154	0.2	NA	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/9/1976	159	0.4	NA	0.12	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/17/1966	175	1	NA	0.07	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-2. NCMA Sentry Well Water Level and Water Quality Data
Well 24B02, North Beach Campground, Intermediate

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/12E-24B02	Screened from 120-145' - 2-inch diameter	**13.58**										
Height of steel casing added to the concrete pad elevation		2.88	1/15/2014	NA	NA	630	33	46	3.9	100	34	290
Pad elevation NAVD 88		10.70	1/14/2014	6.34	7.24	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		10.7	10/15/2013	NA	NA	630	30	44	3.8	98	32	290
			10/14/2013	7.08	6.50	NA	NA	NA	NA	NA	NA	NA
			7/9/2013	7.17	6.41	630	30	43	3.9	110	33	295
			4/10/2013	6.33	7.25	630	31	44	4	100	32	310
			1/14/2013	5.61	7.97	620	30	43	4	97	31	305
			10/29/2012	5.88	7.7	650	29	45	4.2	100	32	280
			7/23/2012	6.12	7.46	650	35	45	4.3	87	27	297
			4/18/2012	5.48	8.1	630	37	39	3.7	88	28	310
			1/11/2012	5.47	8.11	650	33	46	4.6	110	32	300
			11/21/2011	5.69	7.89	640	32	39	3.9	93	29	290
			7/26/2011	6.51	7.07	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	640	36	48	4.2	97	31	290
			4/20/2011	6.30	7.28	620	39	46	7.4	90	36	320
			1/24/2011	5.69	7.53	640	43	44	5.9	87	28	270
			10/28/2010	NA	NA	650	43	50	4.5	110	35	270
			10/21/2010	6.79	6.79	NA	NA	NA	NA	NA	NA	NA
			7/27/2010	7.05	6.53	598	42	48.9	4.29	111	40.5	318
			4/27/2010	4.34	6.36	668	46	52.7	4.73	111	43.2	349
			1/27/2010	3.38	7.32	622	45	58.0	5.39	115	32.2	270
			10/19/2009	2.26	8.44	600	49	59.1	5.12	112	30.1	281
			8/20/2009	4.09	6.61	630	49	63.5	5.85	128	30.1	288
			5/12/2009	4.74	5.96	622	82	67.5	6.33	114	34.5	282
			3/26/1996	NA	NA	652	54	46	5	107	24	344
			6/9/1976	NA	NA	565	34	52	4	104	27	337
			1/17/1966	NA	NA	651	62	79	5	101	32	380

A-2 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 24B02, North Beach Campground, Intermediate

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	165	<0.05	<1	<0.05	<0.1	<0.01	0.14	<0.1	290	<10	<10	940	0.37	NA	NA
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	170	<0.05	<1	<0.05	<0.1	<0.01	0.13	<0.1	290	<10	<10	920	0.39	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/9/2013	170	<0.05	<1	0.076	<0.1	<0.01	0.14	<0.1	295	<10	<10	940	0.6	NA	NA
4/10/2013	160	<0.05	<1	0.08	<0.1	<0.01	0.13	<0.1	310	<10	<10	940	0.41	NA	NA
1/14/2013	170	<0.05	<1	0.079	<0.1	<0.01	0.12	<0.1	305	<10	<10	950	0.72	NA	NA
10/29/2012	160	<0.05	<1	0.074	0.14	<0.01	0.13	<0.1	280	<10	<10	950	0.56	NA	NA
7/23/2012	170	<0.05	<1	<0.1	<0.1	<0.01	0.12	<0.1	297	<10	<10	950	0.43	NA	NA
4/18/2012	171	<0.1	<1	<0.1	0.16	<0.01	0.099	<0.2	310	<10	<10	950	0.26	NA	NA
1/11/2012	150	<0.1	1.3	<0.1	0.21	<0.02	0.13	0.03	300	<10	<10	950	1.7	0.0010	971
11/21/2011	150	<0.05	<1	0.064	<0.1	<0.01	0.096	<0.1	290	<10	<10	930	0.32	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	165.3	<0.05	<1	<0.1	<0.1	<0.01	0.096	<0.1	290	<5	<5	950	0.88	NA	NA
4/20/2011	174	<0.05	<1	0.17	0.14	0.014	<0.005	<0.1	320	<2.0	<2.0	950	NA	NA	NA
1/24/2011	170	<0.05	<1.0	0.11	<0.1	0.14	0.085	<0.1	270	<2.0	<2.0	940	1.3	NA	NA
10/28/2010	160	<0.1	<1.0	0.12	<0.1	NA	0.085	<0.3	270	<10	<10	970	0.63	NA	NA
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/27/2010	160	< 0.10	1.3	0.0609	< 0.10	0.11	0.106	0.15	318	< 1.0	< 1.0	980	2.84	0.0036	280
4/27/2010	150	< 0.10	1.3	0.0666	< 0.10	0.14	0.101	0.16	349	< 1.0	< 1.0	980	6.66	0.0035	288
1/27/2010	160	0.18	0.84	0.117	< 0.10	0.14	0.209	0.16	270	< 1.0	< 1.0	920	3.49	0.0036	281
10/19/2009	160	< 0.10	0.98	0.0776	0.14	< 0.10	0.163	0.19	281	< 1.0	< 1.0	870	1.14	0.0039	258
8/20/2009	150	< 0.10	0.98	NA	< 0.10	< 0.10	0.203	0.20	288	< 1.0	< 1.0	920	3.22	0.0041	245
5/12/2009	150	NA	NA	NA	0.11	NA	0.252	0.24	282	< 1.0	< 1.0	990	6.76	0.0029	342
3/26/1996	169	0.2	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/9/1976	153	0.6	NA	0.02	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/17/1966	147	0	NA	0.05	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-3. NCMA Sentry Well Water Level and Water Quality Data
Well 24B03, North Beach Campground, Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/12E-24B03	Screened from 270-435' - 2-inch diameter	**13.58**										
Height of steel casing added to the concrete pad elevation		2.88	1/15/2014	NA	NA	660	45	52	4.0	100	41	320
Pad elevation NAVD 88		10.70	1/14/2014	3.81	9.77	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		10.7	10/15/2013	NA	NA	720	40	51	4.0	100	40	310
			10/14/2013	4.50	9.08	NA	NA	NA	NA	NA	NA	NA
			7/9/2013	4.48	9.1	660	46	47	3.9	110	41	310
			4/10/2013	3.41	10.17	670	44	46	3.8	96	38	320
			1/14/2013	2.48	11.1	630	45	47	3.9	96	37	320
			10/29/2012	3.01	10.57	680	45	49	4.1	100	39	305
			7/23/2012	2.98	10.6	670	49	47	4.1	86	35	318
			4/18/2012	1.93	11.65	640	50	40	3.4	84	33	320
			1/12/2012	2.15	11.43	660	46	48	3.2	92	36	300
			11/21/2011	2.93	10.65	660	43	41	3.7	91	34	310
			7/26/2011	3.17	10.41	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	650	46.3	50	6.0	98	38	310
			4/20/2011	3.25	10.33	650	47	48	4.6	95	31	310
			1/24/2011	2.65	10.58	660	46	44	5.6	87	33	320
			10/28/2010	NA	NA	660	44	48	3.8	110	39	315
			10/21/2010	4.60	8.98	NA	NA	NA	NA	NA	NA	NA
			7/27/2010	4.54	9.04	610	44	51.4	8.34	112	41.6	328
			4/27/2010	1.43	9.27	666	45	53.2	4.84	118	44	357
			1/27/2010	0.94	9.76	672	48	56.4	5.40	119	43.4	336
			10/19/2009	0.81	9.89	622	40	55.1	3.93	110	42.6	342
			8/19/2009	4.18	6.52	680	47	54.9	5.21	128	43.4	337
			5/12/2009	3.18	7.52	645	44	53.2	4.53	108	41.8	332
			3/26/1996	NA	NA	646	41	52	4.3	104	42	412
			6/9/1976	NA	NA	569	36	53	3.7	85	39	330
			1/17/1966	NA	NA	670	79	74	5	103	36	345

A-3 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 24B03, North Beach Campground, Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	165	<0.05	<1	<0.05	<0.1	<0.01	0.0090	<0.1	320	<10	<10	1,010	0.17	NA	NA
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	170	<0.05	<1	<0.05	<0.1	<0.01	0.0090	<0.1	310	<10	<10	1,010	0.2	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/9/2013	170	<0.05	<1	0.066	<0.1	<0.01	0.0100	<0.1	310	<10	<10	1,010	0.27	NA	NA
4/10/2013	160	<0.05	<1	0.071	<0.1	<0.01	0.0080	<0.1	320	<10	<10	1,010	0.19	NA	NA
1/14/2013	170	<0.05	<1	0.065	<0.1	<0.01	0.0080	<0.1	320	<10	<10	1,010	0.26	NA	NA
10/29/2012	158	<0.05	<1	0.069	0.1	<0.01	0.0090	<0.1	305	<10	<10	1,010	0.22	NA	NA
7/23/2012	170	<0.05	<1	<0.1	<0.1	<0.01	0.0150	<0.1	318	<10	<10	1,010	0.24	NA	NA
4/18/2012	160	<0.1	<1	<0.1	<0.2	<0.01	0.0070	<0.2	320	<10	<10	1,010	0.23	NA	NA
1/12/2012	150	<0.1	<1	<0.1	0.35	<0.02	0.0080	<0.2	300	<10	<10	1,000	0.15	NA	NA
11/21/2011	150	<0.05	1.6	0.046	<0.1	0.014	0.0090	<0.1	310	<10	<10	970	0.12	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	159.6	<0.05	<1	<0.1	<0.1	0.011	0.0100	<0.1	310	<5	<5	1,010	0.21	NA	NA
4/20/2011	168	<0.05	<1	0.11	0.08	0.015	0.0080	<0.1	310	<2.0	<2.0	1,020	NA	NA	NA
1/24/2011	160	<0.05	<1.0	NA	<0.1	0.15	0.0096	<0.1	320	<2.0	<2.0	1,020	0.22	NA	NA
10/28/2010	50	<0.1	<1.0	0.089	<0.1	NA	0.0120	<0.3	315	<10	<10	1,020	0.55	NA	NA
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/27/2010	160	< 0.10	1.8	0.0533	< 0.10	0.17	0.0602	0.16	328	< 1.0	< 1.0	1,000	6.7	0.0036	275
4/27/2010	150	< 0.10	1.5	0.0636	< 0.10	0.1	0.0519	0.17	357	< 1.0	< 1.0	980	9.71	0.0038	265
1/27/2010	150	< 0.10	1.4	0.101	< 0.10	0.15	0.140	0.15	336	< 1.0	< 1.0	1,000	5.18	0.0031	320
10/19/2009	160	< 0.10	< 0.50	0.0613	< 0.10	0.13	0.0181	0.14	342	< 1.0	< 1.0	880	0.343	0.0035	286
8/19/2009	150	< 0.10	2.2	NA	< 0.10	0.66	0.182	0.15	337	< 1.0	< 1.0	1,000	14.3	0.0032	313
5/12/2009	140	NA	NA	NA	< 0.10	NA	0.124	0.16	332	< 1.0	< 1.0	1,000	5.9	0.0036	275
3/26/1996	164	0.2	NA	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/9/1976	165	0	NA	0.06	0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/17/1966	158	1	NA	0	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-4. NCMA Sentry Well Water Level and Water Quality Data
Well 30F01, Highway 1, Shallow

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30F01	Screened from 15- 30 and 40-55' - 1-inch diameter	**23.16**										
Height of steel casing added to the concrete pad elevation		2.80	1/15/2014	NA	NA	510	80	69	2.3	45	22	94
Pad elevation NAVD 88		20.36	1/14/2014	16.58	6.58	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		20.4	10/15/2013	NA	NA	530	78	73	2.3	47	22	86
			10/14/2013	17.07	6.09	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	480	80	64	2.2	49	22	85
			7/9/2013	16.17	6.99	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	460	60	60	2.20	38	18	78
			4/10/2013	14.58	8.58	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	440	65	64	2.40	40	19	95
			1/14/2013	14.36	8.8	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	14.95	8.21	470	60	66	2.50	43	20	75
			7/24/2012	14.00	9.16	470	73	66	2.70	36	18	86
			4/19/2012	NA	NA	450	72	52	1.90	32	15	81
			4/18/2012	13.42	9.74	NA	NA	NA	NA	NA	NA	NA
			1/10/2012	13.80	9.36	460	67	61	2.00	35	17	81
			11/21/2011	13.78	9.38	NA	NA	NA	NA	NA	NA	NA
			11/17/2011	NA	NA	470	70	82	2.40	40	19	78
			7/26/2011	13.50	9.66	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	460	65.8	68	4.40	37	19	78
			4/20/2011	12.82	10.34	460	71	69	2.60	36	14	87
			1/24/2011	13.33	9.97	510	75	64	4.00	34	18	83
			10/21/2010	16.55	6.61	540	100	73	2.00	43	21	88
			7/26/2010	15.68	7.48	464	74	82.2	2.16	47.9	25.1	88.0
			4/27/2010	11.02	9.38	534	72	77.1	2.59	45.8	23.6	100
			1/28/2010	12.73	7.67	725	140	99.9	2.70	76.4	35.8	214
			10/19/2009	14.33	6.07	522	74	85.6	2.35	52.8	26.3	102
			8/19/2009	14.34	6.06	648	92	98.9	3.84	63.1	31.9	113
			5/12/2009	12.38	8.02	792	110	108	2.89	80.2	39.9	136

A-4 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30F01, Highway 1, Shallow

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	136	12.6	13.00	<0.1	<0.1	<0.01	<.005	0.19	94	<10	<10	810	<0.05	0.0024	421
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	140	12	<1	0.072	<0.1	<0.01	<.005	0.17	86	<10	<10	830	<0.05	0.0022	459
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	140	12.2	<1	0.089	<0.1	<0.01	<0.005	<0.1	85	<10	<10	770	<0.05	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	120	12	<1	0.091	<0.1	<0.01	<0.005	0.2	78	<10	<10	710	<0.05	0.0033	300
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	130	12	<1	0.090	<0.1	<0.01	<0.005	0.11	95	<10	<10	720	0.05	0.0017	591
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	123	12	<1	0.087	<0.1	<0.01	<0.005	0.13	75	<10	<10	720	<0.05	0.0022	462
7/24/2012	120	13	<1	<0.1	<0.1	<0.01	0.019	0.11	86	<10	<10	720	<0.05	0.0015	664
4/19/2012	130	13	<1	<0.1	<0.2	<0.01	<0.005	<0.2	81	<10	<10	700	<0.1	NA	NA
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/10/2012	120	11	<1	<0.1	0.12	<0.01	<0.005	<0.1	81	<10	<10	720	<0.1	NA	NA
11/21/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/17/2011	120	12	<1	<0.1	<0.1	<0.01	<0.005	0.16	78	<10	<10	720	<0.1	0.0023	438
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	117.4	12.17	<1	0.100	0.101	<0.01	0.014	0.178	78	<5	<5	720	0.11	0.0027	370
4/20/2011	124	12	<1	0.180	0.11	<0.01	<0.005	0.17	87	<2.0	<2.0	730	NA	0.0024	418
1/24/2011	140	11	<1.0	0.170	0.11	<0.10	<0.005	<0.1	83	<2.0	<2.0	780	<0.1	NA	NA
10/21/2010	120	13	<1.0	0.067	<0.1	NA	<0.005	<0.3	88	<10	<10	894	<.1	NA	NA
7/26/2010	120	12	< 0.50	0.098	< 0.10	< 0.10	0.0817	0.37	88.0	< 1.0	< 1.0	710	0.79	0.0050	200
4/27/2010	140	9.8	0.56	0.129	< 0.10	< 0.10	0.112	0.29	100	< 1.0	< 1.0	780	1.02	0.0040	248
1/28/2010	170	1.6	0.84	0.120	< 0.10	< 0.10	0.112	0.56	214	< 1.0	< 1.0	1,200	0.640	0.0040	250
10/19/2009	150	13	0.70	0.136	0.13	< 0.10	0.123	0.32	102	< 1.0	< 1.0	770	1.30	0.0043	231
8/19/2009	190	10	0.56	NA	< 0.10	0.12	1.03	0.32	113	< 1.0	< 1.0	970	4.52	0.0035	288
5/12/2009	280	NA	NA	NA	< 0.10	NA	0.0353	0.39	136	< 1.0	< 1.0	1,200	0.281	0.0035	282

A-5. NCMA Sentry Well Water Level and Water Quality Data
Well 30F02, Highway 1, Intermediate

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30F02	Screened from 75-100' - 2-inch diameter	**23.16**										
Height of steel casing added to the concrete pad elevation		2.80	1/15/2014	NA	NA	580	50	45	2.7	76	31	190
Pad elevation NAVD 88		20.36	1/14/2014	17.01	6.15	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		20.4	10/15/2013	NA	NA	570	50	45	2.7	75	33	190
			10/14/2013	17.52	5.64	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	570	50	38	2.6	78	32	190
			7/9/2013	17.15	6.01	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	590	50	41	2.6	70	30	190
			4/10/2013	15.76	7.4	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	550	50	44	2.9	72	31	200
			1/14/2013	15.01	8.15	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	15.27	7.89	610	48	45	3.0	79	34	188
			7/24/2012	14.82	8.34	590	56	46	3.2	69	30	194
			4/19/2012	NA	NA	600	60	40	2.7	68	30	200
			4/18/2012	14.38	8.78	NA	NA	NA	NA	NA	NA	NA
			1/12/2012	14.31	8.85	610	52	45	3.0	73	32	200
			11/21/2011	14.94	8.22	580	49	38	2.7	73	30	190
			7/26/2011	14.46	8.7	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	590	52.1	46	5.1	73	31	190
			4/20/2011	14.23	8.93	600	54	57	4.2	74	29	200
			1/24/2011	14.36	8.93	600	51	43	4.9	71	31	210
			10/28/2010	NA	NA	610	49	38	2.3	70	30	210
			10/21/2010	7.39	15.77	NA	NA	NA	NA	NA	NA	NA
			7/26/2010	16.21	6.95	560	49	45.8	2.95	85.4	36.8	223
			4/27/2010	12.14	8.26	634	51	50.3	3.12	87.9	38.6	225
			1/28/2010	13.09	7.31	604	44	52.2	4.47	92.1	38.5	230
			10/19/2009	14.36	6.04	566	49	49.5	2.80	88.3	37.6	240
			8/19/2009	14.81	5.59	614	49	51.8	3.19	87.3	36.8	225
			5/12/2009	14.34	2.96	514	54	48.7	3.26	81.1	34.9	206
			3/27/1996	NA	NA	678	49	52	3.8	98	42	305
			6/9/1976	NA	NA	637	48	55	2.8	98	43	343
			1/20/1966	NA	NA	580	68	47	2	94	38	280

A-5 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30F02, Highway 1, Intermediate

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	136	13.1	13.4	<0.1	<0.1	<0.01	0.054	0.4	190	<10	<10	890	<0.05	0.0080	125
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	140	12	<1	0.69	0.19	<0.01	0.099	0.38	190	<10	<10	890	<0.05	0.0076	132
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	180	<0.05	<1	0.08	0.13	<0.01	0.14	<0.1	190	<10	<10	880	<0.05	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	140	14	<1	0.09	0.1	<0.01	0.082	0.43	190	<10	<10	880	<0.05	0.0086	116
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	140	13	<1	0.09	0.1	<0.01	0.011	0.32	200	<10	<10	880	0.12	0.0064	156
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	135	13	<1	0.09	<0.1	<0.01	0.06	0.31	188	<10	<10	890	0.011	0.0065	155
7/24/2012	140	14	<1	<0.1	0.11	<0.01	0.038	0.27	194	<10	<10	880	<0.05	0.0048	207
4/19/2012	140	14	<1	<0.1	<0.2	<0.01	0.19	0.3	200	<10	<10	890	0.11	0.0050	200
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/12/2012	130	12	<1	<0.1	0.25	<0.02	0.29	0.33	200	<10	<10	890	<0.1	0.0063	158
11/21/2011	120	13	<1	0.07	<0.1	<0.01	0.022	0.34	190	<10	<10	870	<0.1	0.0069	144
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	134.3	13.19	<1	<0.1	0.127	<0.1	0.025	0.387	190	<5	<5	900	<0.1	0.0074	135
4/20/2011	141	13	<1	0.18	0.17	<0.01	0.025	0.38	200	<2.0	<2.0	920	NA	0.0070	142
1/24/2011	140	12	<1.0	0.15	0.12	0.27	0.041	0.3	210	<2.0	<2.0	920	<0.1	0.0059	170
10/28/2010	130	11	<1.0	0.10	<0.1	NA	0.0094	<0.3	210	<10	<10	920	<0.1	NA	NA
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/26/2010	130	11	2.5	0.0928	< 0.10	0.13	0.0646	0.59	223	< 1.0	< 1.0	890	< 0.100	0.0120	83
4/27/2010	130	10	0.8	0.112	< 0.10	< 0.10	0.615	0.51	225	< 1.0	< 1.0	880	3.28	0.0100	100
1/28/2010	150	11	1.4	0.127	< 0.10	< 0.10	0.913	0.48	230	< 1.0	< 1.0	920	4.55	0.0109	92
10/19/2009	140	11	1.0	0.0942	0.17	< 0.10	0.924	0.51	240	< 1.0	< 1.0	850	2.15	0.0104	96
8/19/2009	130	11	2.00	NA	0.10	< 0.10	2.24	0.54	225	< 1.0	< 1.0	920	19.4	0.0110	91
5/12/2009	120	NA	NA	NA	0.11	NA	1.87	0.53	206	< 1.0	< 1.0	890	3.23	0.0098	102
3/27/1996	166	49	NA	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/9/1976	172	17.6	NA	0.1	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/20/1966	152	27	NA	0.08	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-6. NCMA Sentry Well Water Level and Water Quality Data
Well 30F03, Highway 1, Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30F03	Screened from 305-372' - 2-inch diameter	**23.16**										
Height of steel casing added to the concrete pad elevation		2.80	1/15/2014	NA	NA	650	45	35	2.5	90	41	300
Pad elevation NAVD 88		20.36	1/14/2014	15.35	7.81	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		20.4	10/15/2013	NA	NA	670	41	40	2.7	100	44	280
			10/14/2013	17.30	5.86	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	650	50	33	2.4	100	43	290
			7/9/2013	16.61	6.55	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	670	45	36	2.7	94	42	300
			4/10/2013	14.69	8.47	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	630	45	36	2.3	92	41	295
			1/14/2013	12.62	10.54	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	14.61	8.55	650	43	40	3.1	100	46	280
			7/24/2012	14.50	8.66	640	51	36	2.7	81	37	296
			4/19/2012	NA	NA	640	54	32	2.3	84	36	290
			4/18/2012	10.43	12.73	NA	NA	NA	NA	NA	NA	NA
			1/12/2012	12.37	10.79	660	46	39	2.1	94	42	280
			11/21/2011	13.24	9.92	650	43	33	2.6	93	39	290
			7/26/2011	14.22	8.94	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	650	46.5	46	5.1	73	31	190
			4/21/2011	NA	NA	650	48	40	3.8	91	34	280
			4/20/2011	12.51	10.65	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	12.67	10.64	650	46	36	4.7	87	38	300
			10/28/2010	NA	NA	650	46	37	2.7	100	43	280
			10/21/2010	6.62	16.54	NA	NA	NA	NA	NA	NA	NA
			7/26/2010	17.32	5.84	608	45	43.8	2.94	107	46.8	294
			4/27/2010	11.38	9.02	668	48	40.8	2.91	101	44.7	304
			1/28/2010	10.98	9.42	656	40	43.1	3.91	112	47.2	310
			10/19/2009	14.18	6.22	626	48	43.3	3.14	108	46.2	308
			8/19/2009	20.23	0.17	672	45	43.1	3.15	111	44.3	290
			5/12/2009	17.68	2.72	678	49	44.8	3.32	109	42.9	276
			3/27/1996	NA	NA	686	41	40	3.4	109	48	379
			6/7/1976	NA	NA	616	43	41	2.6	96	49	333
			1/19/1966	NA	NA	642	69	49	4	109	40	321

A-6 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30F03, Highway 1, Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	173	<0.05	<1	<0.05	0.13	0.01	0.015	0.12	300	<10	<10	990	<0.05	0.0027	375
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	179	<0.05	<1	<0.05	0.14	0.02	0.016	<0.1	280	<10	<10	990	<0.05	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	140	13.5	<1	0.055	<0.1	0.02	0.017	0.23	290	<10	<10	990	<0.05	0.0046	217
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	170	<0.05	<1	0.06	0.13	0.02	0.016	0.12	300	<10	<10	990	<0.05	0.0027	375
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	180	<0.05	<1	0.06	0.11	<0.01	0.015	<0.1	295	<10	<10	980	<0.05	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	170	<0.05	<1	0.06	<0.1	0.03	0.016	<0.1	280	<10	<10	990	0.02	NA	NA
7/24/2012	180	<0.05	<1	<0.1	0.17	<0.01	0.016	0.2	296	<10	<10	990	<0.05	0.0039	255
4/19/2012	180	<0.1	<1	<0.1	<0.2	0.01	0.014	<0.2	290	<10	<10	990	<0.1	NA	NA
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/12/2012	160	<0.1	<1	<0.1	0.2	0.025	0.016	<0.2	280	<10	<10	990	<0.1	NA	NA
11/21/2011	160	<0.05	<1	0.04	0.15	0.028	0.016	<0.1	290	<10	<10	960	<0.1	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	170.5	<0.05	<1	<0.1	0.155	0.02	0.025	<0.1	190	<5	<5	900	<0.1	NA	NA
4/21/2011	179	<0.05	<1	0.1	0.2	0.029	0.015	0.11	280	<2.0	<2.0	1,000	NA	0.0023	436
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	170	<0.05	<1.0	0.11	0.17	0.24	0.016	<0.1	300	<2.0	<2.0	990	<0.1	NA	NA
10/28/2010	160	<0.1	<1.0	0.10	<0.1	NA	0.032	<0.3	280	<10	<10	1,000	0.53	NA	NA
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/26/2010	160	1.3	0.84	0.0479	< 0.10	0.10	0.129	0.24	294	< 1.0	< 1.0	900	7.55	0.0053	188
4/27/2010	160	0.21	0.84	0.0733	0.14	0.11	0.0694	0.23	304	< 1.0	< 1.0	940	2.62	0.0048	209
1/28/2010	180	< 0.20	2.8	0.0833	0.13	< 0.10	0.287	0.21	310	< 1.0	< 1.0	980	4.80	0.0053	190
10/19/2009	170	< 0.10	1.8	0.0646	0.22	< 0.10	0.255	0.17	308	< 1.0	< 1.0	910	2.09	0.0035	282
8/19/2009	170	< 0.10	2.5	NA	0.14	< 0.10	0.468	0.19	290	< 1.0	< 1.0	980	18.5	0.0042	237
5/12/2009	180	NA	NA	NA	0.17	NA	0.146	0.18	276	< 1.0	< 1.0	960	1.16	0.0037	272
3/27/1996	197	0.2	NA	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/7/1976	190	0.4	NA	0.05	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/19/1966	182	1	NA	0.05	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-7. NCMA Sentry Well Water Level and Water Quality Data
Well 30N01, Pier Avenue, Shallow

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30N01	Screened from 15-40' - 1-inch diameter	**16.13**										
Height of steel casing added to the concrete pad elevation		2.60	1/15/2014	NA	NA	790	154	110	26	56	45	260
Pad elevation NAVD 88		13.53	1/14/2014	9.61	6.52	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		13.5	10/15/2013	NA	NA	950	200	140	32	74	60	330
			10/14/2013	9.86	6.27	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	830	175	120	29	71	54	310
			7/9/2013	9.40	6.73	NA	NA	NA	NA	NA	NA	NA
			4/10/2013	8.98	7.15	860	180	120	29	67	54	320
			1/14/2013	8.60	7.53	800	170	120	32	66	53	280
			10/29/2012	8.96	7.17	900	180	120	34	77	60	300
			7/23/2012	8.54	7.59	840	190	120	31	56	45	266
			4/18/2012	8.53	7.60	1,050	280	140	31	59	47	330
			1/9/2012	8.74	7.39	1,050	260	170	34	68	52	307
			11/21/2011	8.78	7.35	NA	NA	NA	NA	NA	NA	NA
			11/17/2011	NA	NA	1,300	360	320	40	90	69	390
			7/26/2011	9.01	7.12	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	1,680	445.3	230	42	99	81	380
			4/20/2011	8.59	7.54	890	210	130	26	68	46	180
			1/24/2011	8.18	7.35	870	180	100	28	84	46	240
			10/21/2010	9.99	6.14	890	190	120	26	58	45	246
			7/27/2010	8.97	7.16	917	200	130	30.0	75.0	56.2	241
			4/27/2010	6.14	7.36	808	150	130	29	136	55.6	286
			1/26/2010	4.90	8.60	902	210	155	33.5	156	66.4	307
			10/20/2009	6.53	7.00	828	200	159	34.3	118	59.8	238
			8/20/2009	6.71	6.82	835	160	150	27.8	121	49.4	235
			5/11/2009	6.03	7.50	960	180	175	33.5	86.7	46.2	274

A-7 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30N01, Pier Avenue, Shallow

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	190	<0.05	<1	0.19	0.41	<0.01	0.077	1.4	260	<10	<10	1,340	2.5	0.0091	110
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	180	<0.05	<1	0.21	0.33	0.01	0.095	1.3	330	<10	<10	1,570	2.8	0.0065	154
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	185	<0.05	<1	0.22	0.32	0.01	0.087	0.84	310	<10	<10	1,430	2.3	0.0048	208
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/10/2013	180	<0.05	1.1	0.21	0.31	0.01	0.087	1.2	320	<10	<10	1,470	2.5	0.0067	150
1/14/2013	200	<0.05	1.1	0.22	0.26	<0.01	0.09	1.2	280	<10	<10	1,380	2.5	0.0071	142
10/29/2012	190	<0.05	<1	0.21	0.40	0.011	0.098	1.2	300	<10	<10	1,500	2.8	0.0067	150
7/23/2012	200	<0.05	<1	0.22	0.43	<0.01	0.096	1.2	266	<10	<10	1,370	2.3	0.0063	158
4/18/2012	210	<0.1	1.4	0.2	0.50	<0.01	0.078	1.3	330	<10	<10	1,680	2.4	0.0046	215
1/9/2012	200	<0.05	2.7	0.21	0.41	<0.01	0.088	1.9	307	<10	<10	1,760	2.9	0.0073	137
11/21/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/17/2011	220	<0.1	<1	0.23	0.38	0.017	0.11	2.5	390	<10	<10	2,210	3.4	0.0069	144
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	255.5	<0.05	1.2	0.21	<0.1	<0.01	0.12	3.016	380	<5	<5	2,480	4.2	0.0068	148
4/20/2011	215	<0.05	<1	0.24	0.39	0.013	0.086	4.57	180	<2.0	<2.0	1,550	NA	0.0218	46
1/24/2011	210	<0.05	<1.0	<0.1	0.34	0.12	0.24	3.63	240	<2.0	<2.0	1,430	18	0.0202	50
10/21/2010	200	<0.1	<1.0	<0.1	0.37	NA	0.078	2.3	246	<10	<10	1,498	<0.1	0.0121	83
7/27/2010	220	< 0.10	< 0.50	0.165	0.29	0.23	0.101	2.8	241	< 1.0	< 1.0	1,400	2.61	0.0140	71
4/27/2010	210	0.76	1.7	0.171	0.37	0.19	0.276	2.6	286	< 1.0	< 1.0	1,300	20.4	0.0173	58
1/26/2010	230	< 0.10	1.7	0.317	0.30	0.12	0.333	3.2	307	< 1.0	< 1.0	1,500	27.3	0.0152	66
10/20/2009	230	< 0.10	1.3	0.241	0.38	< 0.10	0.157	3.2	238	< 1.0	< 1.0	1,300	5.33	0.0160	63
8/20/2009	220	< 0.10	1.3	NA	0.37	0.12	0.228	2.9	235	< 1.0	< 1.0	1,400	15.9	0.0181	55
5/11/2009	220	NA	NA	NA	0.36	NA	0.113	3.2	274	< 1.0	< 1.0	1,500	2.26	0.0178	56

A-8. NCMA Sentry Well Water Level and Water Quality Data
Well 30N03, Pier Avenue, Intermediate

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30N03	Screened from 60-135' - 2-inch diameter	**16.13**										
Height of steel casing added to the concrete pad elevation		2.60	1/15/2014	NA	NA	610	66	54	3.2	67	31	170
Pad elevation NAVD 88		13.53	1/14/2014	10.26	5.87	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		13.5	10/15/2013	NA	NA	580	60	57	3.3	71	32	170
			10/14/2013	10.72	5.41	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	590	60	48	3.1	71	31	160
			7/9/2013	10.36	5.77	NA	NA	NA	NA	NA	NA	NA
			4/10/2013	8.26	7.87	600	66	53	3.3	69	31	160
			1/14/2013	7.71	8.42	570	66	55	3.4	68	30	165
			10/29/2012	8.01	8.12	610	60	56	3.7	74	33	155
			7/23/2012	9.15	6.98	600	71	56	3.5	61	28	152
			4/18/2012	6.72	9.41	570	80	47	3.0	57	25	150
			1/11/2012	7.17	8.96	570	67	55	3.9	68	30	140
			11/21/2011	6.45	9.68	600	67	47	3.2	64	28	140
			7/26/2011	7.59	8.54	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	590	67	47	5.0	54	24	290
			4/20/2011	6.65	9.48	580	76	58	4.2	62	23	140
			1/24/2011	6.68	8.75	570	76	48	4.8	55	25	130
			10/21/2010	10.76	5.37	550	69	59	3.3	65	31	133
			7/27/2010	9.53	6.60	528	72	55.1	3.41	68.7	31.0	139
			4/27/2010	6.14	7.36	672	89	60.6	3.65	70.6	32.5	134
			1/26/2010	5.88	7.62	606	110	75.0	4.51	77.8	34.3	126
			10/20/2009	6.56	6.94	806	180	93.3	25.5	92.3	41.5	162
			8/20/2009	7.50	6.00	1,070	190	151	61.6	112	44.2	130
			5/12/2009	6.33	7.17	602	97	63.4	3.96	72.9	32.2	122
			3/27/1996	NA	NA	624	70	62	4	78	35	150
			6/7/1976	NA	NA	705	90	54	2.9	99	43	189
			1/21/1966	NA	NA	804	57	54	3	132	59	410

A-8 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30N03, Pier Avenue, Intermediate

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	149	14.8	15	<0.1	0.16	<0.01	0.065	0.46	170	<10	<10	910	0.27	0.0070	143
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	150	14	<1	0.057	0.16	<0.01	0.370	0.41	170	<10	<10	910	0.1	0.0068	146
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	150	15.1	<1	0.074	0.18	<0.01	1.3	0.17	160	<10	<10	900	0.43	0.0028	353
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/10/2013	150	15	<1	0.11	0.2	<0.01	0.064	0.35	160	<10	<10	910	<0.05	0.0053	189
1/14/2013	150	15	<1	0.093	0.2	<0.01	0.028	0.27	165	<10	<10	900	0.084	0.0041	244
10/29/2012	148	14	<1	0.081	0.2	<0.01	0.027	0.3	155	<10	<10	900	0.04	0.0050	200
7/23/2012	200	<0.05	<1	0.1	<0.1	<.002	0.120	0.3	152	<10	<10	890	0.44	0.0042	237
4/18/2012	150	16	<1	0.1	0.3	<0.01	<0.005	0.28	150	<10	<10	880	<0.1	0.0035	286
1/11/2012	130	14	<1	0.1	0.2	<0.02	0.0510	0.39	140	<10	<10	870	0.17	0.0058	172
11/21/2011	130	15	1.2	0.088	0.2	<0.01	<0.005	0.62	140	<10	<10	850	<0.1	0.0093	108
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	139.8	15	<1	<0.1	0.2	<0.01	0.0520	0.79	290	<5	<5	890	0.14	0.0118	85
4/20/2011	142	16	<1	0.12	0.2	<0.1	0.0510	0.92	140	<2.0	<2.0	890	NA	0.0121	83
1/24/2011	130	16	<1.0	0.12	0.2	<0.10	0.0088	1.7	130	<2.0	<2.0	900	<0.1	0.0224	45
10/21/2010	130	15	<1.0	<0.1	0.1	NA	<0.005	1.1	133	<10	<10	886	<0.1	0.0159	63
7/27/2010	130	15.0	< 0.50	0.0672	0.14	0.11	< 0.00500	1.3	139	< 1.0	< 1.0	860	< 0.100	0.0181	55
4/27/2010	130	14.0	< 0.50	0.0779	0.18	0.11	< 0.00500	1.2	134	< 1.0	< 1.0	870	< 0.100	0.0135	74
1/26/2010	130	14	1.4	0.0654	0.15	< 0.10	0.0130	1.3	126	< 1.0	< 1.0	990	0.653	0.0118	85
10/20/2009	150	9.7	2.2	0.107	0.26	< 0.10	0.245	1.4	162	< 1.0	< 1.0	1,200	0.344	0.0078	129
8/20/2009	130	16	3.4	NA	0.20	< 0.10	0.151	1.6	130	< 1.0	< 1.0	1,700	1.93	0.0084	119
5/12/2009	120	NA	NA	NA	0.22	NA	24	1.2	122	< 1.0	< 1.0	900	2.24	0.0124	81
3/27/1996	161	106.8	NA	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/7/1976	168	112.5	NA	0.08	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/21/1966	250	1	NA	0.08	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-9. NCMA Sentry Well Water Level and Water Quality Data
Well 30N02, Pier Avenue, Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
32S/13E-30N02	Screened from 175-255' - 2-inch diameter	**16.13**										
Height of steel casing added to the concrete pad elevation		2.60	1/15/2014	NA	NA	1,060	45	60	4.1	120	49	190
Pad elevation NAVD 88		13.53	1/14/2014	9.30	6.83	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		13.5	10/15/2013	NA	NA	1,030	46	70	4.9	140	58	190
			10/14/2013	12.13	4.00	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	1,020	50	61	4.5	140	59	185
			7/9/2013	11.05	5.08	NA	NA	NA	NA	NA	NA	NA
			4/10/2013	7.06	9.07	1,080	48	60	4.3	120	52	185
			1/14/2013	4.98	11.15	1,010	48	63	4.5	120	53	188
			10/29/2012	8.52	7.61	1,030	40	68	5.0	140	58	180
			7/23/2012	8.31	7.82	1,040	54	63	4.5	110	48	188
			4/18/2012	3.45	12.68	990	60	56	4.2	110	47	190
			1/11/2012	4.88	11.25	1,040	49	64	4.9	130	54	180
			11/21/2011	5.35	10.78	1,020	46	57	4.5	130	54	180
			7/26/2011	7.25	8.88	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	1,050	50.4	81	7.7	150	62	180
			4/20/2011	3.53	12.60	1,030	52	63	5.4	130	44	180
			1/24/2011	3.67	11.76	1,050	50	60	6.4	120	49	190
			10/21/2010	10.42	5.71	1,040	48	52	3.5	100	45	181
			7/27/2010	10.02	6.11	777	57	67.6	7.31	141	58.5	190
			4/27/2010	5.26	8.27	800	93	71.9	12.50	108	46.3	159
			2/25/2010	1.72	11.78	1,000	48	71.4	4.70	141	58.1	195
Confirmation Sample Collected from Pump Discharge at End of Purge:			2/25/2010	1.72	11.78	1,010	74	76.9	10.2	138	55.8	195
Confirmation Sample Collected by Standard Method (Bailer):			1/26/2010	3.72	9.78	970	50	74.2	4.77	152	62.2	195
			10/20/2009	7.38	6.12	2,080	690	274	151	239	101.0	220
			8/20/2009	11.94	1.56	1,350	500	199	82.2	123	49.0	199
			5/11/2009	6.98	6.52	1,290	170	129	52	137	66.9	176
			3/27/1996	NA	NA	1,050	50	71	5.5	145	60	243
			6/7/1976	NA	NA	1,093	48	62	4.7	150	60	248
			1/21/1966	NA	NA	1,069	54	71	5	148	63	232

A-9 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 30N02, Pier Avenue, Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/15/2014	477	0.65	1.1	0.13	0.43	<0.01	<0.005	<0.2	190	<10	<10	1,370	<0.05	NA	NA
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/15/2013	541	0.46	<1	0.12	0.18	<0.01	<0.005	<0.2	190	<10	<10	1,360	<0.05	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	500	0.63	<1	0.14	0.12	<0.01	<0.005	<0.1	185	<10	<10	1,370	<0.05	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/10/2013	500	0.50	<1	0.15	<0.2	<0.01	<0.005	<0.2	185	<10	<10	1,360	<0.05	NA	NA
1/14/2013	530	0.40	<1	0.14	<0.2	<0.01	<0.005	<0.2	188	<10	<10	1,350	0.07	NA	NA
10/29/2012	500	<0.25	<1	0.14	<0.5	<0.01	<0.005	<0.5	180	<10	<10	1,360	<0.05	NA	NA
7/23/2012	510	0.13	<1	0.15	0.15	<0.01	0.01	<0.1	188	<10	<10	1,360	<0.05	NA	NA
4/18/2012	560	0.14	<1	0.12	0.21	<0.01	<0.005	0.28	190	<10	<10	1,360	<0.1	0.0047	214
1/11/2012	460	1.30	<1	0.17	0.16	<0.02	<0.005	<0.2	180	<10	<10	1,360	<0.1	NA	NA
11/21/2011	450	0.15	<1	0.15	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,360	<0.1	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	479.1	0.15	<1	0.16	0.144	<0.01	0.006	<0.1	180	<5	<5	1,370	0.49	NA	NA
4/20/2011	508	0.17	<1	0.19	0.2	<0.01	<0.005	<0.1	180	<2.0	<2.0	1,380	NA	NA	NA
1/24/2011	490	0.24	<1.0	0.17	0.17	<0.10	0.064	<0.1	190	<2.0	<2.0	1,380	0.12	NA	NA
10/21/2010	460	0.15	<1.0	<0.1	<0.1	NA	<0.005	<0.3	181	<10	<10	1,377	<0.1	NA	NA
7/27/2010	470	0.3	3.5	0.138	< 0.10	0.11	0.102	0.28	190	< 1.0	< 1.0	1,300	3.43	0.0049	204
4/27/2010	300	7.0	3.2	0.123	0.13	0.11	0.0776	0.7	159	< 1.0	< 1.0	1,100	3.27	0.0075	133
2/25/2010	490	0.16	< 0.50	0.15	0.15	< 0.10	0.0393	0.16	195	< 1.0	< 1.0	1,300	3.30	0.0033	300
2/25/2010	440	0.13	2.4	0.142	0.16	< 0.10	0.0579	0.24	195	< 1.0	< 1.0	1,400	1.69	0.0032	308
1/26/2010	510	0.14	< 0.50	0.129	0.11	< 0.10	< 0.00500	0.16	195	< 1.0	< 1.0	1,300	< 0.100	0.0032	313
10/20/2009	400	< 0.10	7.0	0.201	0.16	0.87	0.398	2.0	220	< 1.0	< 1.0	2,800	5.50	0.0029	345
8/20/2009	220	6.4	6.3	NA	0.23	0.14	0.339	2.8	199	< 1.0	< 1.0	2,100	4.91	0.0056	179
5/11/2009	470	NA	NA	NA	0.18	NA	0.128	0.56	176	< 1.0	< 1.0	1,800	5.24	0.0033	304
3/27/1996	516	0.9	NA	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/7/1976	484	0	NA	0.13	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/21/1966	483	0	NA	0.12	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-10. NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Green, Shallow

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
Oceano MW-Green	Screened from 110-130' - 3-inch diameter	**30.49**										
	Casing relative to concrete pad	-4.14	1/16/2014	NA	NA	900	57	66	4.60	110	50	240
	Pad elevation above MSL, approximate	34.63	1/14/2014	28.55	6.08	NA	NA	NA	NA	NA	NA	NA
	All elevations relative to MSL		10/16/2013	NA	NA	690	30	40	3.40	100	49	340
			10/14/2013	30.31	4.32	NA	NA	NA	NA	NA	NA	NA
			7/11/2013	NA	NA	860	60	50	4.40	110	47	240
			7/9/2013	29.98	4.65	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	900	60	69	4.60	110	47	250
			4/10/2013	23.30	11.33	NA	NA	NA	NA	NA	NA	NA
			1/16/2013	NA	NA	820	66	76	5.00	100	47	260
			1/14/2013	23.59	11.04	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	27.31	7.32	780	65	75	4.70	100	46	255
			7/25/2012	27.15	7.48	830	76	80	5.30	96	45	250
			4/19/2012	NA	NA	790	87	69	4.50	52	37	250
			4/18/2012	21.65	12.98	NA	NA	NA	NA	NA	NA	NA
			1/12/2012	23.29	11.34	760	76	85	4.00	79	40	270
			11/21/2011	22.46	12.17	720	39	38	3.40	96	43	320
			7/26/2011	25.51	9.12	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	760	69.3	66	6.40	80	35	310
			4/20/2011	114.79	-80.16	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	106.59	-71.96	310	98	22	8.1	34	9.2	19.0
			10/28/2010	NA	NA	290	81	26	9.3	64	11	160.0
			10/21/2010	112.71	-82.22	NA	NA	NA	NA	NA	NA	NA
			7/26/2010	95.61	-65.12	438	85	34.3	1.93	61.7	30.4	30.0
			4/26/2010	63.90	-33.41	560	83	47.7	5.7	86.1	48.3	62
			1/27/2010	43.71	-13.22	460	130	45.0	25.4	682	124	112
			10/20/2009	29.20	1.29	362	92	39.6	2.92	19.2	45.1	76.8
			8/19/2009	24.55	5.94	420	160	48.4	3.37	49.9	20.4	17.6
			5/16/1983	15.80	14.69	665	35	40	NA	85	65	360

A-10 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Green, Shallow

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	360	<0.05	<1	0.180	0.2	0.02	0.32	<0.1	240	<10	<10	1,260	6.0	NA	NA
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	190	<0.05	<1	0.091	0.14	<0.01	0.23	<0.1	340	<10	<10	1,050	7.4	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/11/2013	340	<0.05	<1	0.18	0.15	0.02	0.28	<0.1	240	<10	<10	1,230	4.9	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	350	0.82	<1	0.2	0.12	0.03	0.28	<0.2	250	<10	<10	1,250	5.7	NA	NA
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/16/2013	320	<0.1	<1	0.21	0.13	<0.01	0.31	<0.2	260	<10	<10	1,230	4.2	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	280	<0.05	<1	0.19	0.14	0.04	0.23	<0.1	255	<10	<10	1,190	4	NA	NA
7/25/2012	310	<0.05	<1	0.22	0.15	0.04	0.24	<0.1	250	<10	<10	1,220	6.7	NA	NA
4/19/2012	270	<0.1	<1	0.19	0.21	0.05	0.17	<0.2	250	<10	<10	1,180	4	NA	NA
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/12/2012	190	<0.1	<1	0.23	0.21	0.069	0.23	<0.2	270	<10	<10	1,150	4.8	NA	NA
11/21/2011	180	<0.05	3.5	0.079	0.19	0.013	0.17	<0.1	320	<10	<10	1,050	4.8	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	208.8	<0.05	<1	0.16	0.17	0.041	0.23	0.199	310	<5	<5	1,170	5.3	0.0029	348
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	53	<0.05	<1.0	<0.1	0.2	4.42	0.4	0.63	19.0	<2.0	<2.0	480	10	0.0064	156
10/28/2010	68	<0.1	<1.0	<0.1	0.2	NA	0.85	0.36	160.0	<10	<10	520	38	0.0044	225
10/21/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/26/2010	210	< 0.10	< 0.50	0.0435	0.58	0.22	1.46	0.32	30.0	< 1.0	< 1.0	690	36	0.0038	266
4/26/2010	310	< 0.10	0.84	< 0.02	< 0.1	0.56	2.54	0.31	62.0	< 1.0	< 1.0	880	233	0.0037	268
1/27/2010	100	0.56	NA	< 0.0200	0.21	0.25	32.4	0.49	112.0	< 1.0	< 1.0	760	4,360	0.0038	265
10/20/2009	110	< 0.10	< 0.50	0.0697	< 0.10	< 0.10	0.242	0.39	80.0	3.2	< 1.0	590	11.4	0.0042	236
8/19/2009	54	< 0.10	1.1	NA	< 0.10	0.25	1.76	0.68	17.6	< 1.0	< 1.0	690	242	0.0043	235
5/16/1983	90	< 4	NA	NA	0.2	NA	0.01	NA	360	ND	ND	950	0.10	NA	NA

A-11. NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Blue, Intermediate Shallow

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
Oceano MW-Blue	Screened from 190-210' and 245-265' - 3-inch diameter	**30.54**										
	Casing relative to concrete pad	-4.09	1/16/2014	NA	NA	350	122	89	15	2	18	68
	Pad elevation above MSL, approximate	34.63	1/14/2014	27.86	6.77	NA	NA	NA	NA	NA	NA	NA
	All elevations relative to MSL		10/16/2013	NA	NA	360	100	98	20	3.1	15	66
			10/14/2013	30.98	3.65	NA	NA	NA	NA	NA	NA	NA
			7/11/2013	NA	NA	370	140	70	6.3	4	23	82
			7/9/2013	29.36	5.27	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	340	90	81	14	2.9	18	78
			4/10/2013	24.45	10.18	NA	NA	NA	NA	NA	NA	NA
			1/16/2013	NA	NA	360	107	99	7.1	3.3	24	110
			1/14/2013	23.14	11.49	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	27.68	6.95	380	97	100	6.4	4.5	24	130
			7/25/2012	27.18	7.45	240	49	56	11	5.4	22	99
			4/19/2012	NA	NA	380	100	87	5.5	3.5	26	150
			4/18/2012	20.10	14.53	NA	NA	NA	NA	NA	NA	NA
			1/12/2012	22.26	12.37	480	96	110	4.9	5.6	33	154
			11/21/2011	22.73	11.90	390	90	78	4.6	5.2	24	111
			7/26/2011	25.29	9.34	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	260	29.3	23	5.3	8.7	20	84
			4/21/2011	NA	NA	580	118	70	19	49	17	8.8
			4/20/2011	22.59	12.04	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	24.87	9.76	680	110	60	17	64	22	5.0
			10/21/2010	30.11	0.43	770	100	68	12	88	31	14.0
			7/26/2010	24.74	5.80	783	130	80.1	8.58	142	42.0	2.8
			4/26/2010	18.52	12.02	1,130	160	70.2	6.48	208	50.7	8.4
			1/27/2010	22.06	8.48	1,740	430	55.6	4.98	282	43.0	< 1.0
			10/20/2009	27.50	3.04	2,250	1,000	19.5	2.40	487	22.5	5.0
			8/19/2009	24.65	5.89	322	150	93.2	16.7	23.9	12.1	3.0
			5/16/1983	13.30	17.24	840	80	90	NA	100	50	250

A-11 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Blue, Intermediate Shallow

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	42	<0.05	<1	0.17	0.1	0.09	0.026	0.48	125	57.5	<10	710	2.3	0.0039	254
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	36	<0.05	<1	0.19	<0.1	0.11	0.057	0.38	139	73	<10	710	4.1	0.0038	263
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/11/2013	40	0.4	<1	0.2	0.11	0.11	0.043	0.44	117	35	<10	730	3.2	0.0031	318
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	30	<0.05	<1	0.19	0.12	0.07	0.046	0.3	155	77.5	<10	650	3.2	0.0033	300
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/16/2013	36	<0.05	<1	0.25	<0.1	<0.01	0.048	0.4	165	55	<10	720	3.7	0.0037	268
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	38	<0.05	<1	0.28	<0.1	0.1	0.09	0.2	168	38	<10	720	6.1	0.0021	485
7/25/2012	43	<0.05	<1	0.16	0.19	0.023	0.11	<0.1	132	33	<10	470	6.6	NA	NA
4/19/2012	79	<0.1	<1	0.27	0.26	0.09	0.033	0.68	180	30	<10	750	1.6	0.0068	147
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/12/2012	95	<0.1	<1	0.28	<0.2	0.11	0.01	0.306	180	26	<10	850	0.2	0.0032	314
11/21/2011	86	<0.05	<1	0.19	0.13	0.092	0.014	0.28	128	17	<10	720	0.5	0.0031	321
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	80	<0.05	<1	<0.1	0.199	0.072	0.041	<0.1	89	<5	<5	440	2.7	NA	NA
4/21/2011	274	<0.05	<1	<0.1	0.29	0.109	0.091	0.4	11.3	2.5	<2.0	950	NA	0.0034	295
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	330	<0.05	<1.0	<0.1	0.22	0.96	0.16	0.31	11.2	6.2	<2.0	1,040	10.0	0.0028	355
10/21/2010	380	<0.1	<1.0	<0.1	0.28	NA	0.054	<0.3	14.0	<10	<10	1,163	2.2	NA	NA
7/26/2010	450	< 0.10	< 0.50	< 0.0200	0.26	0.31	3.97	0.8	2.8	< 1.0	< 1.0	1,200	593	0.0059	169
4/26/2010	530	< 0.10	0.56	< 0.02	0.23	0.54	3.10	1.0	8.4	< 1.0	< 1.0	1,600	383	0.0061	165
1/27/2010	680	< 0.10	< 0.50	0.0819	0.14	0.41	9.41	2.0	< 1.0	< 1.0	< 1.0	2,300	170	0.0047	215
10/20/2009	410	< 0.10	0.98	0.0532	0.13	< 0.10	13.1	4.5	5.0	< 1.0	< 1.0	3,100	236	0.0045	222
8/19/2009	4	< 0.10	1.3	NA	0.19	0.5	0.7	0.74	23.0	20.0	< 1.0	640	153	0.0049	203
5/16/1983	160	< 4	NA	ND	0.2	NA	0.14	NA	250.0	ND	ND	1,200	0.10	NA	NA

A-12. NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Silver, Intermediate Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
Oceano MW-Silver	Screened from 395-435' and 470-510' - 3-inch diameter	**30.48**										
	Casing relative to concrete pad	-4.15	1/14/2014	37.78	6.85	NA	NA	NA	NA	NA	NA	NA
	Pad elevation above MSL, approximate	34.63	10/14/2013	30.92	3.71	NA	NA	NA	NA	NA	NA	NA
	All elevations relative to MSL		7/9/2013	30.91	3.72	NA	NA	NA	NA	NA	NA	NA
			4/10/2013	26.08	8.55	NA	NA	NA	NA	NA	NA	NA
			1/14/2013	23.12	11.51	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	27.14	7.49	NA	NA	NA	NA	NA	NA	NA
			7/25/2012	27.68	6.95	NA	NA	NA	NA	NA	NA	NA
			4/18/2012	20.13	14.5	NA	NA	NA	NA	NA	NA	NA
			1/11/2012	23.00	11.63	NA	NA	NA	NA	NA	NA	NA
			11/21/2011	22.85	11.78	NA	NA	NA	NA	NA	NA	NA
			7/26/2011	25.23	9.4	NA	NA	NA	NA	NA	NA	NA
			4/21/2011	NA	NA	410	97	100	7.2	3.5	21	80
			4/20/2011	21.27	13.36	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	22.02	12.61	440	92	90	9.2	3.4	27	90
			10/21/2010	29.11	5.52	460	90	110	15	6.8	32	94
			7/26/2010	24.24	6.24	478	83	109	5.94	52.9	30.4	122.0
			4/26/2010	19.04	11.44	452	83	83	7.42	29.3	34.5	72.0
			1/27/2010	21.05	9.43	496	71	92.2	10.6	22.9	39.1	13.0
			10/20/2009	27.52	2.96	564	71	80.8	8.63	33.2	49.8	49.6
			8/19/2009	29.34	1.14	522	180	148	71.6	95.2	8.42	30.0
			5/16/1983	13.50	16.98	630	40	40	NA	90	50	330

A-12 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Silver, Intermediate Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/11/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/21/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/21/2011	134	<0.05	<1	0.23	0.18	0.097	0.065	0.42	100	20	<2.0	770	NA	0.0043	231
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	140	<0.05	<1.0	0.25	0.11	0.94	0.041	0.35	110	20	<2.0	810	2.2	0.0038	263
10/21/2010	140	<0.1	<1.0	0.2	0.1	NA	0.1	0.38	124	30	<10	868	3.5	0.0042	237
7/26/2010	94	< 0.10	<0.50	0.255	< 0.10	0.41	0.477	0.56	130.0	8.0	< 1.0	730	61.0	0.0067	148
4/26/2010	190	< 0.1	0.56	0.134	< 0.10	0.65	0.702	0.4	86.0	14.0	< 1.0	810	71.0	0.0048	208
1/27/2010	230	<0.10	< 0.50	0.323	< 0.10	0.20	0.604	0.29	51.0	38.0	< 1.0	780	54.4	0.0041	245
10/20/2009	310	<0.10	< 0.50	0.148	< 0.10	< 0.10	0.337	0.32	64.0	14.4	< 1.0	850	20.0	0.0045	222
8/19/2009	3.5	<0.10	1.7	NA	0.24	0.52	2.36	0.76	170	140	< 1.0	1,000	278	0.0042	237
5/16/1983	80	< 4	NA	NA	0.1	NA	0.02	NA	330	ND	ND	900	0.05	NA	NA

A-13. NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD #8

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
Oceano # 8												
Casing relative to concrete pad			1/16/2014	NA	NA	680	45	42	2.6	100	46	360
Pad elevation above MSL, approximate			10/16/2013	NA	NA	670	40	44	2.6	100	47	350
All elevations relative to MSL			7/10/2013	NA	NA	670	44	43	2.8	110	52	350
			4/11/2013	NA	NA	720	43	40	2.7	98	46	350
			1/16/2013	NA	NA	660	43	43	2.7	100	47	360
			10/30/2012	NA	NA	660	40	44	2.9	110	49	345
			7/24/2012	NA	NA	700	47	44	2.8	93	45	356
			4/25/2012	NA	NA	680	48	44	2.7	95	43	350
			1/10/2012	NA	NA	690	45	44	2.6	100	44	340
			11/22/2011	NA	NA	690	41	39	2.7	100	46	350
			7/25/2011	NA	NA	690	44	39	4.5	86	40	340

A-13 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD #8

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	171	<0.05	<1	<0.05	0.13	<0.01	0.032	<0.1	360	<10	<10	1,060	0.18	NA	NA
10/16/2013	180	0.47	<1	<0.05	0.15	<0.01	0.03	<0.1	350	<10	<10	1,053	0.11	NA	NA
7/10/2013	180	<0.05	<1	0.072	0.12	<0.01	0.032	<0.1	350	<10	<10	1,070	0.11	NA	NA
4/11/2013	170	<0.05	<1	0.072	0.14	<0.01	0.029	<0.1	350	<10	<10	1,070	0.12	NA	NA
1/16/2013	180	<0.05	<1	0.07	0.1	<0.01	0.031	<0.1	360	<10	<10	1,060	0.130	NA	NA
10/30/2012	170	<0.05	<1	0.071	0.14	<0.01	0.03	<0.1	345	<10	<10	1,070	0.086	NA	NA
7/24/2012	180	<0.05	<1	<0.1	0.17	<0.01	0.029	<0.1	356	<10	<10	1,070	0.660	NA	NA
4/25/2012	200	<0.1	<1	<0.1	0.26	<0.01	0.032	<0.2	350	<10	<10	1,070	0.200	NA	NA
1/10/2012	160	<0.05	<1	<0.1	0.2	<0.01	0.024	<0.1	340	<10	<10	1,070	0.100	NA	NA
11/22/2011	160	<0.1	<1	0.046	<0.2	0.013	0.03	<0.2	350	<10	<10	1,010	0.0	NA	NA
7/25/2011	166.9	<0.05	<1	<0.1	0.145	<0.01	0.026	<0.1	340	<5	<5	1,070	<0.1	NA	NA

A-14. NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Yellow, Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
Oceano MW-Yellow	Screened from 625-645' - 3-inch diameter	**30.52**										
	Casing relative to concrete pad	-4.11	1/16/2014	NA	NA	390	89	91	5	4.1	34	119
	Pad elevation above MSL, approximate	34.63	1/14/2014	27.80	6.83	NA	NA	NA	NA	NA	NA	NA
	All elevations relative to MSL		10/16/2013	NA	NA	410	84	87	4.7	5.3	33	114
			10/14/2013	30.83	3.80	NA	NA	NA	NA	NA	NA	NA
			7/11/2013	NA	NA	420	80	70	4.8	4.5	35	116
			7/9/2013	30.41	4.22	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	450	77	77	4.7	5.8	38	113
			4/10/2013	26.09	8.54	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	420	74	78	4.7	7.0	40	110
			1/14/2013	23.25	11.38	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	27.23	7.40	380	88	99	5.7	3.3	30	160
			7/25/2012	27.69	6.94	390	108	107	5.5	2.7	29	13
			4/19/2012	NA	NA	390	110	83	4.3	2.5	26	400
			4/18/2012	20.05	14.58	NA	NA	NA	NA	NA	NA	NA
			1/12/2012	23.08	11.55	410	94	95	4.5	3.0	28	300
			11/21/2011	22.98	11.65	410	94	83	4.6	3.4	30	152
			7/26/2011	26.73	7.90	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	420	89.7	84	7.1	4.4	31	148
			4/21/2011	NA	NA	380	88	110	6.3	4.0	27	140
			4/20/2011	21.30	13.33	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	22.01	12.62	430	83	73	6	6.3	31	160
			10/21/2010	28.22	2.30	410	87	100	3.9	6.0	33	148
			7/26/2010	25.50	5.02	446	94	93.0	8.81	10.2	32.0	38.4
			4/26/2010	19.17	11.35	416	96	87.6	9.86	14.8	37.1	46.0
			1/27/2010	20.58	9.94	498	89	79.6	10.2	15.6	38.0	31.0
			10/20/2009	25.80	4.72	446	100	97.1	12.8	16.4	37.9	26.6
			8/19/2009	31.04	-0.52	426	160	101	18.9	93.2	29.1	64.4
			5/16/1983	14.30	16.22	770	60	70	NA	90	70	330

A-14 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Oceano CSD Yellow, Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	103	<0.05	<1	0.20	<0.1	0.06	0.043	0.34	136	17	<10	740	0.30	0.0038	262
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	130	<0.05	<1	0.17	<0.1	0.08	0.053	0.3	124	10	<10	760	0.28	0.0036	280
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/11/2013	120	<0.05	<1	0.19	<0.1	0.06	0.047	0.21	136	20	<10	760	0.19	0.0026	381
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	150	<0.05	<1	0.19	<0.1	0.06	0.069	0.2	128	15	<10	780	0.15	0.0026	385
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	180	<0.05	<1	0.18	<0.1	<0.01	0.087	<0.1	125	15	<10	810	0.55	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	63	<0.05	<1	0.25	<0.1	0.08	0.035	0.3	168	7.5	<10	740	0.33	0.0034	293
7/25/2012	66	<0.05	<1	0.28	<0.1	0.079	0.0037	0.23	168	155	<10	750	0.84	0.0021	470
4/19/2012	68	<0.1	<1	0.22	0.23	0.09	0.032	0.39	420	20	<10	790	0.24	0.0035	282
4/18/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/12/2012	68	<0.1	<1	0.24	<0.2	0.1	0.032	0.31	320	20	<10	760	0.89	0.0033	303
11/21/2011	72	<0.05	<1	0.21	<0.1	0.09	0.035	0.3	160	8	<10	730	0.65	0.0032	313
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	91.8	<0.05	<1	0.20	<0.1	0.071	0.046	0.297	150	2.5	<5	760	1.90	0.0033	302
4/21/2011	101	<0.05	<1	0.41	0.14	0.07	0.13	0.33	140	<2.0	<2.0	750	N/A	0.0038	267
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	100	<0.05	<1.0	0.22	0.11	0.66	0.078	0.28	160	<2.0	<2.0	780	0.49	0.0034	296
10/21/2010	100	<0.1	<1.0	0.14	<0.1	NA	0.087	<0.3	148	<10	<10	796	0.66	NA	NA
7/26/2010	120	< 0.10	< 0.50	0.142	< 0.10	0.32	0.196	0.48	56.0	17.6	< 1.0	700	22.4	0.0051	196
4/26/2010	150	< 0.1	0.63	0.132	< 0.10	0.39	0.579	0.44	58.0	12.0	< 1.0	780	56.2	0.0046	218
1/27/2010	180	< 0.10	0.56	0.132	< 0.10	0.19	0.283	0.38	51.0	20.0	< 1.0	810	23.6	0.0043	234
10/20/2009	180	< 0.10	0.56	0.168	0.2	< 0.10	0.180	0.42	42.6	16.0	< 1.0	760	18.9	0.0042	238
8/19/2009	36	< 0.10	0.98	NA	0.2	0.31	5.490	0.60	84.4	20.0	< 1.0	790	682	0.0038	267
5/16/1983	120	9	NA	NA	0.1	NA	0.02	NA	330	ND	ND	1,100	0.24	NA	NA

A-15. NCMA Sentry Well Water Level and Water Quality Data
Well 36L01, Oceano Dunes, Intermediate

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
12N/36W-36L01	Screened from 227-237' - 2-inch diameter	**26.77**										
Height of steel casing added to the concrete pad elevation	2.79		1/16/2014	NA	NA	910	35	60	3.1	110	42	180
Pad elevation NAVD 88	23.98		1/14/2014	20.38	6.39	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)	24.0		10/16/2013	NA	NA	910	40	63	4.5	120	43	170
			10/14/2013	21.71	5.06	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	910	39	54	3.2	120	42	175
			7/9/2013	21.37	5.4	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	890	38	59	3.6	110	43	180
			4/10/2013	20.10	6.67	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	870	39	61	3.4	110	41	178
			1/14/2013	18.62	8.15	NA	NA	NA	NA	NA	NA	NA
			10/31/2012	20.11	6.66	910	35	66	4.0	130	46	165
			7/24/2012	19.42	7.35	880	43	65	3.9	110	41	168
			4/20/2012	18.26	8.03	NA	NA	NA	NA	NA	NA	NA
			4/18/2012	23.83	2.94	880	47	52	3.2	95	36	180
			1/11/2012	17.68	9.09	790	41	64	4.1	120	44	170
			11/21/2011	18.08	8.69	910	39	55	3.5	110	40	180
			7/26/2011	19.63	7.14	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	890	40.5	65	5.7	110	43	170
			4/21/2011	NA	NA	890	42	61	4.2	100	30	170
			4/20/2011	18.26	8.51	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	17.61	8.68	890	41	55	5.1	98	36	180
			10/21/2010	20.75	5.54	910	38	76	3.6	130	47	169
			7/27/2010	21.18	5.11	707	36	64.2	3.70	127	47.4	182
			4/26/2010	15.94	8.06	860	42	70.3	4.13	129	48.9	191
			10/21/2009	17.72	6.28	856	38	72.0	4.64	131	48.2	192
			8/20/2009	19.16	4.84	890	39	78.0	4.21	138	48.1	184
			5/11/2009	17.68	6.32	832	63	83.8	4.88	111	45.4	204
			3/26/1996	NA	NA	882	35	66	4.8	124	47	233
			6/8/1976	NA	NA	936	38	72	3.5	130	48	223

A-15 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 36L01, Oceano Dunes, Intermediate

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	416	1.00	1.1	0.14	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,190	<0.05	NA	NA
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	460	0.76	<1	0.13	<0.2	<0.01	<0.005	<0.2	170	<10	<10	1,210	<0.05	NA	NA
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	430	0.78	<1	0.14	<0.1	<0.01	<0.005	<0.1	175	<10	<10	1,210	0.18	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	420	0.82	<1	0.16	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,200	<0.05	NA	NA
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	440	0.57	<1	0.15	<0.2	<0.01	<0.005	<0.2	178	<10	<10	1,190	0.13	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/31/2012	400	1.60	<1	0.16	0.2	<0.01	<0.005	<0.5	165	<10	<10	1,200	<0.05	NA	NA
7/24/2012	420	<0.05	<1	0.16	<0.1	<0.01	0.02	<0.1	168	<10	<10	1,190	0.19	NA	NA
4/20/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/18/2012	450	0.42	<1	0.12	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,190	<0.1	NA	NA
1/11/2012	380	1.30	<1	0.19	0.18	<0.02	<0.005	<0.2	170	<10	<10	1,190	<0.1	NA	NA
11/21/2011	380	0.37	<1	0.16	<0.2	<0.01	<0.005	<0.2	180	<10	<10	1,200	<0.1	NA	NA
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	408.9	0.39	<1	0.15	<0.1	<0.01	<0.005	<0.1	170	<5	<5	1,200	0.024	NA	NA
4/21/2011	415	0.60	<1	0.19	0.07	<0.01	<0.005	<0.1	170	<2.0	<2.0	1,200	NA	NA	NA
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	400	0.50	<1.0	0.20	0.15	<0.10	<0.005	<0.1	180	<2.0	<2.0	1,200	<0.1	NA	NA
10/21/2010	400	0.39	<1.0	0.10	<0.1	NA	<0.005	<0.3	169	<10	<10	1,213	<0.1	NA	NA
7/27/2010	420	0.40	< 0.50	0.158	< 0.10	< 0.10	< 0.00500	0.11	182	< 1.0	< 1.0	1,100	< 0.100	0.0031	327
4/26/2010	400	0.45	0.77	0.223	< 0.1	0.15	0.057	0.14	191	< 1.0	< 1.0	1,100	4.53	0.0033	300
10/21/2009	420	0.49	0.84	0.150	0.12	< 0.10	0.0994	0.13	192	< 1.0	< 1.0	1,100	1.68	0.0034	292
8/20/2009	390	0.49	0.56	NA	< 0.10	< 0.10	0.185	0.14	184	< 1.0	< 1.0	1,200	2.03	0.0036	279
5/11/2009	330	NA	NA	NA	0.12	NA	0.551	0.22	204	< 1.0	< 1.0	1,200	4.02	0.0035	286
3/26/1996	408	2	NA	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/8/1976	423	0.6	NA	0.15	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-16. NCMA Sentry Well Water Level and Water Quality Data
Well 36L02, Oceano Dunes, Deep

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
12N/36W-36L02	Screened from 535-545' - 2-inch diameter	**26.77**										
Height of steel casing added to the concrete pad elevation		2.79	1/16/2014	NA	NA	800	100	87	5	76	33	270
Pad elevation NAVD 88		23.98	1/14/2014	18.76	8.01	NA	NA	NA	NA	NA	NA	NA
TOC elevation prior to renovation (Approximate)		24.0	10/16/2013	NA	NA	810	90	110	6.4	91	40	260
			10/14/2013	23.94	2.83	NA	NA	NA	NA	NA	NA	NA
			7/10/2013	NA	NA	790	105	94	5.8	88	38	260
			7/9/2013	23.15	3.62	NA	NA	NA	NA	NA	NA	NA
			4/11/2013	NA	NA	830	100	99	6.2	83	37	260
			4/10/2013	15.35	11.42	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	770	110	110	6.7	84	38	265
			1/14/2013	11.24	15.53	NA	NA	NA	NA	NA	NA	NA
			10/31/2012	18.81	7.96	800	100	120	7.3	90	39	265
			7/24/2012	19.05	7.72	800	134	125	7.4	83	35	277
			4/18/2012	10.81	15.96	770	130	95	6.2	75	33	270
			1/11/2012	11.18	15.59	900	122	110	7.2	95	37	290
			11/21/2011	13.99	12.78	780	130	95	6.1	77	33	270
			7/26/2011	18.03	8.74	NA	NA	NA	NA	NA	NA	NA
			7/25/2011	NA	NA	790	128.8	110	9.1	74	33	280
			4/21/2011	NA	NA	770	120	90	5.3	86	26	280
			4/20/2011	10.33	16.44	NA	NA	NA	NA	NA	NA	NA
			1/24/2011	9.37	16.92	800	120	95	7.6	75	30	300
			10/21/2010	19.77	6.52	770	120	130	7.6	89	44	275
			7/27/2010	20.53	5.76	737	110	121	7.81	91.1	38.9	268
			4/26/2010	9.24	14.76	720	100	116	6.88	85.4	32.4	215
			10/21/2009	17.65	6.35	638	99	113	6.15	81.6	23.0	172
			8/20/2009	19.15	4.85	785	100	131	6.66	89.8	36.6	290
			5/11/2009	14.38	9.62	775	120	132	7.24	84	39.7	294
			3/26/1996	NA	NA	772	127	130	8.7	86	36	390
			6/8/1976	NA	NA	820	126	118	6.6	94	44	393

A-16 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 36L02, Oceano Dunes, Deep

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	230	<0.05	2.3	0.31	0.23	0.09	0.14	0.44	270	<10	<10	1,230	0.41	0.0044	227
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	240	<0.05	2.2	0.32	<0.1	0.1	0.15	0.32	260	<10	<10	1,220	0.54	0.0036	281
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/10/2013	240	<0.05	2.5	0.34	<0.1	0.08	0.13	0.11	260	<10	<10	1,240	0.31	0.0010	955
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/11/2013	220	<0.05	2.2	0.35	<0.1	0.098	0.14	0.45	260	<10	<10	1,240	0.60	0.0045	222
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	220	<0.05	2.8	0.36	<0.1	0.02	0.14	0.20	265	<10	<10	1,240	0.61	0.0018	550
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/31/2012	200	<0.1	2.4	0.4	0.34	0.12	0.14	0.34	265	<10	<10	1,250	0.30	0.0034	294
7/24/2012	200	<0.05	2.3	0.42	0.13	0.12	0.14	0.31	277	<10	<10	1,250	0.52	0.0023	432
4/18/2012	210	0.42	4	0.35	0.36	0.12	0.13	<0.2	270	<10	<10	1,250	0.77	NA	NA
1/11/2012	170	<0.1	4.8	0.48	0.28	<0.02	0.17	0.45	290	<10	<10	1,250	1.80	0.0037	271
11/21/2011	160	<0.1	<1	0.4	<0.2	<0.01	0.13	0.45	270	<10	<10	1,240	0.40	0.0035	289
7/26/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/25/2011	177	<0.05	2.3	0.36	0.12	0.14	0.13	0.51	280	<5	<5	1,280	2.30	0.0040	252
4/21/2011	206	<0.05	2.3	0.24	0.26	0.14	0.004	0.57	280	<2.0	<2.0	1,270	NA	0.0048	211
4/20/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/24/2011	190	<0.05	2.3	0.39	0.16	1.31	0.13	0.53	300	<2.0	<2.0	1,270	1.40	0.0044	226
10/21/2010	160	<0.1	3.4	0.48	<0.1	NA	0.15	0.54	275	<10	<10	1,293	0.12	0.0045	222
7/27/2010	190	< 0.10	< 0.50	0.427	0.10	0.77	0.180	0.80	268	< 1.0	< 1.0	1,200	0.845	0.0073	138
4/26/2010	210	1.5	0.77	0.382	0.2	0.28	0.167	0.7	215	< 1.0	< 1.0	1,100	3.870	0.0070	143
10/21/2009	200	< 0.10	3.2	0.268	0.33	57	0.128	0.61	172	< 1.0	< 1.0	940	0.255	0.0062	162
8/20/2009	190	< 0.10	3.8	NA	0.15	0.27	0.307	0.75	290	< 1.0	< 1.0	1,200	0.830	0.0075	133
5/11/2009	180	NA	NA	NA	0.18	NA	0.426	0.78	294	< 1.0	< 1.0	1,300	0.958	0.0065	154
3/26/1996	148	0.2	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6/8/1976	184	0	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

A-17. NCMA Sentry Well Water Level and Water Quality Data
Well 32C03, County MW #3, Intermediate

Well	Construction	Top of Casing Elevation (ft NAVD)	Date	Depth to Water (ft)	Groundwater Elevation (ft NAVD)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Bicarbonate (as CaCO3) (mg/L)
County MW-3 12N/35W-32C03	Screened from 90-170' - 5-inch diameter	47.70										
	Casing relative to concrete pad		1/16/2014	NA	NA	300	62	57	2.8	14	6.3	54
	Pad elevation above MSL, approximate	47.70	1/14/2014	41.00	6.70	NA	NA	NA	NA	NA	NA	NA
	All elevations relative to MSL		10/16/2013	NA	NA	310	58	62	2.9	15	6.4	54
			10/14/2013	45.26	2.66	NA	NA	NA	NA	NA	NA	NA
			7/11/2013	NA	NA	290	60	45	2.4	14	5.9	61
			7/9/2013	43.83	3.87	NA	NA	NA	NA	NA	NA	NA
			4/12/2013	NA	NA	330	58	55	2.9	16	6.6	60
			4/10/2013	37.89	9.81	NA	NA	NA	NA	NA	NA	NA
			1/15/2013	NA	NA	290	62	57	2.8	15	6.3	55
			1/14/2013	32.26	15.44	NA	NA	NA	NA	NA	NA	NA
			10/30/2012	40.05	7.65	330	57	60	3.3	19	7.5	60
			7/25/2012	38.62	9.08	330	67	61	3.3	17	6.4	59
			4/19/2012	23.02	24.68	370	74	52	2.9	30	12	120

A-17 (Continued). NCMA Sentry Well Water Level and Water Quality Data
Well 32C03, County MW #3, Intermediate

Date	Sulfate (mg/L)	Nitrate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Boron (mg/L)	Fluoride (mg/L)	Iodide (mg/L)	Manganese (mg/L)	Bromide (mg/L)	Alkalinity, Total (as CaCO3) (mg/L)	Carbonate (as CaCO3) (mg/L)	Hydroxide (as CaCO3) (mg/L)	Specific Conductance (umhos/cm)	Iron (mg/L)	Bromide / Chloride Ratio	Chloride / Bromide Ratio
1/16/2014	35	8.1	8.2	<0.1	<0.1	<0.01	0.008	0.12	54	<10	<10	450	0.47	0.0019	517
1/14/2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/16/2013	38	7.5	<1	0.06	<0.1	<0.01	0.009	0.1	54	<10	<10	450	0.21	0.0017	580
10/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/11/2013	30	7.4	<1	0.071	<0.1	<0.01	0.006	<0.1	61	<10	<10	440	0.17	NA	NA
7/9/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/12/2013	35	7.5	<1	0.091	<0.1	<0.01	0.019	0.1	60	<10	<10	460	0.49	0.0017	580
4/10/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/15/2013	38	8.3	<1	0.089	<0.1	<0.01	0.01	<0.1	55	<10	<10	470	0.23	NA	NA
1/14/2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/30/2012	36	7.8	<1	0.09	<0.1	<0.01	0.033	<0.1	60	<10	<10	470	1.9	NA	NA
7/25/2012	35	8.2	<1	<0.1	<0.1	<0.01	0.068	<0.1	59	<10	<10	460	0.49	NA	NA
4/19/2012	58	5	<1	0.17	0.2	<0.01	0.056	<0.2	120	<10	<10	580	1.3	NA	NA