TO: BOARD OF DIRECTORS

FROM: BRUCE BUEL BB

DATE: SEPT. 7, 2007

AGENDA ITEM
C-3
SEPT. 12, 2007

SAIC PRESENTATION

ITEM

Presentation by Dr. Brad Newton of SAIC regarding revisions to 2007 Groundwater Storage Calculations and Proposed Water Emergency Triggers [RECEIVE PRESENTATION].

BACKGROUND

Attached is a copy of SAIC Memorandum entitled "Revisions to Groundwater in Storage underneath the Nipomo Mesa Management Area as of April 2007". As detailed in the Memorandum, SAIC has recalculated the storage above sea-level based on new information and based on elimination of actively pumping wells from the data set.

Also attached is a SAIC Memorandum entitled "Alternative Methodology to Determine the Water Conservation Shortage Stages". As detailed in the Memorandum, SAIC looked at options for determining the appropriate Water Supply Emergency Stage in drought situations. SAIC's recommendation to use storage above sea level will be incorporated into the Draft Ordinance under preparation by District CounSEL for conceptual review by your Honorable Board at your September 26, 2007 Meeting.

RECOMMENDATION

The presentation is for information only. Staff is not recommending action at this time; however, this presentation does give your Honorable Board the opportunity to ask questions of Dr. Newton.

ATTACHMENT

- REVISIONS TO GW STORAGE CALCULATIONS MEMORANDUM
- EMERGENCY WATER SUPPLY TRIGGER OPTIONS MEMORANDUM

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TECHNICAL MEMORANDUM

TO: Bruce Buel, General Manager, Nipomo Community Services District

FROM: Drew Beckwith, SAIC

RE: Revision of Groundwater in storage underneath the Nipomo Mesa Management Area as of April 2007, Project Number 01-0236-00-9100

DATE: August 28, 2007

INTRODUCTION

Nipomo Community Services District (NCSD) directed SAIC to: (1) determine the amount of groundwater in storage within the deep aquifer underneath Nipomo Mesa Management Area (NMMA) based on groundwater surface elevation data; (2) compare the groundwater in storage between 2007, 2006, and 2000; and, (3) compute the volumes of groundwater in storage above sea level for 2007, 2006, and 2000. Similar prior analyses were conducted by SAIC in October 2006 (TM #1) and May 2007 (TM #4).

RESULTS

The results are presented in Table 1.

Table 1: Groundwater in Storage Underneath the NMMA

	Volume of groundwater in storage above sea level (AF)			
SAIC Deliverable	**Spring 2000**	**Spring 2006**	**Spring 2007**	**Comment**
TM 1, dated 10-11-2006	124,000	121,000	-	Initial estimates based on available data
TM 4, dated 5-29-07	105,000	102,000	90,000	Well location and measurement reference point updated from GPS survey
TM 4 Revision, dated 8-21-2007	108,000	107,000	93,000	Potential Monitoring Well refinements based on review of well data provided by DWR

Tables and figures are attached, which support the above results.

METHODOLOGY

Data provided by DWR, consisting of well completion reports, lithographic logs, electronic logs, and pump tests, was used to develop the hydrogeologic conditions underlying the NMMA. A systematic review of the wells used for storage calculations was conducted in

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order to verify that each well's screened interval is within the primary production aquifer (Paso Robles Formation). Groundwater surface elevation measurements that do not represent water in the Paso Robles Formation were not included in the calculations. None of NCSD's production wells were included in the analysis. Groundwater in storage calculations were made from a "master list" of wells in which each well has a groundwater surface elevation measurement for each of the three years (2000, 2006, 2007).

Groundwater Surface Elevation Measurements

Groundwater surface elevation data was obtained from the San Luis Obispo County Department of Public Works (SLO DPW), NCSD, and Woodlands. SLO DPW measures groundwater surface elevations in monitoring wells in the spring and the fall of each year. Woodlands and NCSD measures groundwater surface elevations in their monitoring wells monthly. Woodlands' groundwater surface elevation data for April 2007 had not been released at the time of this analysis so January 11th was used. Table 2 lists the groundwater surface elevation data for Spring 2000, Spring 2006, and Spring 2007.

The groundwater surface elevation data was reviewed in combination with well completion reports and historical hydrographic records in order to flag data that appeared to be anomalous. Wells that do not access the primary production aquifer or were otherwise determined to not accurately represent static water levels within the aquifer were not included in analysis. The groundwater surface elevation measured at each well location in Spring 2000, Spring 2006, and Spring 2007 is posted in Figures 2, 3, and 4, respectively.

Groundwater Surface Interpolation

The individual groundwater surface measurements from each year were interpolated to a groundwater surface elevation field using the inverse distance weighting method. The interpolation is based on groundwater surface elevation data alone, and does not incorporate structural geology that may or may not influence the groundwater surface. Estimates of the groundwater surface elevation field in Spring 2000, Spring 2006, and Spring 2007 are shown in color on Figures 2, 3, and 4, respectively.

Groundwater Volume Estimate

The amount of groundwater in storage under the NMMA was estimated using the boundary determined in Phase III of the trial. The groundwater volume above sea level as shown in Table 1 was estimated by subtracting both the sea level surface (elevation equals zero) and the volume of bedrock above sea level from the saturated volume. The bedrock surface elevation is based on Figure 11: Base of Potential Water-Bearing Sediments, presented in the report, Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR 2002). The bedrock surface elevation was preliminarily verified by reviewing driller reports obtained from DWR. The saturated volume above sea level was multiplied by the specific yield of 11.7% to estimate

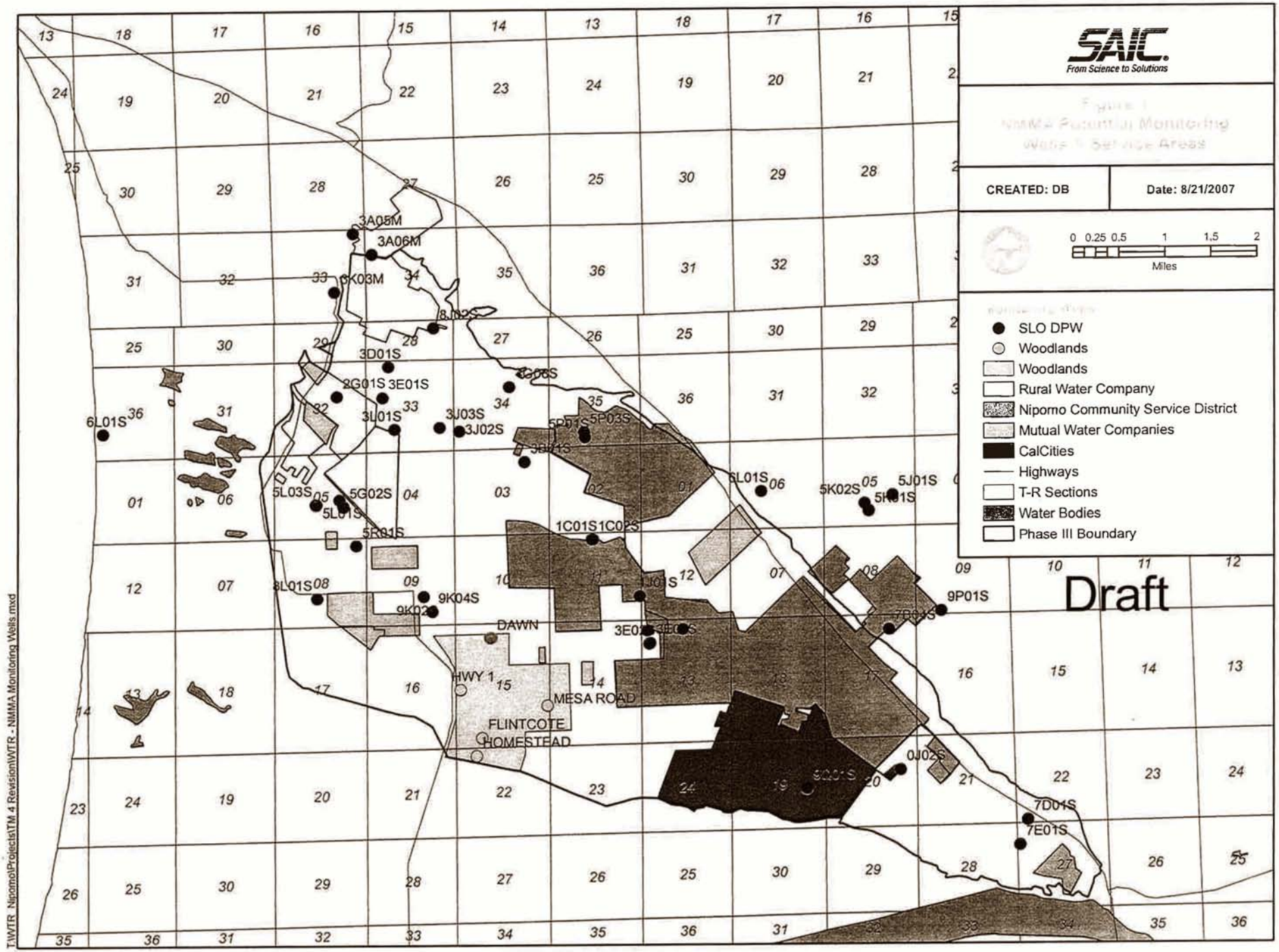
the amount of groundwater in storage above sea level. The specific yield was based on the average weighted specific yield for the Nipomo Mesa Hydrologic Sub-Area (DWR 2002, pg. 86).

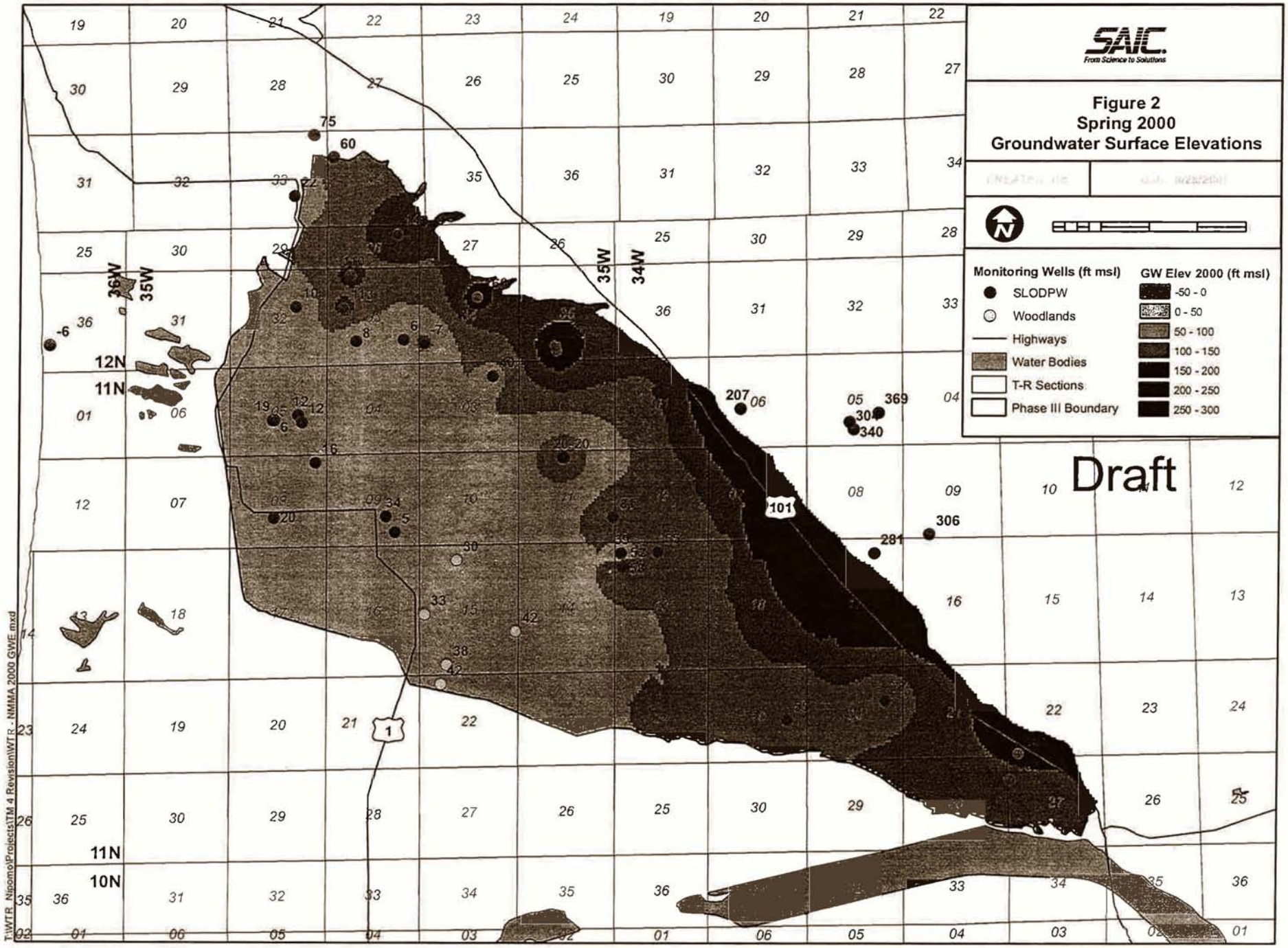
REFERENCES

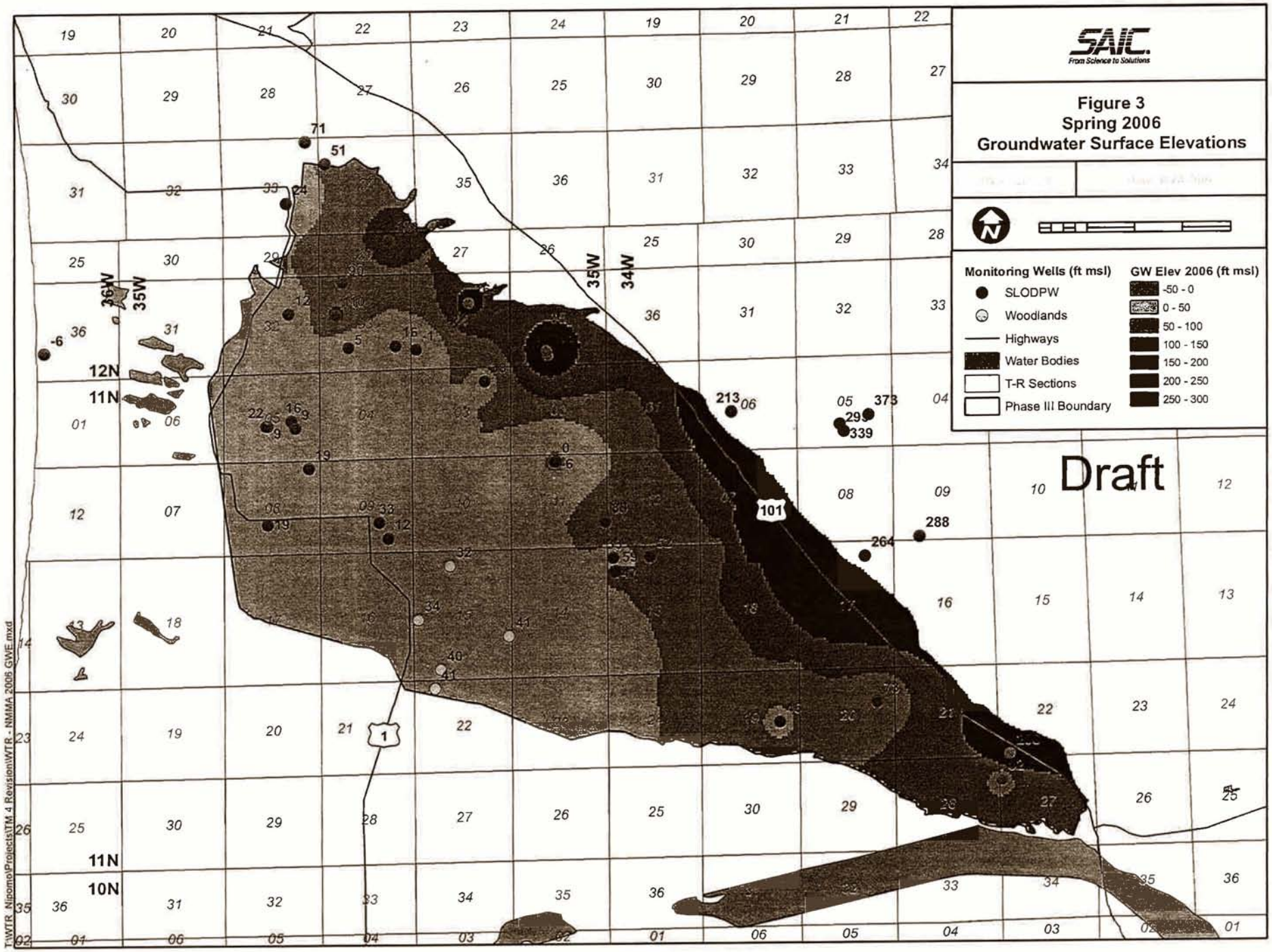
Department of Water Resources (DWR). 2002. Water Resources of the Arroyo Grande – Nipomo Mesa Area, Southern District Report.

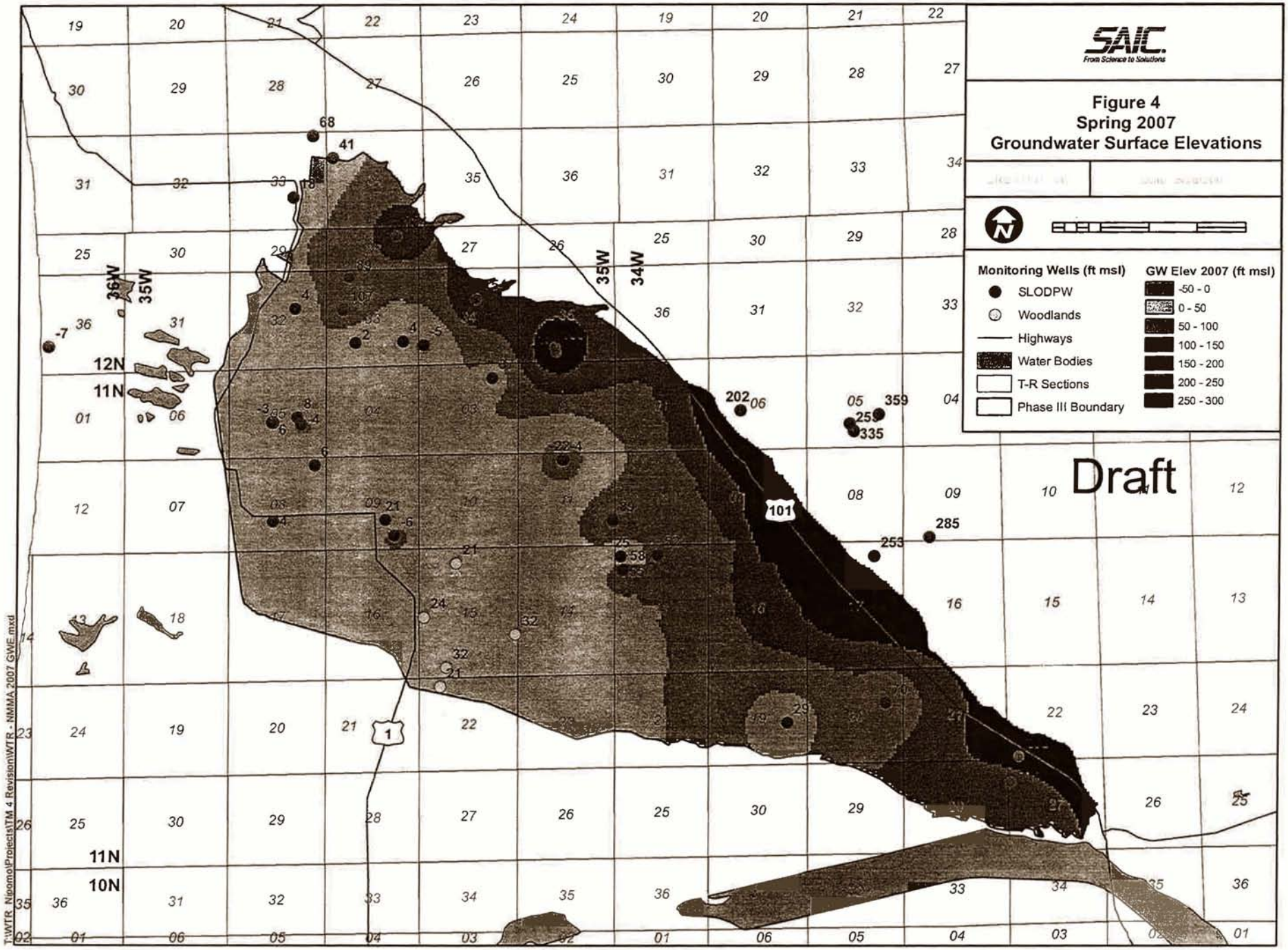
Table 2: Groundwater Surface Elevation Data for Spring 2000, Spring 2006, and Spring 2007

Well_ID	Well_Name	Latitude (decimal degrees)	Longitude (decimal degrees)	Monitoring Agency	Date	Groundwater Elevation (ft msl)	Date	Groundwater Elevation (ft msl)	Date	Groundwater Elevation (ft msl)
11N34W05J01S	-	35.0604	-120.4757	SLO DPW	4/21/2000	369.0	4/11/2006	372.8	4/19/2007	359.2
11N34W05K01S	TODD DOMESTIC	35.0580	-120.4803	SLO DPW	4/21/2000	339.7	4/11/2006	338.6	4/19/2007	334.8
11N34W05K02S	TODD IRRIGATION	35.0592	-120.4810	SLO DPW	4/21/2000	304.2	4/11/2006	292.8	4/19/2007	252.7
11N34W06L01S	-	35.0616	-120.5011	SLO DPW	4/21/2000	206.7	4/11/2006	213.1	4/19/2007	201.6
11N34W09P01S	-	35.0417	-120.4667	SLO DPW	4/21/2000	305.5	4/11/2006	288.2	4/19/2007	285.0
11N34W17B04S	-	35.0389	-120.4769	SLO DPW	4/21/2000	280.7	4/6/2006	263.6	4/19/2007	253.2
11N34W19Q01S	BENNY - DIVISION	35.0138	-120.4935	SLO DPW	4/21/2000	54.9	4/11/2006	46.1	4/23/2007	29.5
11N34W20J02S	EGG FARM	35.0164	-120.4753	SLO DPW	4/21/2000	76.7	4/11/2006	73.0	4/23/2007	70.2
11N34W27D01S	P G & E	35.0078	-120.4510	SLO DPW	4/21/2000	180.9	4/6/2006	206.3	4/23/2007	207.6
11N34W27E01S	LAMPHIER - MESA	35.0039	-120.4525	SLO DPW	4/21/2000	106.6	4/6/2006	82.1	4/23/2007	101.4
11N35W03B01S	FITZPATRICK - FRANKIE	35.0674	-120.5469	SLO DPW	4/20/2000	39.7	4/18/2006	38.4	4/23/2007	36.8
11N35W05G01S	ANDREWS - FOWLER LANE	35.0622	-120.5830	SLO DPW	4/19/2000	12.5	4/10/2006	15.7	4/24/2007	8.2
11N35W05G02S	WHITE - FOWLER LANE	35.0610	-120.5823	SLO DPW	4/19/2000	11.5	4/10/2006	9.3	4/24/2007	-4.1
11N35W05L01S	SACKMAN - HWY #1	35.0615	-120.5874	SLO DPW	4/19/2000	5.9	4/10/2006	8.7	4/24/2007	-3.2
11N35W05L03S	SACKMAN	35.0615	-120.5876	SLO DPW	4/19/2000	19.3	4/10/2006	22.0	4/24/2007	6.4
11N35W05R01S	GATES - CALLENDER	35.0548	-120.5800	SLO DPW	4/19/2000	16.1	4/13/2006	18.6	4/24/2007	6.1
11N35W08L01S	-	35.0465	-120.5878	SLO DPW	4/19/2000	20.2	4/30/2006	19.0	4/24/2007	4.1
11N35W09K02S	SCHAEFER - HWY#1/WILLOW	35.0463	-120.5671	SLO DPW	4/19/2000	34.3	4/10/2006	32.7	4/24/2007	21.1
11N35W09K04S	CASANO - HWY#1/WILLOW	35.0439	-120.5655	SLO DPW	4/19/2000	4.6	4/10/2006	11.8	4/24/2007	-6.4
11N35W11C01S	NASHOLM - MESA	35.0547	-120.5340	SLO DPW	4/21/2000	-19.7	4/11/2006	0.2	4/24/2007	-4.1
11N35W11C02S	STRUBLE - MESA	35.0547	-120.5342	SLO DPW	4/21/2000	-20.1	4/11/2006	-6.0	4/24/2007	-22.2
11N35W11J01S	CAMACHO - MESA	35.0454	-120.5251	SLO DPW	4/20/2000	80.9	4/11/2006	88.2	4/23/2007	88.6
11N35W13C01S	ARLT - POMEROY	35.0399	-120.5169	SLO DPW	4/20/2000	55.1	4/11/2006	52.2	4/19/2007	51.5
11N35W13D01S	KAMINAKA	35.0398	-120.5238	SLO DPW	4/20/2000	38.6	4/6/2006	33.0	4/23/2007	24.6
11N35W13E02S	KAMINAKA - SOUTH	35.0377	-120.5235	SLO DPW	4/20/2000	58.0	4/6/2006	46.8	4/19/2007	55.0
11N35W13E03S	KAMINAKA - NORTH	35.0378	-120.5233	SLO DPW	4/20/2000	52.4	4/6/2006	59.0	4/19/2007	58.2
12N35W28J02S	BARNETT - HALCYON	35.0893	-120.5640	SLO DPW	4/13/2000	142.4	4/13/2006	132.9	4/17/2007	133.7
12N35W32G01S	COLE - HALCYON	35.0787	-120.5830	SLO DPW	4/20/2000	9.5	4/19/2006	11.8	4/24/2007	4.3
12N35W33D01S	PHIL - BEN	35.0833	-120.5729	SLO DPW	4/13/2000	109.9	4/13/2006	90.1	4/17/2007	88.8
12N35W33E01S	RENO - HALCYON	35.0783	-120.5742	SLO DPW	4/20/2000	112.7	4/19/2006	110.1	4/24/2007	107.5
12N35W33J02S	DICK - FERNDALE	35.0727	-120.5595	SLO DPW	4/20/2000	-7.2	4/18/2006	-1.3	4/23/2007	-5.0
12N35W33J03S	FAGUNDES - FERNDALE	35.0733	-120.5633	SLO DPW	4/20/2000	5.5	4/18/2006	15.9	4/23/2007	3.8
12N35W33L01S	JOHNSON - HALCYON	35.0732	-120.5721	SLO DPW	4/20/2000	7.7	4/19/2006	4.8	4/23/2007	2.3
12N35W34G08S	OLIVER - LOS BERROS	35.0795	-120.5496	SLO DPW	4/17/2000	165.5	4/13/2006	164.4	4/17/2007	153.9
12N35W35P01S	JOHNSON - APPLEGATE RANCH	35.0711	-120.5351	SLO DPW	4/20/2000	179.0	4/18/2006	181.1	4/19/2007	182.8
12N35W35P03S	SEVERENCE - DOMESTIC	35.0719	-120.5352	SLO DPW	4/20/2000	160.0	4/18/2006	167.7	4/19/2007	168.5
12N36W36L01S	PISMO BEACH - EAST	35.0737	-120.6283	SLO DPW	4/28/2000	-6.1	4/20/2006	-6.1	4/18/2007	-7.4
32S13E33A05M	GARING - LOS BERROS	35.1049	-120.5792	SLO DPW	4/13/2000	75.2	4/13/2006	71.3	4/17/2007	67.7
32S13E33A06M	GARING NEW DOM	35.1014	-120.5756	SLO DPW	4/13/2000	60.0	4/13/2006	50.6	4/17/2007	41.3
32S13E33K03M	WALLER SEED COMPANY	35.0956	-120.5830	SLO DPW	4/14/2000	22.5	4/13/2006	23.7	4/17/2007	17.6
-	DAWN	35.0393	-120.5542	Woodlands	4/18/2000	30.3	4/17/2006	31.6	1/11/2007	21.3
-	FLINTCOTE	35.0234	-120.5564	Woodlands	4/18/2000	37.7	4/17/2006	40.5	1/11/2007	31.5
-	HOMESTEAD	35.0205	-120.5575	Woodlands	4/18/2000	41.6	4/17/2006	40.6	1/11/2007	21.4
-	HWY 1	35.0312	-120.5603	Woodlands	4/18/2000	33.4	4/17/2006	34.3	1/11/2007	23.9
-	MESA ROAD	35.0282	-120.5435	Woodlands	4/18/2000	42.3	4/17/2006	41.4	1/11/2007	31.8









SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WATER RESOURCES ENGINEERING - CARPINTERIA

MEMORANDUM

TO: Bruce Buel, General Manager, Nipomo Community Service District

FROM: Brad Newton, SAIC

RE: Alternative Methodology to Determine the Water Conservation Shortage Stages, 01-0236-00-9100

DATE: August 28, 2007

INTRODUCTION

Nipomo Community Services District (NCSD) requested SAIC to review the Draft Ordinance Chapter 3.24 - Emergency Water Shortage Regulations (Regulations), and (1) evaluate the methodology used to determine the Water Conservation Shortage Stages, and (2) propose an alternative methodology, if appropriate, to determine the Water Conservation Shortage Stages. The Draft Ordinance Chapter 3.24 methodology is based on annual rainfall to determine the Water Conservation Shortage Stages.

SUMMARY OF FINDING

Draft Ordinance Chapter 3.24 utilizing CDF Nipomo Rain Gauge Data (WY 1960-2006)

As presented in the technical memorandum titled Evaluation of Chapter 3.24 Emergency Water Shortage Regulations dated June 6, 2007 the Ordinance was applied to the 46 years historical CDF Nipomo rain gauge record (WY 1960-2006). Using rainfall magnitude as a trigger results in an insufficient level of conservation, and results in long-term decline in water levels and amount of recoverable groundwater in storage (Figure 1).

Alternative Methodology to Determine the Water Conservation Shortage Stages

The conceptual underpinnings of the Draft Ordinance Chapter 3.24 were considered and a new metric is proposed for the Ordinance. Groundwater in storage above sea level (GWS) will be evaluated annually by the Nipomo Mesa Management Area (NMMA) Technical Group (TG) as ordered by the Court in the final decision pursuant to the adjudication of the Santa Maria Groundwater Basin. It is recommended that the annual GWS estimate be utilized as the basis for establishing triggers to set Water Shortage Conservation Stages. The trigger conditions for Stage I-IV and the reset value would be revisited as additional data become available to NCSD. Additionally, it is recommended that if 65,000 acre-feet (AF) of GWS is estimated, annual pumping would be limited to an amount established by the Board.

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Water Shortage Conservation Stages I – IV would be triggered by the following conditions when the GWS is at or below the reset value:

Stage I Conservation – Weather Watch

Trigger Condition: **1,500 AF** decline in GWS from the previous year

Stage II Conservation – Water Warning

Trigger Condition: **3,000 AF** decline in GWS from the previous year

Stage III Conservation – Water Emergency

Trigger Condition: **6,000 AF** decline in GWS from the previous year

Stage IV Conservation – Extreme Water Emergency

Trigger Condition: **10,000 AF** decline in GWS from the previous year

In conjunction with a trigger metric and conditions, a reset value is proposed to relinquish the prescribed conservation action following each Conservation Stage set forth in the Ordinance. At this time, the reset value of 95,000 AF of GWS is proposed. If in any year, the GWS is greater than the reset value, annual changes in GWS that may trigger a conservation stage would be evaluated by the Board for implementation of conservation. Continued review of new data, as it becomes available, may likely motivate a revision of this reset value.

DISCUSSION

The following example is presented to illustrate the application of the proposed metric. If the change in GWS for one year was -10,000 AF of water, then Stage IV Conservation would be triggered and the commensurate conservation actions would be initiated. If after some time, the change in GWS increase 5,000 AF of water, then Stage II Conservation would be triggered and the commensurate conservation actions would be initiated. If at some time, the total GWS is greater than or equal to 95,000 AF, then all conservation actions would be relaxed. If at some time, the GWS was 65,000 AF or less, a mandatory "stop all pumping" action would be established.

Estimates of GWS for Spring 2000, Spring 2006, and Spring 2007 have been made and presented in TM#4 Revised dated August 22, 2007. In addition to these estimates, estimates have been made for 1975, 1980, 1985, 1990, and 1995 (Table 1). From these estimates, several key insights may be gleaned, (1) the reset value of 95,000 AF is consistent with the GWS estimate made for the beginning of hydrologic base period presented to the Court during the adjudication of the Santa Maria Groundwater Basin, (2) the GWS has exceeded the reset value during several wet periods, (3) GWS was lowest following the prolonged drought of 1984 – 1991, (4) GWS increased during the wet period following the drought of 1984 – 1991, and the GWS increased above the reset value by year 2000, (5) the magnitude of the decrease in GWS

from 2006 to 2007 is sufficient to trigger Stage IV Conservation – Extreme Water Emergency, which is consistent with the RMS Level of Severity III recently certified by County of San Luis Obispo Board of Supervisors on June 26, 2007, and (6) the estimate of average annual decrease in GWS from 1985 to 1990 is 9,000 AF, which is sufficient to have triggered Stage III Conservation – Water Emergency.

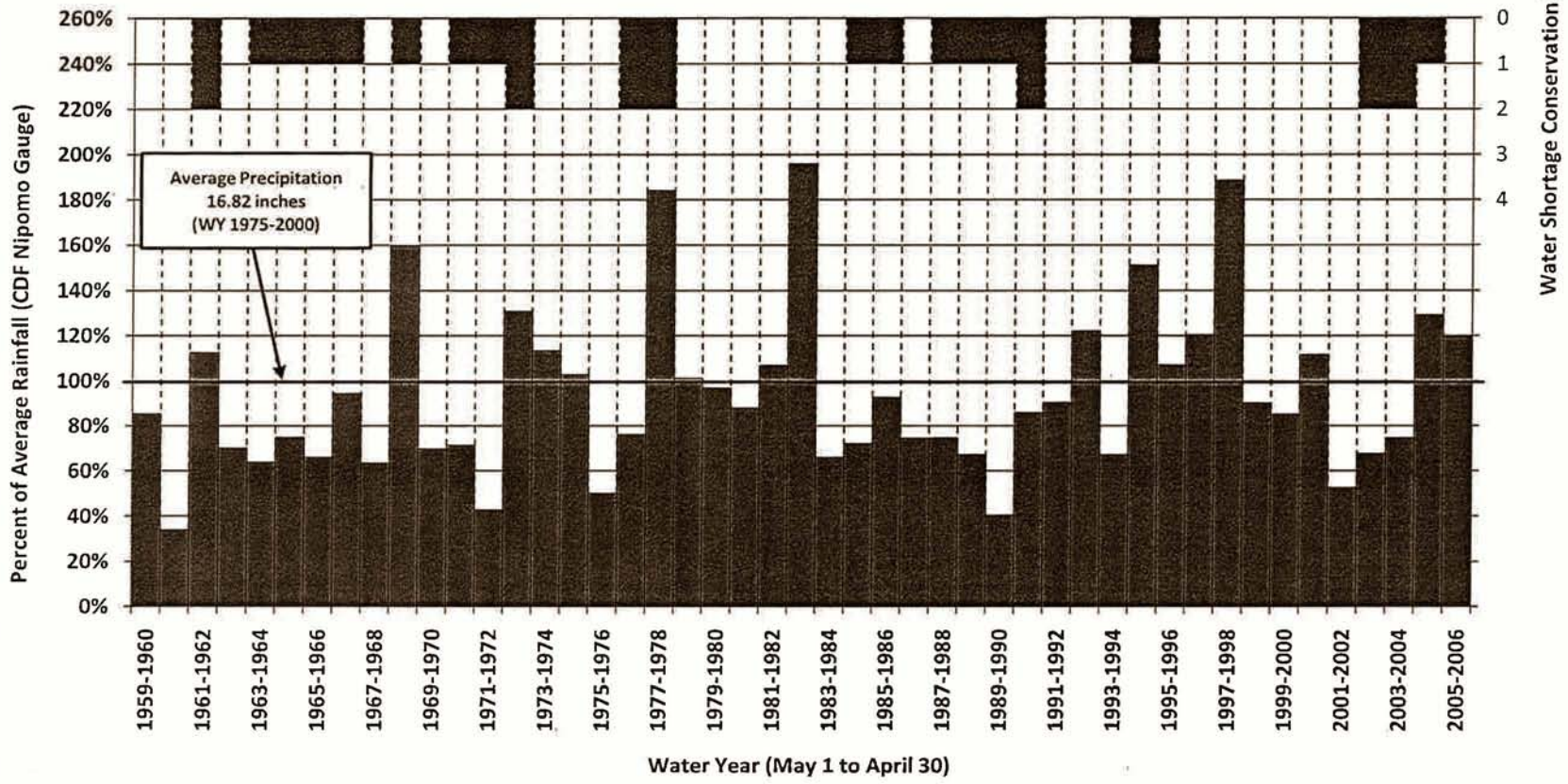
Table 1: GWS beneath NMMA

DATE	GWS (Acre-Feet)
Spring 1975	95,000
Spring 1980	90,000
Spring 1985	106,000
Spring 1990	62,000
Spring 1995	89,000
Spring 2000	108,000
Spring 2006	107,000
Spring 2007	93,000

Hypothetical Water Conservation Shortage Stages based on NCSD 04-10-07 Draft Ordinance using CDF Nipomo Historical Rain Gauge Record

Stage	Rainfall Criteria	Years	Conservation Goal
0	PY =>80%	25	
1	PY <80 %	14	
2	NLY <60% and PY<80% or PY <60%	7	10%
3	PY<60% and NLY<60%	0	35%
4	PY<50% and NLY<50%	0	50%

Note: PY = Prior Year, NLY =Next to Last Year, % = Percent of Average Rainfall



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Water Shorage Stages

Draft
Subject to Revision

Figure 1
SAIC WRE
Created 4/13/07