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June 28, 2007

Via Certified Mail #7006 2150 0004 3614 1378
Return Receipt Requested

Mr. Robert Casey
Arizona Department of Environmental Quality
Water Quality Enforcement Unit
1110 West Washington Street
Phoenix, Arizona 85007-2935

Re: Groundwater Monitoring Report, Second Quarter 2007
Phelps Dodge Sierrita, Inc. – Mitigation Order on Consent, Docket No. P-50-06

Dear Mr. Casey:

Phelps Dodge Sierrita, Inc. ("PDSI") submits three copies of the attached Quarterly Groundwater Monitoring Report that provides the results of groundwater monitoring conducted during the second quarter of 2007 in the vicinity of the PDSI Tailing Impoundment. This document was prepared by Hydro Geo Chem, Inc. as described in Section 3.3 of the Work Plan. Also included are compact discs containing the complete report and the report tables in electronic format.

Please do not hesitate to contact Mr. Stuart Brown at (503) 675-5252 or Mr. Ned Hall at (520) 648-8857 if you have any question regarding this submittal.

Very Truly Yours,

A handwritten signature in black ink that reads "Chad D. Fretz". The signature is stylized with a large, looped "F" and a trailing flourish.

Chad D. Fretz, Manager
Environment, Land and Water

CDF:eh
Attachment
20070628-001

xc: John Brack, Phelps Dodge Sierrita, Inc.
Chad Fretz, Phelps Dodge Sierrita, Inc.
Ray Lazuk, Phelps Dodge Corporation
Stuart Brown, Bridgewater Group, Inc.

**SECOND QUARTER 2007
GROUNDWATER MONITORING REPORT
TASKS 2.2 AND 2.3 OF AQUIFER CHARACTERIZATION PLAN
MITIGATION ORDER ON CONSENT DOCKET NO. P-50-06
PIMA COUNTY, ARIZONA**

Prepared for:

PHELPS DODGE SIERRITA, INC.
6200 West Duval Mine Road
Green Valley, Arizona 85614

Prepared by:

HYDRO GEO CHEM, INC.
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(520) 293-1500

June 28, 2007

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TASKS 2.2 AND 2.3 OF AQUIFER CHARACTERIZATION PLAN
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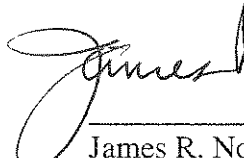
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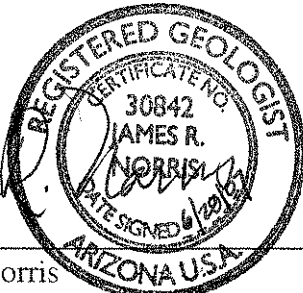
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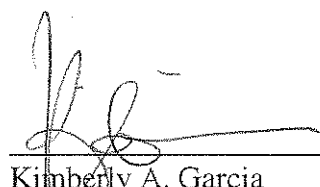
6200 West Duval Mine Road
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Approved by:

Prepared by:


James R. Norris
Arizona Registered Geologist No. 30842




Kimberly A. Garcia
Environmental Scientist

June 28, 2007

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C	Second Quarter 2007 Data Verification Report for Groundwater Samples Collected for Extended Parameters by Phelps Dodge Sierrita, Inc. and Hydro Geo Chem, Inc.
D	Analytical Data Reports from ACZ Laboratories
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1. INTRODUCTION

This data report provides the results of groundwater monitoring conducted in the second quarter of 2007 in the vicinity of the Phelps Dodge Sierrita, Inc. (PDSI) Tailing Impoundment (PDSTI). Groundwater monitoring was conducted by PDSI pursuant to Tasks 2.2 and 2.3 of the Work Plan (Hydro Geo Chem, Inc. (HGC), 2006a) to characterize sulfate in the vicinity of the PDSTI. The Work Plan was approved by the Arizona Department of Environmental Quality (ADEQ) pursuant to the Mitigation Order on Consent Docket No. P-50-06. HGC prepared this groundwater monitoring report on behalf of PDSI.

1.1 Scope of Groundwater Monitoring

The scope of the groundwater monitoring program is described in Sections 3.3.2 and 3.3.3 and Appendix G of the Work Plan (HGC, 2006a). Groundwater monitoring for Task 2.2 consists of water elevation measurement and collection of groundwater samples from wells in the vicinity of the PDSTI. Task 2.3 consists of depth-specific groundwater sampling to determine vertical variations of sulfate along the screened interval of selected wells.

1.1.1 Groundwater Monitoring for Task 2.2

The Work Plan identifies two purposes for the groundwater monitoring program required in Task 2.2: plume monitoring and regional monitoring. Plume monitoring is conducted quarterly at wells that are proximal to the sulfate plume in order to track the plume's location in the aquifer. Regional monitoring is set on a semiannual basis during the first and third quarters

of 2007 to characterize regional hydrologic conditions using wells that are outside the area of the sulfate plume. The data collected for the groundwater monitoring program will be used to refine the conceptual model of the sulfate plume and to calibrate a numerical model for the fate and transport of sulfate within the region. This report presents the results of plume monitoring conducted during the second quarter of 2007. Pursuant to the Work Plan, the only constituent of interest for quarterly plume monitoring is sulfate.

Table 1 lists all wells identified in the Work Plan for quarterly monitoring, their availability for sampling in the second quarter of 2007, and their sampling status. As discussed in the Work Plan, Table 1 consists of wells that are under the control of PDSI and others that are not. PDSI gained access to a number of wells that are not under their control; these wells were accessed with the well owners' permission, and all samples were collected in the presence of the owner or their representative. In addition to the wells listed in the Work Plan, Table 1 also lists alternate wells that have been used in place of wells that were unable to be sampled.

Analytical data for plume monitoring during the second quarter of 2007 were obtained from two sources: PDSI and HGC. Groundwater sampling and analysis methods used by PDSI and HGC are described in the Quality Assurance Project Plan (QAPP) contained in Appendix E of the Work Plan (HGC, 2006a). Results of plume monitoring for Task 2.2 are presented in Section 2.1.

1.1.2 Groundwater Monitoring for Task 2.3

Depth-specific groundwater sampling for Task 2.3 was conducted at wells ESP-4 and MH-11 from March 20 to March 23, 2007 and at well ESP-2 from June 3 to June 7, 2007. The depth-specific sampling was accomplished using the BESST Hydrobooster™ groundwater sampling technique. This technique uses a high-lift gas displacement pump connected to sample tubing that is lowered into a well and through which a depth-discrete sample is retrieved. All samples collected were unfiltered and submitted to an Arizona state certified laboratory for sulfate analysis using the methods described in Appendix E of the QAPP (HGC, 2006a).

Sampling at ESP-4 was conducted under active pumping conditions with a steady pumping rate of approximately 1550 gallons per minute (gpm). This is in contrast to the non-pumping conditions for which depth-specific sampling was conducted for ESP-4 in the fourth quarter of 2006. Groundwater samples were collected from monitoring well MH-11 under static, or non-pumping, conditions. Results of groundwater sampling for Task 2.3 are presented in Section 2.2.

1.2 Updates to First Quarter 2007 Groundwater Monitoring Report

As discussed in Section 2 of the First Quarter 2007 Groundwater Monitoring report (HGC, 2007), survey coordinates for wells RRQC-1, RRQC-2, and RRQC-3 were uncertain at the time the report was prepared. Survey coordinates for these wells have been verified and additional information was obtained on the surface elevation at twelve wells. Updated survey

information and revised groundwater elevation and sulfate concentration maps for the first quarter of 2007 are provided in Appendix A.

2. GROUNDWATER MONITORING RESULTS

2.1 Results of Monitoring for Task 2.2

Analytical results and groundwater elevation data for the second quarter of 2007 are tabulated in Tables 2 and 3, respectively. Figure 1 shows the dissolved sulfate concentrations in groundwater samples from wells sampled in the second quarter of 2007. Figure 2 shows groundwater elevations in the second quarter of 2007. Groundwater elevations were calculated using the depth to water measurements collected under static (nonpumping) conditions for all wells shown. Water level data for the IW-series wells were not used to estimate groundwater elevation contours for Figure 2 because the depth to water was measured while the wells were pumping.

2.2 Results of Monitoring for Task 2.3

Analytical results for depth-specific samples collected from ESP-4 and MH-11 are shown in Table 4. Sulfate concentrations for samples collected between depths of 450 to 950 feet from ESP-4 ranged from 220 milligrams per liter (mg/L) to 730 mg/L, with the highest concentrations centered around 800 feet below land surface (bls). Samples collected between depths of 450 and 750 feet from MH-11 had sulfate concentrations of 1500 mg/L in all but one sample which had a sulfate concentration of 1600 mg/L at a depth of 550 ft bls. Results for ESP-2 are unavailable and will be reported in the third quarter 2007 groundwater monitoring report.

2.3 Quality Assurance/Quality Control Review

Pursuant to Section 6.4 of the QAPP, a data verification report was prepared for quality assurance and quality control purposes. The data verification report reviews sulfate data collected by PDSI and HGC during the second quarter of 2007, and is included in Appendix B. In this quarter, samples were collected from two wells, CW-3 and NP-2, previously unsampled for this project. As this was their initial sampling for plume monitoring, an extended suite of analytes was evaluated (Table 5). Because these samples had an expanded analyte list, a separate data verification report is provided for them in Appendix C.

Analytical laboratory reports for samples collected by PDSI and HGC during the second quarter of 2007 are provided in portable document format in the compact disc in Appendix D. Copies of groundwater sampling forms for samples collected by HGC are in Appendix E.

As determined by the analytical data verification review, all data for samples collected in the second quarter of 2007 by HGC and PDSI are of acceptable quality for use in the aquifer characterization being conducted pursuant to the Work Plan.

3. DISCUSSION

This data report provides the results of groundwater monitoring conducted in the vicinity of the PDSTI for the second quarter of 2007. As presented in Table 1, during this monitoring period 66 wells were identified for quarter quality sampling and 59 wells were identified for water level monitoring. Groundwater samples were collected from 58 plume area wells and depth to water measurements were collected at 50 wells.

Groundwater samples were not collected from all the wells identified in the Work Plan due to delays related to ongoing well development, owner limitations on access, unsuitable well construction, inability to contact the owner, inoperable pump status, or a well no longer existing. The specific reason(s) for not sampling these wells are provided in Table 1. Overall, groundwater monitoring conducted during the second quarter of 2007 is deemed to have met the objective of identifying the location of the sulfate plume from the PDSTI.

Figure 1 shows the distribution of dissolved sulfate concentrations in samples collected from wells in the basin fill aquifer. The concentration contours shown in Figure 1 are inferred assuming that sulfate concentrations in the aquifer are spatially correlated, although a strict linear interpolation was not applied. Sulfate concentration contours of 50, 100, 250, 500, 1000, and 1500 mg/L are shown as requested by ADEQ (2006).

Comparison of the second quarter 2007 sulfate concentrations in the vicinity of the PDSTI with those shown in the Work Plan for early 2006 and with those in the groundwater monitoring reports for the fourth quarter of 2006 (HGC, 2006b) and first quarter of 2007

(HGC, 2007) indicates no substantive difference in the location of the sulfate plume from the PDSTI as defined by the 250 mg/L sulfate concentration contour.

Groundwater elevations are shown on Figure 2. Groundwater elevations decrease from west to east in the immediate vicinity of the PDSTI, and from south to north across the central portion of the study area near Green Valley. Comparison of the second quarter 2007 water elevations with those in the Work Plan for early 2006 and with those in the groundwater monitoring reports for the fourth quarter of 2006 (HGC, 2006b) and first quarter of 2007 (HGC, 2007) indicates no substantive difference in groundwater flow patterns.

4. LIMITATIONS

The information and conclusions presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and the party for whom this report was originally prepared. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

5. REFERENCES

- Arizona Department of Environmental Quality. 2006. Correspondence from Robert Casey to John Brack, Regarding: Mitigation Order on Consent, Docket P-50-06 – Work Plan Response. September 22, 2006.
- Errol L. Montgomery & Associates and Dames & Moore. 1994. Aquifer Protection Permit Application Sierrita Operation, Cyprus Sierrita Corporation, Pima County, Arizona. September 7, 1994.
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- HGC. 2006b. Groundwater Monitoring Report, Fourth Quarter 2006, Tasks 2.2 and 2.3 of Aquifer Characterization Plan, Mitigation Order on Consent Docket No. P-50-06. December 29, 2006.
- HGC. 2007. Groundwater Monitoring Report, First Quarter 2007, Tasks 2.2 and 2.3 of Aquifer Characterization Plan, Mitigation Order on Consent Docket No. P-50-06. March 30, 2007.
- Laney, R.L. 1972. Chemical Quality of Water in the Tucson Basin, Arizona. U.S. Geological Survey Water Supply Paper 1939-D.
- Pima Association of Governments. 1983. Region Wide Groundwater Quality in the Upper Santa Cruz Basin Mines Task Force Area. September 1983.

TABLES

TABLE 1
Summary of Groundwater Monitoring for Mitigation Order
Docket No. P-50-06 for Second Quarter 2007 (Sorted by ADWR Well Registry Number)

Well Name	ADWR 55 Registry Number	Owner	Purpose	Casing or Well Depth (feet)	Work Plan Specification		Q2-2007 Monitoring		Status	Substitute Well
					Water Level	Water Quality	Water Level Measured?	Water Quality Sample Collected?		
WELLS FOR QUARTERLY [PLUME] MONITORING CONTROLLED BY PDSI										
IW-22	200554	PDSI	Plume Monitoring	590	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-23	200555	PDSI	Plume Monitoring	964	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-24	200556	PDSI	Plume Monitoring	880	-	Q	-	NO	Unable to sample because well pump was pulled for maintenance	
MH-26A	201527	PDSI	Plume Monitoring	538	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-25A	201528	PDSI	Plume Monitoring	530	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-25C	208426	PDSI	Plume Monitoring	1101	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-26B	208427	PDSI	Plume Monitoring	735	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-26C	208428	PDSI	Plume Monitoring	900	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-25B	208429	PDSI	Plume Monitoring	680	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
IW-11	508235	PDSI	Plume Monitoring	605	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-8	508236	PDSI	Plume Monitoring	783	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-10	508237	PDSI	Plume Monitoring	831	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-9	508238	PDSI	Plume Monitoring	853	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
MH-15W	528093	PDSI	Plume Monitoring	466	Q	-	YES	-	Well identified for water level measurement only; water level measurement collected in April-2007	
MH-15E	528094	PDSI	Plume Monitoring	467	Q	-	YES	-	Well identified for water level measurement only; water level measurement collected in April-2007	
MH-14	528098	PDSI	Plume Monitoring	561	Q	-	YES	-	Well identified for water level measurement only; water level measurement collected in April-2007	
MH-16W	528099	PDSI	Plume Monitoring	460	Q	-	YES	-	Well identified for water level measurement only; water level measurement collected in April-2007	
MH-16E	528100	PDSI	Plume Monitoring	460	Q	-	YES	-	Well identified for water level measurement only; water level measurement collected in April-2007	
IW-12	545555	PDSI	Plume Monitoring	625	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-13	545556	PDSI	Plume Monitoring	495	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-14	545557	PDSI	Plume Monitoring	550	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-15	545558	PDSI	Plume Monitoring	548	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-16	545559	PDSI	Plume Monitoring	470	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-17	545560	PDSI	Plume Monitoring	502	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-18	545561	PDSI	Plume Monitoring	508	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-19	545562	PDSI	Plume Monitoring	544	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-20	545563	PDSI	Plume Monitoring	506	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-21	545564	PDSI	Plume Monitoring	620	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-6A	545565	PDSI	Plume Monitoring	492	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
PZ-9	561859	PDSI	Plume Monitoring	230	Q	Q	NO	NO	Piezometer is dry	
PZ-8	561866	PDSI	Plume Monitoring	280	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
PZ-7	561870	PDSI	Plume Monitoring	155	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-24	563799	PDSI	Plume Monitoring	468	Q	-	YES	-	Well identified for water level measurement only	
ESP-4	623105	PDSI	Plume Monitoring	1045	Q	Q	YES	YES	Water quality sample collected during depth-specific sampling in March-2007 and in June-2007; Water level measurement collected in May-2007	
IW-1	623129	PDSI	Plume Monitoring	855	-	Q	-	YES	Well identified for water quality sample only; Water quality sample collected in April-2007	
IW-2	623130	PDSI	Plume Monitoring	1028	Q	Q	YES	YES	Water quality sample and water level measurement collected in April & May-2007	
IW-3A	623131	PDSI	Plume Monitoring	1047	-	Q	-	YES	Water quality sample and water level measurement collected in April & May-2007	
IW-4	623132	PDSI	Plume Monitoring	946	-	Q	-	YES	Water quality sample and water level measurement collected in April & May-2007	
MH-1	803629	PDSI	Plume Monitoring	520	Q	-	YES	NO	Well identified for water level measurement only	
MH-3	803630	PDSI	Plume Monitoring	535	Q	-	YES	NO	Well identified for water level measurement only	
MH-4	803631	PDSI	Plume Monitoring	540	Q	-	NO	NO	Obstruction in well prevented WL measurement	
MH-5	803632	PDSI	Plume Monitoring	640	Q	-	YES	NO	Well identified for water level measurement only	
MH-6	803633	PDSI	Plume Monitoring	960	Q	-	YES	NO	Well identified for water level measurement only	
MH-7	803634	PDSI	Plume Monitoring	1100	Q	-	YES	NO	Well identified for water level measurement only	
MH-9	803635	PDSI	Plume Monitoring	1400	Q	-	YES	NO	Well identified for water level measurement only	
MH-10	803636	PDSI	Plume Monitoring	600	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-11 ¹	803637	PDSI	Plume Monitoring	820	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-12 ¹	803638	PDSI	Plume Monitoring	800	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-28	903648	PDSI	Plume Monitoring	490	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-29	903649	PDSI	Plume Monitoring	475	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-30	903884	PDSI	Plume Monitoring	920	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-13A	904071	PDSI	Plume Monitoring	660	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-13B	904072	PDSI	Plume Monitoring	960	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
MH-13C	904073	PDSI	Plume Monitoring	1360	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	

TABLE 1
Summary of Groundwater Monitoring for Mitigation Order
Docket No. P-50-06 for Second Quarter 2007 (Sorted by ADWR Well Registry Number)

Well Name	ADWR 55 Registry Number	Owner	Purpose	Casing or Well Depth (feet)	Work Plan Specification		Q2-2007 Monitoring		Status	Substitute Well
					Water Level	Water Quality	Water Level Measured?	Water Quality Sample Collected?		
WELLS FOR QUARTERLY [PLUME] MONITORING NOT CONTROLLED BY PDSI										
M-6	087388	TBPI	Plume Monitoring	660	Q	Q	NO	NO	Unavailable for WQ monitoring	M-9, 55-501652
M-8	087390	TBPI	Plume Monitoring	660	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
CW-10	207982	CWC	Plume Monitoring	1140	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
SI WELL/GV WATER	208825	GVDWID	Plume Monitoring	650	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
M-10	501653	TBPI	Plume Monitoring	1050	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
CW-7	502546	CWC	Plume Monitoring	1065	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
Haven Golf	515867	Haven Golf	Plume Monitoring	500	Q	Q	NO	YES	Sampled April-2007; unable to obtain water level due to obstruction	55-623106
CW-8	543600	CWC	Plume Monitoring	1200	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
CW-9	588121	CWC	Plume Monitoring	1000	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
GV-1-GVDWID	603428	GVDWID	Plume Monitoring	645	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
GV-2-GVDWID	603429	GVDWID	Plume Monitoring	560	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
NP-2	605898	CWC	Plume Monitoring	515	Q	Q	YES	YES	Water quality sample and water level measurement collected in June-2007	
I-10	608525	TBPI	Plume Monitoring	932	Q	Q	YES	YES	Water quality sample and water level measurement collected in April-2007	
I-9	608526	TBPI	Plume Monitoring	900	Q	Q	NO	NO	Not operational; no power to well, unavailable for sampling	None
SCHNEIKER	611220	Schneiker	Plume Monitoring	495	Q	Q	NO	NO	Owner telephone unlisted and did not respond to a letter requesting access	
PC Parks*	616156	Pima County	Plume Monitoring	500	Q	Q	YES	YES	Water quality sample and water level measurement collected in June-2007	None
ESP-1	623102	PDSI	Plume Monitoring	1020	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
ESP-2	623103	PDSI	Plume Monitoring	1044	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
ESP-3	623104	PDSI	Plume Monitoring	1043	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
CW-3	627483	CWC	Plume Monitoring	501	Q	Q	YES	YES	Water quality sample and water level measurement collected in June-2007	
CW-6	627485	CWC	Plume Monitoring	840	Q	Q	YES	YES	Water quality sample and water level measurement collected in May-2007	
Davis-Monthan	804995	Pima County	Plume Monitoring	600	Q	Q	NO	NO	Believed to be the same well as 55-616156	None
1350	not available	TBPI	Plume Monitoring	n/a	Q	Q	NO	NO	Well unavailable for sampling	
SUBSTITUTE WELLS FOR QUARTERLY [PLUME] MONITORING FOR WELLS NOT CONTROLLED BY PDSI										
M-9	501652	TBPI	Plume Monitoring	440	Q	Q	NO	NO	Unavailable for monitoring in Q2-2007	55-087388
CC OF GV	501760	CC OF GV	Plume Monitoring	955	Q	Q	YES	YES	Water quality sample collected in April-2007	55-640274
ESP-5	623106	PDSI	Plume Monitoring	950	Q	-	YES	-	Well identified for water level measurement only (substitute for water level only); Water level measurement collected in May-2007	55-515867

Notes:

1= MH-11 and MH-12 added to sampling list after Work Plan approved

n/a= not available

Q= Quarterly

PDSI= Phelps Dodge Sierrita Inc.

TBPI= Twin Buttes Properties, Inc.

CWC= Community Water Company

GVDWID= Green Valley Domestic Water Improvement District

WQ= water quality

* The PC Parks Well (55-616156) (also referred to as the Titan Missile Museum Well, TMM-1) is believed to be the same well as that listed as Davis-Monthan (55-804955), which was on the original list of wells in the Work Plan (Attachment C).

TABLE 2
Analytical Results for Second Quarter 2007 Groundwater Monitoring

ADWR WELL REGISTRY NUMBER	Well Name	Sample Date	FIELD PARAMETERS			Unfiltered Sulfate, (total, mg/L)	Filtered Sulfate, (dissolved, mg/L)
			pH (SU)	EC (µS/cm)	Temp (°C)		
WELLS FOR QUARTERLY [PLUME] MONITORING CONTROLLED BY PDSI							
200554	IW-22	04/09/07	7.09	1325	26	NA	1740
200555	IW-23	04/11/07	6.88	1528	26.7	NA	1670
201527	MH-26A	04/04/07	7.83	325	27	NA	10
201528	MH-25A	04/04/07	7.82	322	26.6	NA	<10
208426	MH-25C	04/13/07	7.24	1357	26	NA	1260
208427	MH-26B	04/04/07	7.31	1448	30.5	NA	1620
208428	MH-26C	04/04/07	7.58	1128	29.5	NA	720
208429	MH-25B	04/04/07	7.32	1333	28.7	NA	1550
508235	IW-11	04/09/07	6.76	1342	26.2	NA	1760
508235	IW-11 [DUP]	04/09/07	6.76	1342	26.2	NA	1760
508236	IW-8	04/03/07	7.11	1523	24.1	NA	1760
508237	IW-10	04/03/07	7.11	1520	26.7	NA	1750
508238	IW-9	04/11/07	6.73	1424	25.1	NA	1750
545555	IW-12	04/17/07	6.56	1345	25.9	NA	1630
545556	IW-13	04/17/07	6.81	1430	25.8	NA	1690
545557	IW-14	04/16/07	6.63	1383	24.4	NA	1790
545558	IW-15	04/16/07	6.82	1314	27.4	NA	1740
545559	IW-16	04/17/07	6.86	1320	26.8	NA	1770
545559	IW-16 [DUP]	04/17/07	6.86	1320	26.8	NA	1790
545560	IW-17	04/16/07	6.9	1303	26.3	NA	1670
545561	IW-18	04/16/07	6.8	1161	24.9	NA	1610
545562	IW-19	04/16/07	6.69	1296	26.7	NA	1630
545563	IW-20	04/09/07	7.07	1260	27.2	NA	1500
545564	IW-21	04/17/07	6.85	1424	29.4	NA	1650
545565	IW-6A	04/09/07	6.69	1627	26	NA	1830
561866	PZ-8	04/11/07	7.41	1074	19.8	NA	540
561870	PZ-7	04/17/07	7.13	777	23.8	NA	360
623105	ESP-4 ¹	03/20/07	7.67	1187	26.7	397	393
623105	ESP-4	06/04/07	7.45	733	28.4	NA	385
623129	IW-1	04/09/07	7.24	918	26	NA	480
623130	IW- 2	04/03/07	7.08	492	25.3	NA	90
623131	IW-3A	04/03/07	7.29	1374	25.1	NA	1540
623132	IW-4	04/11/07	6.6	1252	28.2	NA	1600
803636	MH-10	04/03/07	6.86	1267	30.2	NA	1360
803637	MH-11	04/10/07	7.02	1327	28.3	NA	1580
803638	MH-12	04/04/07	7.19	1225	30.7	NA	1130
903548	MH-28	04/17/07	6.98	1359	26.1	NA	1920
903649	MH-29	04/17/07	7.01	1345	25.1	NA	1690
903884	MH-30	04/09/07	7.3	1529	27.3	NA	1810
904071	MH-13A	04/18/07	7.1	1609	27.4	NA	1720
904072	MH-13B	04/18/07	7.36	1396	30	NA	1120
904073	MH-13C	04/18/07	9.2	379	29.1	NA	20
904073	MH-13C [DUP]	04/18/07	9.2	379	29.1	NA	20

TABLE 2
Analytical Results for Second Quarter 2007 Groundwater Monitoring

ADWR WELL REGISTRY NUMBER	Well Name	Sample Date	FIELD PARAMETERS			Unfiltered Sulfate, (total, mg/L)	Filtered Sulfate, (dissolved, mg/L)
			pH (SU)	EC (µS/cm)	Temp (°C)		
WELLS FOR QUARTERLY [PLUME] MONITORING NOT CONTROLLED BY PDSI							
087390	M-8	4/16/2007	7.87	424	23.1	NA	<0.5
207982	CW-10	05/14/07	7.81	392	31.3	52.8	52.8
208825	SI WELL/ GV WATER	04/10/07	7.48	367	26.8	6.6	6.6
501653	M-10	04/16/07	7.97	475	28.2	NA	72.6
501760	CC OF GV	04/16/07	7.44	767	22.6	130	133
502546	CW-7	05/14/07	7.40	1860	27.4	874	874
515867	HAVEN GOLF	04/16/07	7.26	655	23.3	105	105
543600	CW-8	05/14/07	7.69	1379	29.4	530	529
588121	CW-9	05/14/07	7.74	414	27.5	47.2	47.8
603428	GV-1-GVDWID	04/10/07	7.69	421	27.2	43.6	43.2
603429	GV- 2-GVDWID	04/10/07	7.60	479	24.1	107	106
605898	NP-2	06/04/07	7.20	411	25.9	41.3	41.2
608525	I-10	04/16/07	7.17	878	28.8	NA	533
623102	ESP-1	05/14/07	7.70	592	28.7	112	113
623103	ESP- 2	05/14/07	7.86	368	27.8	28.4	28.4
623104	ESP-3	05/14/07	7.78	374	28.8	36.7	36.6
623104	ESP-3 [DUP]	05/14/07	7.78	374	28.8	36.8	36.6
627483	CW-3	06/06/07	7.74	449	25.3	58.7	57.9
627485	CW-6	05/14/07	7.58	507	26.1	69.3	68.7

Notes:

All units are in milligrams per liter (mg/L) unless otherwise noted,

NA = Not Analyzed

U = Analyte was not detected

meq/L = milliequivalent per liter

°C = degrees Celcius

SU = standard units

µS/cm = microsiemens per centimeter

EC = electrical conductivity

¹ = Water quality sample collected in Q1-2007 and reported in Q2-2007

² = Also referred to as TMM-1 on the field data sheets; refers to the well located at the Titan Missile Museum.

** = Formerly listed as Davis Monthan (55-804995) and PC Parks wells (55-616156); determined to be the same well located at the Titan Missile Museum.*

TABLE 3
Groundwater Elevation Data for Water Levels Collected in Second Quarter 2007 (Sorted by ADWR Registry Number)

ADWR WELL REGISTRY NUMBER	WELL NAME	SURVEY SOURCE	UTM NORTH (NAD 27, METERS)	UTM EAST (NAD27, METERS)	GROUND SURFACE ELEVATION (ft amsl)	HEIGHT OF MEASURING POINT ABOVE GROUND SURFACE (ft)	MEASURING POINT ELEVATION (ft amsl)	DATE	DEPTH TO WATER FROM MEASURING POINT (ft)	GROUNDWATER ELEVATION (ft amsl)
WELLS FOR QUARTERLY [PLUME] MONITORING CONTROLLED BY PDSI										
201527	MH-26A	PDSI	3527621.755	498913.871	3069.54	1.35	3070.89	4/4/2007	493.75	2577.14
201528	MH-25A	PDSI	3526313.992	497365.137	3055.81	0.76	3056.57	4/4/2007	452.20	2604.37
208426	MH-25C	PDSI	3526294.663	498935.843	3056.71	0.53	3057.24	4/13/2007	452.30	2604.94
208427	MH-26B	PDSI	3527617.539	498901.079	3068.68	1.82	3070.50	4/4/2007	490.78	2579.72
208428	MH-26C	PDSI	3527610.293	498926.419	3067.27	1.84	3069.11	4/4/2007	492.30	2576.81
208429	MH-25B	PDSI	3526318.775	498931.519	3056.21	2.01	3058.22	4/4/2007	453.20	2605.02
528093	MH-15W	PDSI	3523078.550	497585.246	3116.12	0.00	3116.12	4/23/2007	391.18	2724.94
528094	MH-15E	PDSI	3523077.874	497645.979	3110.12	0.00	3110.12	4/23/2007	385.11	2725.01
528098	MH-14	PDSI	3525072.873	497578.809	3150.74	0.00	3150.74	4/23/2007	425.58	2725.16
528099	MH-16W	PDSI	3521674.374	497577.250	3098.37	0.00	3098.37	4/23/2007	355.75	2742.62
528100	MH-16E	PDSI	3521673.788	497637.848	3096.66	0.00	3096.66	4/23/2007	352.85	2743.81
561859	PZ-9	PDSI	3525372.230	493241.716	3504.18	0.48	3504.66	4/20/2007	DRY	DRY
561866	PZ-8	PDSI	3523999.763	493033.889	3476.64	0.00	3476.64	4/17/2007	198.52	3278.12
561870	PZ-7	PDSI	3526160.990	492594.390	3545.30	0.92	3546.22	4/9/2007	139.65	3406.57
563799	MH-24	PDSI	3523512.589	497451.696	3128.17	0.00	3128.17	4/20/2007	399.35	2728.82
623105	ESP-4	PDSI	3525936.573	499977.998	2955.22	0.39	2955.61	5/4/2007	346.90	2608.71
623130	IW- 2	PDSI	3521164.111	497546.637	3098.00	0.29	3098.29	5/4/2007	344.00	2754.29
803629	MH-1	PDSI	3525676.440	497433.577	3176.00	1.80	3177.80	4/20/2007	442.70	2735.10
803630	MH-3	PDSI	3525073.714	497533.614	3151.91	0.47	3152.38	4/23/2007	425.51	2726.87
803632	MH-5	PDSI	3523528.883	497538.532	3122.00	0.80	3122.80	4/20/2007	391.60	2731.20
803633	MH-6	PDSI	3522574.001	497497.825	3133.00	2.02	3130.98	4/20/2007	374.80	2756.18
803634	MH-7	PDSI	3521820.025	497563.652	3109.00	0.34	3108.66	4/20/2007	368.20	2740.46
803635	MH-9	PDSI	3521056.161	496499.361	3158.00	1.50	3159.50	4/20/2007	363.60	2795.90
803636	MH-10	PDSI	3521040.412	495778.954	3184.00	0.95	3184.95	4/3/2007	355.65	2829.30
803637	MH-11	PDSI	3524267.192	498810.555	3039.00	1.30	3040.30	4/10/2007	370.46	2669.84
803638	MH-12	PDSI	3525010.541	498833.336	3052.00	2.07	3054.07	4/4/2007	419.60	2634.47
903548	MH-28	PDSI	3524413.518	497532.609	3141.51	0.67	3142.18	4/17/2007	403.18	2739.00
903649	MH-29	PDSI	3522609.068	497665.504	3122.24	0.91	3123.15	4/17/2007	376.75	2746.40
903884	MH-30	PDSI	3525913.515	496750.399	3231.92	0.53	3232.45	4/9/2007	419.32	2813.13
904071	MH-13A	PDSI	3523597.287	497308.223	3025.18	1.05	3026.23	4/18/2007	328.14	2698.09
904072	MH-13B	PDSI	3523590.907	498891.053	3023.93	1.70	3025.63	4/18/2007	332.21	2693.42
904073	MH-13C	PDSI	3523596.580	498858.634	3026.81	0.00	3026.81	4/18/2007	337.80	2689.01
WELLS FOR QUARTERLY [PLUME] MONITORING NOT CONTROLLED BY PDSI										
087390	M-8	x,y - estimated, mp - TBPI	3529495.719	499720.318	2988.00	n/a	2998.18	4/16/2007	458.83	2539.35
207982	CW-10	CWC	3523259.063	500974.523	2867.00	1.50	2868.50	5/24/2007	196.30	2672.20
208825	SI WELL/ GV WATER	HGC	3519313.499	497288.347	3040.55	2.25	3042.80	4/10/2007	238.55	2804.25
501653	M-10	x,y - estimated, mp - TBPI	3529946.617	499720.418	3004.39	n/a	3004.40	4/16/2007	471.47	2532.93
501760	CC OF GV	HGC	3572679.954	501696.539	2823.45	1.25	2824.70	4/16/2007	254.20	2570.50
502546	CW-7	CWC	3527897.679	499721.015	2986.00	1.50	2987.50	5/14/2007	424.15	2563.35
543600	CW-8	CWC	3525464.732	499859.689	2956.00	1.50	2957.50	5/24/2007	338.14	2619.36
588121	CW-9	CWC	3528544.309	501133.203	2833.00	1.30	2834.30	5/24/2007	309.40	2524.90
603428	GV-1-GVDWID	HGC	3522057.907	499874.026	2940.85	1.75	2942.60	4/10/2007	218.11	2724.49
603429	GV- 2-GVDWID	HGC	3521458.204	499847.973	2929.27	1.33	2930.60	4/10/2007	187.10	2743.50
605898	NP-2	CWC	3528320.834	500644.673	2905.95	0.33	2906.28	5/30/2007	351.50	2554.78
608525	I-10	x,y - estimated, mp - TBPI	3528272.206	497859.067	3203.20	n/a	3203.20	4/16/2007	630.00	2573.20
616156	PC Parks ¹	HGC	3529736.231	500018.322	2970.58	-3.50	2967.08	6/18/2007	432.50	2534.58
623102	ESP-1	PDSI	3526252.213	500030.855	2946.76	1.12	2947.88	5/24/2007	349.55	2598.33
623103	ESP- 2	PDSI	3526728.190	500302.810	2921.22	2.39	2923.61	5/14/2007	339.90	2583.71
623104	ESP-3	PDSI	3527190.039	500234.071	2931.38	0.81	2932.19	5/14/2007	355.85	2576.34
623106	ESP-5	PDSI	3526885.773	502069.049	2815.00	2.06	2817.06	5/4/2007	217.75	2599.31
627483	CW-3	CWC	3523613.540	500108.828	2941.24	0.00	2941.24	6/6/2007	265.35	2675.89
627485	CW-6	CWC	3525597.784	500952.233	2866.00	1.00	2867.00	5/24/2007	252.25	2614.75

NOTES:
PDSI CONVERSION: GEOGRAPHIC / NAD83 TO UTM / NAD27 / ZONE 12 / METERS
NAD = North American Datum
UTM = Universal Transverse Mercator
n/a = not available
PDSI = Phelps Dodge Sierrita, Inc.
TBPI = Twin Buttes Properties, Inc.
CWC = Community Water Company
GVDWID = Green Valley Domestic Water Improvement District
ADWR = Arizona Department of Water Resources
ft amsl = feet above mean sea level
ft = feet
¹ = Also referred to as TMM-1 on the field data sheets; refers to the well located at the Titan Missile Museum.

TABLE 4
Results of Depth-Specific Sampling at ESP-4 and MH-11

Sample	Depth	Date	Time	Temperature (°C)	Conductivity (µS/cm)	pH (SU)	Sulfate (mg/L)
ESP-4-450	450	3/20/2007	15:20	29.7	1178	8.14	370
ESP-4-500	500	3/20/2007	14:55	32	1221	8.15	390
ESP-4-550	550	3/20/2007	14:30	32	1236	7.86	400
ESP-4-600	600	3/20/2007	14:06	32.1	1215	7.73	400
ESP-4-650	650	3/20/2007	13:31	30.7	1276	7.73	410
ESP-4-700	700	3/20/2007	12:56	31.9	1278	7.54	400
ESP-4-750	750	3/20/2007	12:26	31.1	1571	7.45	620
ESP-4-800	800	3/20/2007	11:58	29.6	1886	7.43	730
ESP-4-850	850	3/20/2007	11:12	30.8	1364	7.74	480
ESP-4-900	900	3/20/2007	10:40	29.7	937	7.61	280
ESP-4-950	950	3/20/2007	10:05	28.4	830	7.83	220

Sample	Depth	Date	Time	Temperature (°C)	Conductivity (µS/cm)	pH (SU)	Sulfate (mg/L)
MH-11-450	450	3/23/2007	9:29	18.8	3085	7.98	1500
MH-11-500	500	3/23/2007	9:10	18.2	3070	7.59	1500
MH-11-550	550	3/23/2007	8:51	18.5	3118	7.46	1600
MH-11-600	600	3/23/2007	8:32	17.8	3107	7.22	1500
MH-11-650	650	3/22/2007	17:15	21.9	2975	7.38	1500
MH-11-700	700	3/22/2007	17:21	19.8	2997	7.37	1500
MH-11-750	750	3/22/2007	17:40	16.7	2715	7.55	1500

Notes:

°C = degrees Celsius.

µS/cm = microsiemens per centimeter.

SU = Standard Unit.

mg/L = milligrams per liter.

TABLE 5
Analytical Results for CW-3 and NP-2

ADWR WELL REGISTRY NUMBER	Well Name	Sample Date	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Alkalinity as CaCO ³ (mg/L)	Total Alkalinity (mg/L)	Chloride, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Nitrate as N, dissolved (mg/L)	Nitrate/Nitrite as N, dissolved (mg/L)	Nitrite as N, dissolved (mg/L)	Total Dissolved Solids @ 180°C (mg/L)
EXTENDED PARAMETERS COLLECTED FROM QUARTERLY [PLUME] MONITORING NOT CONTROLLED BY PDSI														
605898	NP-2	06/04/07	50.3	10.9	3.9	31.7	169	169	9.1	0.2	0.34	0.34	<0.01	280
627483	CW-3	06/06/07	56.1	10.9	3.0	30.5	140	140	17.7	0.3	2.92	2.92	<0.01	300

Notes:

All units are in milligrams per liter (mg/L) unless otherwise noted,

meq/L = milliequivalent per liter

°C = degrees Celcius

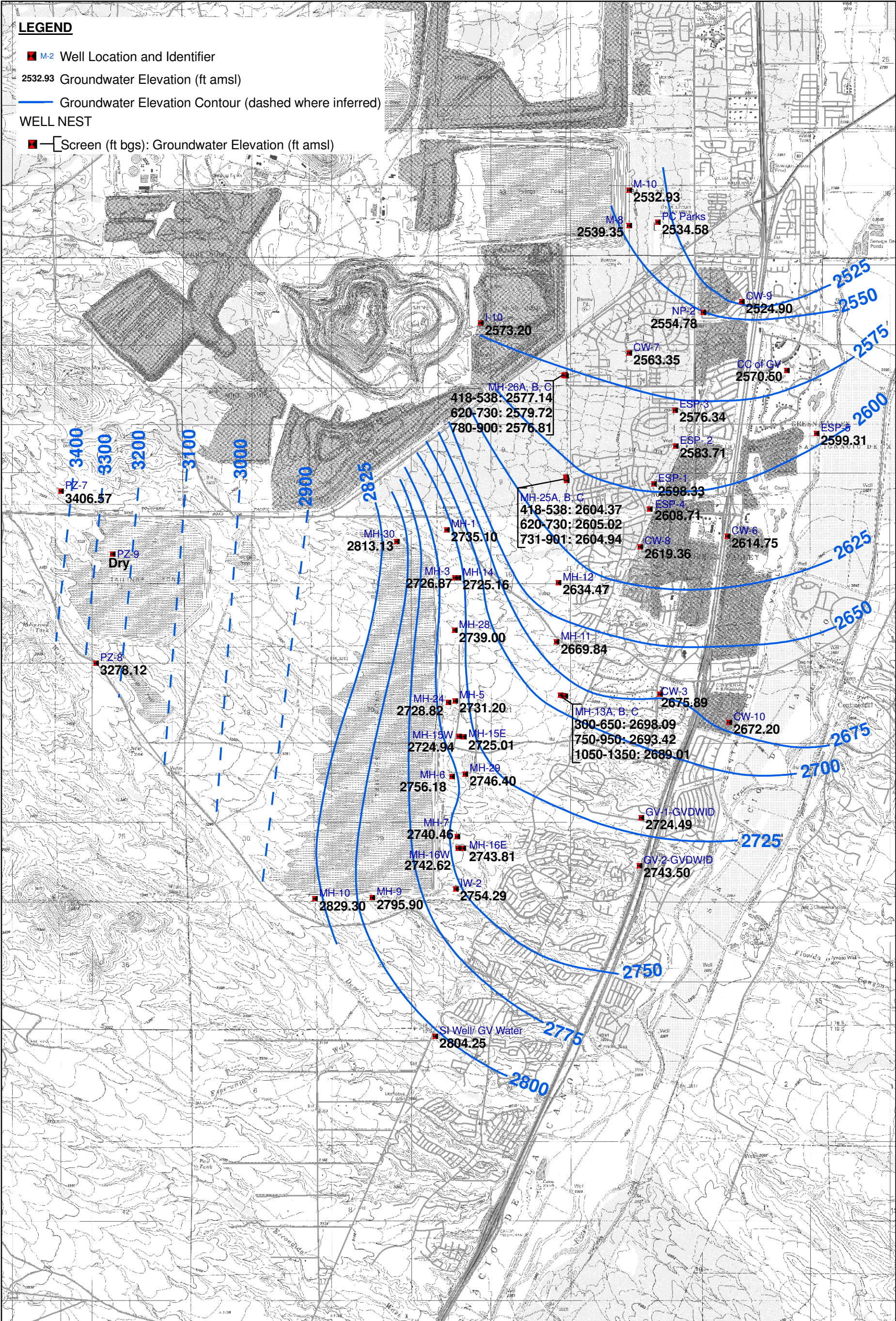
SU = standard units

µS/cm = microsiemens per centimer

EC = electrical conductivity

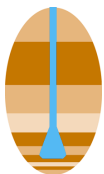
CaCO³ = Calcium

FIGURES



0 4,000 8,000 Feet

PROJECTION: UTM ZONE 12N NAD83



**HYDRO
GEO
CHEM, INC.**

**GROUNDWATER ELEVATIONS FOR
APRIL THROUGH MAY 2007**

Approved	Date	Author	Date	File No.	Figure
KAG	06/27/07	RAM	06/27/07	7830120G	2

APPENDIX A

UPDATES TO FIRST QUARTER 2007 GROUNDWATER ELEVATION AND SULFATE CONCENTRATION DATA

UPDATES TO FIRST QUARTER 2007 GOUNDWATER DATA

This appendix identifies updates to information reported in the First Quarter 2007 Groundwater Monitoring Report (Hydro Geo Chem, Inc. (HGC), 2007). The updates are based on final survey information for wells and on review of the first quarter report. Updated information consists of revised well locations and elevation data and sulfate data for one well that was omitted from the from the first quarter 2007 (Q1-2007) report. The updates are described below.

1) Updates to Q1-2007 Sulfate Isoconcentration Map

- The revised Q1-2007 sulfate isoconcentration map shows the correct location of the sample from RRQC-1, which was misidentified as RRQC-2 and misplotted.
- The revised figure (Figure A.1) shows the sulfate concentration in the sample collected from well M-5, which was inadvertently omitted from the figure in HGC (2007).

2) Updates to Q1-2007 Groundwater Elevation Data

- Well locations were updated for the following two wells.

WELL NAME/ ADWR WELL REGISTRY NUMBER	Coordinates Reported in First Quarter 2007		Revised Coordinates	
	UTM NORTH	UTM EAST	UTM NORTH	UTM EAST
RRQC-2 608519	3527591.000	502956.000	3527992.000	502957.000
RRQC-1 608521	3527992.000	502957.000	3527591.000	502956.000

Notes:

UTM = Universal Transverse Mercator

- Ground surface elevation data were revised for the following thirteen wells after receiving the final survey data.

WELL NAME/ ADWR WELL REGISTRY NUMBER	Q1-07 GROUND SURFACE ELEVATIONS (ft amsl)	Q2-07 REVISED GROUND SURFACE ELEVATIONS (ft amsl)	HEIGHT OF MP (ft ags)	MP ELEVATION (ft amsl)	DATE	DTW (ft bmp)	REVISED GW ELEVATIONS (ft amsl)
CC OF GV 501760	2823.446	2821.85	1.30	2823.15	1/15/07	253.15	2570.00
GORETCKI / STEINMAN 532595	3010.03	3008.83	2.87	3011.70	1/19/07	186.90	2824.80
CW-11 608518	2789.00	2777.21	1.70	2778.91	1/3/07	258.40	2520.51
RRQC-5 616212	3003.56	3002.86	0.63	3003.49	2/27/07	294.67	2708.82
S-46 623996	2769.722	2769.72	2.12	2771.85	1/24/07	253.00	2518.85
C-4 624010	2836.19	2835.09	1.10	2836.19	01/07 *	190.00	2646.19
W-9 624024	2852.908	2852.81	1.33	2854.14	1/18/07	177.00	2677.14
QUIHUIS 627439	2749.246	2747.25	1.08	2748.33	1/11/07	194.10	2554.23
JOHNSON 634036	3126.89	3125.49	1.06	3126.56	1/17/06	228.30	2898.26
SANTA RITA RANCH-1 635386	2995.273	2994.77	0.00	2994.77	2/15/07	316.03	2678.74
SANTA RITA RANCH-2 635387	2984.262	2982.86	0.25	2983.11	2/15/07	172.80	2810.31
W-11 642025	2893.50	2908.16	1.75	2909.91	1/20/07	136.00	2773.91
KULESZA 599769	2803.00	2800.04	1.08	2801.13	3/13/07	234.75	2566.38

Notes:

PDSI CONVERSION: GEOGRAPHIC / NAD 83 TO UTM / NAD27 / ZONE 12 / METERS

ft amsl = feet above mean sea level

ft ags = feet above ground surface

ft bmp = feet below measuring point

UTM = Universal Transverse Mercator

MP = Measuring Point

DTW = Depth to Water

**Water level measure date was estimated*

- Updated and verified survey information for all wells monitored during the first quarter of 2007 is contained in Table A.1.
- The revised groundwater elevation data was used to re-contour the groundwater elevations presented in Figure A.2.

REFERENCES

Hydro Geo Chem, Inc. (HGC). 2007. First Quarter 2007 Groundwater Monitoring Report, Tasks 2.2 and 2.3 of Aquifer Characterization Plan, Mitigation Order on Consent Docket No. P-50-6, Pima County, Arizona. March 30, 2007

TABLE

TABLE A.1
Revised Q1-2007 Groundwater Elevation Data (Sorted by ADWR Well Registry Number)

ADWR WELL REGISTRY NUMBER	WELL NAME	SURVEY SOURCE	UTM NORTH (NAD27, Meters)	UTM EAST (NAD27, Meters)	GROUND SURFACE ELEVATION (ft amsl)	HEIGHT OF MEASURING POINT ABOVE GROUND (ft)	MEASURING POINT ELEVATION (ft amsl)	DATE	DEPTH TO WATER FROM MEASURING POINT (feet)	GROUNDWATER ELEVATION (ft amsl)
WELLS FOR QUARTERLY [PLUME] MONITORING CONTROLLED BY PDSI										
200554	IW-22	PDSI	3523077.138	497430.770	3124.84	3.41	3128.25	2/24/2007	433.58	2694.67
200555	IW-23	PDSI	3522774.335	497430.417	3125.03	3.50	3128.53	2/24/2007	499.20	2629.33
201527	MH-26A	PDSI	3527621.755	498913.871	3069.54	1.35	3070.89	1/15/2007	495.65	2575.24
201528	MH-25A	PDSI	3526313.992	497365.137	3055.81	0.76	3056.57	1/10/2007	453.10	2603.47
208426	MH-25C	PDSI	3526294.663	498935.843	3056.71	0.53	3057.24	1/10/2007	453.57	2603.67
208427	MH-26B	PDSI	3527617.539	498901.079	3068.68	1.82	3070.50	1/15/2007	492.85	2577.65
208428	MH-26C	PDSI	3527610.293	498926.419	3067.27	1.84	3069.11	1/15/2007	494.10	2575.01
208429	MH-25B	PDSI	3526318.775	498931.519	3056.21	2.01	3058.22	1/10/2007	454.28	2603.94
508235	IW-11	PDSI	3523232.498	497432.594	3125.00	0.79	3124.21	2/24/2007	428.05	2696.16
508236	IW-8	PDSI	3521824.074	497429.430	3115.00	4.20	3119.20	2/24/2007	434.05	2685.15
508237	IW-10	PDSI	3522925.746	497431.547	3125.00	1.65	3126.65	2/24/2007	463.40	2663.25
508238	IW-9	PDSI	3522011.192	497430.969	3100.00	0.02	3099.98	2/24/2007	405.95	2694.03
528093	MH-15W	PDSI	3523078.550	497585.246	3116.12	0.00	3116.12	2/23/2007	390.00	2726.12
528094	MH-15E	PDSI	3523077.874	497645.979	3110.12	0.00	3110.12	2/23/2007	384.07	2726.05
528098	MH-14	PDSI	3525072.873	497578.809	3150.74	0.00	3150.74	2/23/2007	426.75	2723.99
528099	MH-16W	PDSI	3521674.374	497577.250	3098.37	0.00	3098.37	2/23/2007	352.18	2746.19
528100	MH-16E	PDSI	3521673.788	497637.848	3096.66	0.00	3096.66	2/23/2007	349.39	2747.27
545555	IW-12	PDSI	3523773.410	497426.092	3131.53	1.42	3132.95	2/24/2007	456.20	2676.75
545557	IW-14	PDSI	3524176.661	497428.308	3139.35	2.20	3141.55	2/24/2007	463.35	2678.20
545558	IW-15	PDSI	3524370.798	497434.056	3145.27	1.40	3146.67	2/24/2007	429.89	2716.78
545559	IW-16	PDSI	3524586.404	497431.834	3156.54	1.73	3158.27	2/24/2007	409.95	2748.32
545560	IW-17	PDSI	3524806.403	497434.901	3154.71	1.80	3156.51	2/24/2007	429.70	2726.81
545561	IW-18	PDSI	3524973.304	497435.240	3165.79	1.50	3167.29	2/24/2007	449.55	2717.74
545562	IW-19	PDSI	3525146.924	497434.814	3148.92	1.80	3150.72	2/23/2007	444.65	2706.07
545563	IW-20	PDSI	3525372.300	497425.917	3158.90	1.80	3160.70	1/29/2007	445.30	2715.40
545564	IW-21	PDSI	3525576.796	497435.770	3166.07	1.61	3167.68	2/23/2007	449.65	2718.03
545565	IW-6a	PDSI	3523512.299	497442.407	3125.86	1.65	3127.51	2/24/2007	433.60	2693.91
561859	PZ-9	PDSI	3525372.230	493241.716	3504.18	0.48	3504.66	1/25/2007	229.50	3275.16
561866	PZ-8	PDSI	3523999.763	493033.889	3476.64	0.00	3476.64	1/10/2007	207.42	3269.22
561870	PZ-7	PDSI	3526160.990	492594.390	3545.30	0.92	3546.22	1/12/2007	139.50	3406.72
623129	IW-1	PDSI	3521081.335	496967.070	3141.00	0.70	3141.70	2/24/2007	386.70	2755.00
623130	IW- 2	PDSI	3521164.111	497546.637	3098.00	0.29	3098.29	2/24/2007	406.80	2691.49
623132	IW-4	PDSI	3522269.430	497432.878	3134.00	0.07	3134.07	2/24/2007	417.70	2716.37
803629	MH-1	PDSI	3525676.440	497433.577	3176.00	1.80	3177.80	1/10/2007	444.15	2733.65
803630	MH-3	PDSI	3525073.714	497533.614	3151.91	0.47	3152.38	2/23/2007	427.31	2725.07
803632	MH-5	PDSI	3523528.883	497538.532	3122.00	0.80	3122.80	1/12/2007	390.70	2732.10
803633	MH-6	PDSI	3522574.001	497497.825	3133.00	2.02	3130.98	1/9/2007	378.32	2752.66
803634	MH-7	PDSI	3521820.025	497563.652	3109.00	0.34	3108.66	1/12/2007	360.20	2748.46

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WELLS FOR QUARTERLY [PLUME] MONITORING CONTROLLED BY PDSI										
803635	MH-9	PDSI	3521056.161	496499.361	3158.00	1.50	3159.50	1/9/2007	362.10	2797.40
803636	MH-10	PDSI	3521040.412	495778.954	3184.00	0.95	3184.95	1/9/2007	364.80	2820.15
803637	MH-11	PDSI	3524267.192	498810.555	3039.00	1.30	3040.30	1/11/2007	369.55	2670.75
803638	MH-12	PDSI	3525010.541	498833.336	3052.00	2.07	3054.07	1/10/2007	419.88	2634.19
903548	MH-28	PDSI	3524413.518	497532.609	3141.51	0.67	3142.18	2/19/2007	402.32	2739.86
903649	MH-29	PDSI	3522609.068	497665.504	3122.24	0.91	3123.15	2/19/2007	376.58	2746.57
903884	MH-30	PDSI	3525913.515	496750.399	3231.92	0.53	3232.45	1/9/2007	421.65	2810.80
904071	MH-13A	PDSI	3523597.287	497308.223	3025.18	1.05	3026.23	1/24/2007	326.35	2699.88
904072	MH-13B	PDSI	3523590.907	498891.053	3023.93	1.70	3025.63	1/24/2007	330.58	2695.05
904073	MH-13C	PDSI	3523596.580	498858.634	3026.81	0.00	3026.81	1/24/2007	335.45	2691.36
WELLS FOR QUARTERLY [PLUME] MONITORING NOT CONTROLLED BY PDSI										
087390	M-8	x,y - estimated, mp - TBPI	3529495.719	499720.318	2988.00	n/a	2998.18	1/15/2007	460.92	2537.26
207982	CW-10	CWC	3523259.063	500974.523	2867.00	1.50	2868.50	1/3/2007	177.20	2691.30
208825	SI WELL/GV WATER	HGC	3519313.499	497288.347	3040.55	2.42	3042.97	1/9/2007	237.50	2805.47
501652	M-9	x,y - estimated, mp - TBPI	3530107.382	500045.475	2971.00	n/a	2971.00	1/15/2007	445.76	2525.24
501653	M-10	x,y - estimated, mp - TBPI	3529946.617	499720.418	3004.39	n/a	3004.40	1/15/2007	473.65	2530.75
501760	CC OF GV	HGC	3527679.754	501696.539	2821.85	1.30	2823.15	1/15/2007	253.15	2570.00
502546	CW-7	CWC	3527897.679	499721.015	2986.00	1.50	2987.50	2/2/2007	425.00	2562.50
543600	CW-8	CWC	3525464.732	499859.689	2956.00	1.50	2957.50	1/3/2007	336.50	2621.00
588121	CW-9	CWC	3528544.309	501133.203	2833.00	1.30	2834.30	1/3/2007	304.20	2530.10
603428	GV-1-GVDWID	HGC	3522057.907	499874.026	2940.85	1.50	2942.35	1/9/2007	221.00	2721.35
603429	GV-2-GVDWID	HGC	3521458.204	499847.973	2929.27	1.20	2930.47	1/9/2007	185.30	2745.17
608525	I-10	x,y - estimated, mp - TBPI	3528272.206	497859.067	3203.20	n/a	3203.20	1/15/2007	655.89	2547.31
623102	ESP-1	PDSI	3526252.213	500030.855	2946.76	1.12	2947.88	1/3/2007	350.10	2597.78
623103	ESP-2	PDSI	3526728.190	500302.810	2921.22	2.39	2923.61	1/3/2007	343.10	2580.51
623104	ESP-3	PDSI	3527190.039	500234.071	2931.38	0.81	2932.19	1/3/2007	358.60	2573.59
623105	ESP-4	PDSI	3525936.573	499977.998	2955.22	0.39	2955.61	1/12/2007	348.30	2607.31
623106	ESP-5	PDSI	3526885.773	502069.049	2815.00	2.06	2817.06	2/12/2007	219.50	2597.56
627485	CW-6	CWC	3525597.784	500952.233	2866.00	1.00	2867.00	1/3/2007	245.00	2622.00
WELLS FOR SEMI-ANNUAL [REGIONAL] MONITORING										
085304	M-2	x,y - estimated, mp - TBPI	3532755.721	499583.158	n/a	n/a	2993.60	1/15/2007	489.14	2504.46
501654	M-11	x,y - estimated, mp - TBPI	3530561.182	500328.664	n/a	n/a	2937.54	1/15/2007	415.23	2522.31
206214	GRAEF	HGC	3517841.357	495895.947	3149.64	2.10	3151.74	1/8/2007	281.25	2870.49
509604	GV-02-PCWW	PIMA COUNTY	3530023.290	502739.743	2770.76	2.38	2773.13	1/18/2007	162.76	2610.37
529142	SIMONS	HGC	3515972.999	49536.496	3142.61	1.17	3143.78	1/11/2007	244.70	2899.08
531807	MW-2	ASARCO	3535481.300	500393.400	2998.90	1.00	2999.90	12/19/2006	428.28	2571.62
532595	GORETCKI / STEINMAN	HGC	3517393.510	501206.269	3008.83	2.87	3011.70	1/19/2007	186.90	2824.80
532627	AXABC0-1	HGC	3535160.501	502824.104	2732.28	3.20	2735.48	1/5/2007	177.22	2558.26

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WELLS FOR SEMI-ANNUAL [REGIONAL] MONITORING										
537958	AXABC0-3	HGC	3534764.927	502643.298	2743.15	2.10	2745.25	1/5/2007	181.60	2563.65
545349	SALVATORE	HGC	3517166.926	495744.844	3145.27	1.52	3146.79	1/8/2007	266.40	2880.39
550533	SAH-1-PCSW	PIMA COUNTY	3534342.394	500530.888	2908.10	0.00	2908.10	1/25/2007	408.25	2499.85
562962	RANCHO SAHUARITA	HGC	3535692.169	501618.877	2817.21	1.87	2819.08	2/2/2007	342.80	2476.28
599350	ROBERTS	HGC	3514580.742	601657.550	3142.13	1.40	3143.53	2/2/2007	251.30	2892.23
608518	CW-11	HGC	3531003.354	502440.773	2777.21	1.70	2778.91	1/3/2007	258.40	2520.51
608519	RRQC-2	HGC	3529053.253	503518.429	2784.23	0.50	2784.73	2/27/2007	114.40	2670.33
608521	RRQC-1	HGC	3527793.890	502656.673	2801.67	2.75	2804.42	2/28/2007	257.44	2546.98
608530	ST-6	HGC	3531156.231	501309.476	2854.47	2.33	2856.81	2/16/2007	333.25	2523.56
608591	RRQC-3	HGC	3527654.766	503018.256	2801.22	1.83	2803.05	2/27/2007	124.80	2678.25
608597	RRQC-4	HGC	3526921.817	505942.900	2938.52	2.17	2940.69	2/27/2007	280.20	2660.49
616212	RRQC-5	HGC	3524537.525	505430.466	3002.86	0.63	3003.49	2/27/2007	294.67	2708.82
623112	S-2	PDSI	3517379.377	499023.660	2935.87	n/a	2936.16	1/16/2007	118.80	2817.36
623113	S-3	PDSI	3516092.581	498184.215	2953.09	n/a	2953.28	1/16/2007	102.30	2850.98
623114	S-4	PDSI	3514876.027	497313.042	2079.44	n/a	2979.76	1/25/2007	93.40	2886.36
623115	S-5	PDSI	3513422.954	496747.939	2990.82	n/a	2991.05	1/25/2007	82.70	2908.35
623116	S-6	PDSI	3512172.430	496324.397	3003.89	n/a	3003.15	1/25/2007	70.65	2932.50
623982	S-19A	HGC	3531852.484	504912.322	2762.68	1.58	2764.26	1/24/2007	228.00	2536.26
623991	S-40	HGC	3534758.010	504912.181	2714.90	1.33	2716.24	1/24/2007	161.00	2555.24
623994	S-44	HGC	3530760.810	503924.221	2761.57	1.08	2762.65	1/24/2007	211.00	2551.65
623996	S-46	HGC	3532292.423	502575.584	2769.72	2.12	2771.85	1/24/2007	253.00	2518.85
624010	C-4	HGC	3525187.298	501820.790	2835.09	1.10	2836.19	01/2007**	190.00	2646.19
624012	E-5A	HGC	3524136.096	502245.398	2851.34	3.10	2854.44	1/16/2007	181.00	2673.44
624013	E-6	HGC	3524972.459	502486.220	2841.15	1.08	2842.23	1/20/2007	186.00	2656.23
624024	W-9	HGC	3523935.785	501332.354	2852.81	1.33	2854.14	1/18/2007	177.00	2677.14
624026	W-12	HGC	3521103.235	500217.850	2892.70	1.90	2894.60	01/2007**	157.00	2737.60
624028	NP-2	HGC	3519849.294	500970.269	2910.71	1.96	2912.67	1/20/2007	138.00	2774.67
627439	QUIHUIS	HGC	3533503.205	502817.797	2747.25	1.08	2748.33	1/11/2007	194.10	2554.23
634036	JOHNSON	HGC	3513323.566	499997.971	3125.49	1.06	3126.56	1/17/2006	228.30	2898.26
634393	1759	x,y - estimated, mp - TBPI	3531309.828	499451.529	n/a	n/a	2986.00	1/15/2007	469.42	2516.58
634394	1225	x,y - estimated, mp - TBPI	3530408.470	499727.179	n/a	n/a	2998.01	1/15/2007	475.40	2522.61
WELLS FOR SEMI-ANNUAL [REGIONAL] MONITORING										
635386	SANTA RITA RANCH-1	HGC	3526412.601	506817.364	2994.77	0.00	2994.77	2/15/2007	316.03	2678.74
635387	SANTA RITA RANCH-2	HGC	3517793.492	501327.055	2982.86	0.25	2983.11	2/15/2007	172.80	2810.31
639055	SIMPSON	HGC	3516527.357	495515.199	3095.93	1.60	3097.53	1/4/2007	203.95	2893.58
640358	GIACALONE	HGC	3519058.087	495830.481	3123.82	1.80	3125.62	1/4/2007	285.20	2840.42
642025	W-11	HGC	3519888.941	500030.392	2908.16	1.75	2909.91	1/20/2007	136.00	2773.91
905019	SAH-3B-PCSW	PIMA COUNTY	3534809.053	500824.776	2883.35	3.62	2886.97	1/25/2007	401.45	2485.52

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ADDITIONAL WELLS SAMPLED FOR SEMIANNUAL MONITORING THAT WERE NOT IDENTIFIED IN THE WORK PLAN										
087387	M-5	x,y - estimated, mp - TBPI	3530602.714	499701.814	n/a	n/a	2995.43	1/15/2007	474.01	2521.42
087388	M-6	x,y - estimated, mp - TBPI	3530105.381	499720.772	n/a	n/a	3002.54	1/15/2007	475.55	2526.99
087389	M-7	x,y - estimated, mp - TBPI	3529800.549	499720.375	n/a	n/a	3008.04	1/15/2007	474.55	2533.49
504946	RT-1	x,y - estimated, mp - TBPI	3530774.637	499871.985	n/a	n/a	2977.9	1/15/2007	457.81	2520.09
508428	M-13	x,y - estimated, mp - TBPI	3530814.150	498789.283	n/a	n/a	3074.06	1/15/2007	555.36	2518.70
532628	AXABC0-2	HGC	3535161.590	502485.179	2759.13	1.90	2761.03	1/5/2007	205.85	2555.18
586729	CANOA RANCH	HGC	3516220.094	497453.001	3014.03	1.04	3015.07	1/9/2007	146.70	2868.37
599769	KULESZA	HGC	3528880.273	502025.215	2800.04	1.08	2801.13	3/13/2007	234.75	2566.38
603430	GV-06-GVDWID	HGC	3518637.527	498433.381	2979.05	0.50	2979.55	1/9/2007	158.00	2821.55
603504	GV-07-GVDWID	HGC	3518513.712	496938.934	3088.82	0.00	3056.00	1/9/2007	262.80	2793.20
608523	I-12	x,y - estimated, mp - TBPI	3528381.292	498171.375	n/a	n/a	3327.8	1/15/2007	772.62	2555.18
608524	I-11	x,y - estimated, mp - TBPI	3528288.808	497980.593	n/a	n/a	3325.86	1/15/2007	766.59	2559.27
634392	1758	x,y - estimated, mp - TBPI	3532098.971	499677.470	n/a	n/a	2983.50	1/15/2007	471.34	2512.16
509603	GV-01-PCWW*	PIMA COUNTY	3529728.507	502928.924	2786.06	1.10	2787.16	1/18/2007	174.11	2613.05
085305	M-3	x,y - estimated, mp - TBPI	3532375.839	497000.127	n/a	n/a	3205.00	1/15/2007	617.51	2587.49
ND	M-4	x,y - estimated, mp - TBPI	3532387.310	496423.972	n/a	n/a	3260.00	1/15/2007	293.73	2966.27
ND	A-955	x,y - estimated, mp - TBPI	3528636.457	499281.255	n/a	n/a	3039.70	1/15/2007	484.48	2555.22
ND	2125	x,y - estimated, mp - TBPI	3529396.596	497976.264	n/a	n/a	3253.90	1/15/2007	703.74	2550.16

NOTES:

PDSI CONVERSION: GEOGRAPHIC / NAD 83 TO UTM / NAD27 / ZONE 12 / METERS

NAD = North American Datum

ft amsl = feet above mean sea level

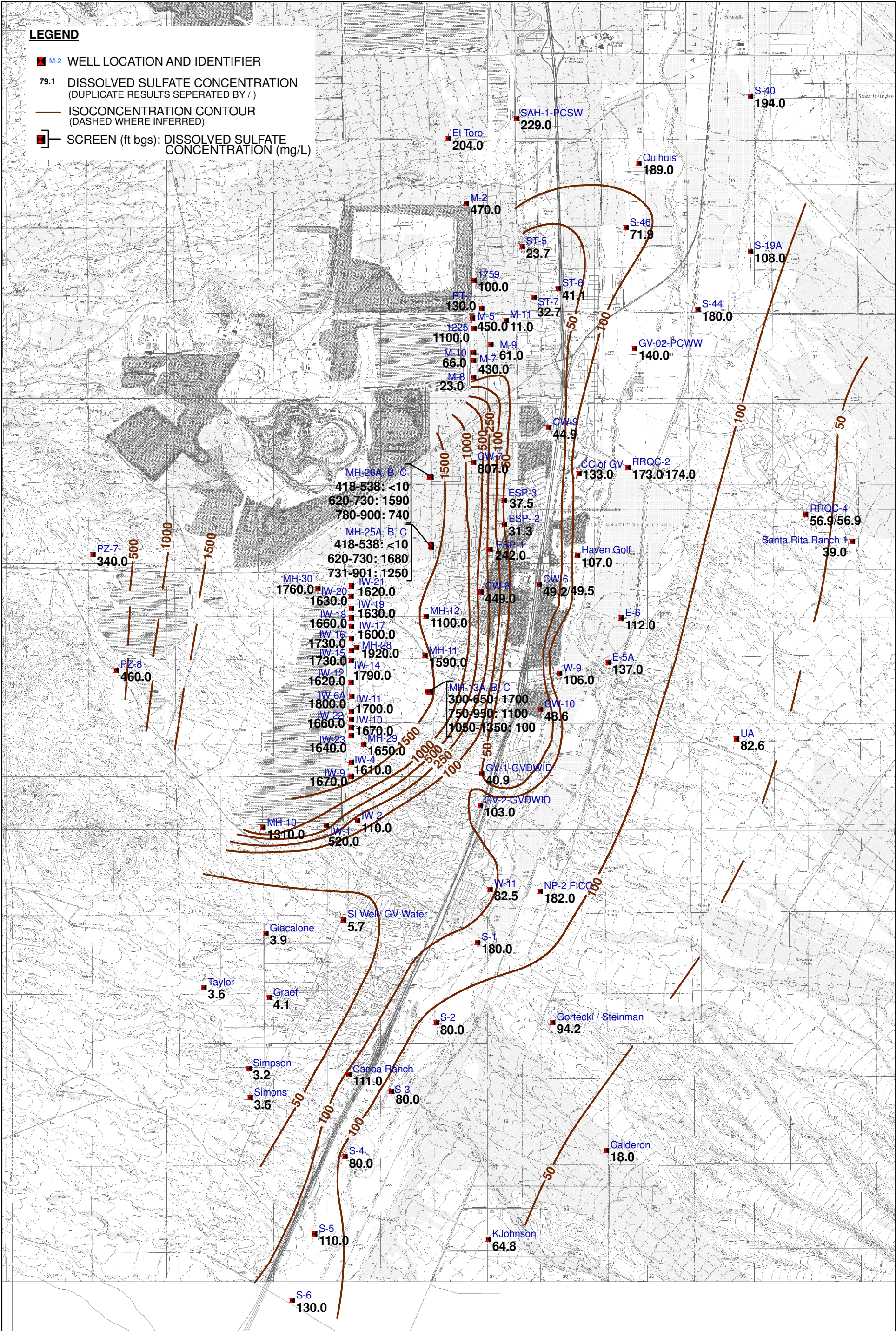
UTM = Universal Transverse Mercator

n/a = not available

*Ground surface elevations estimated using USGS topographic map; approximation verified using Google Earth.

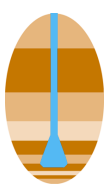
**WL measure date was estimated

FIGURES



0 5,000 10,000 Feet

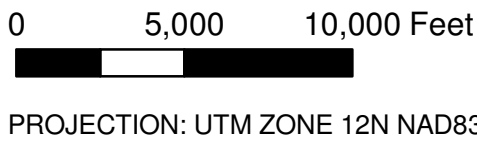
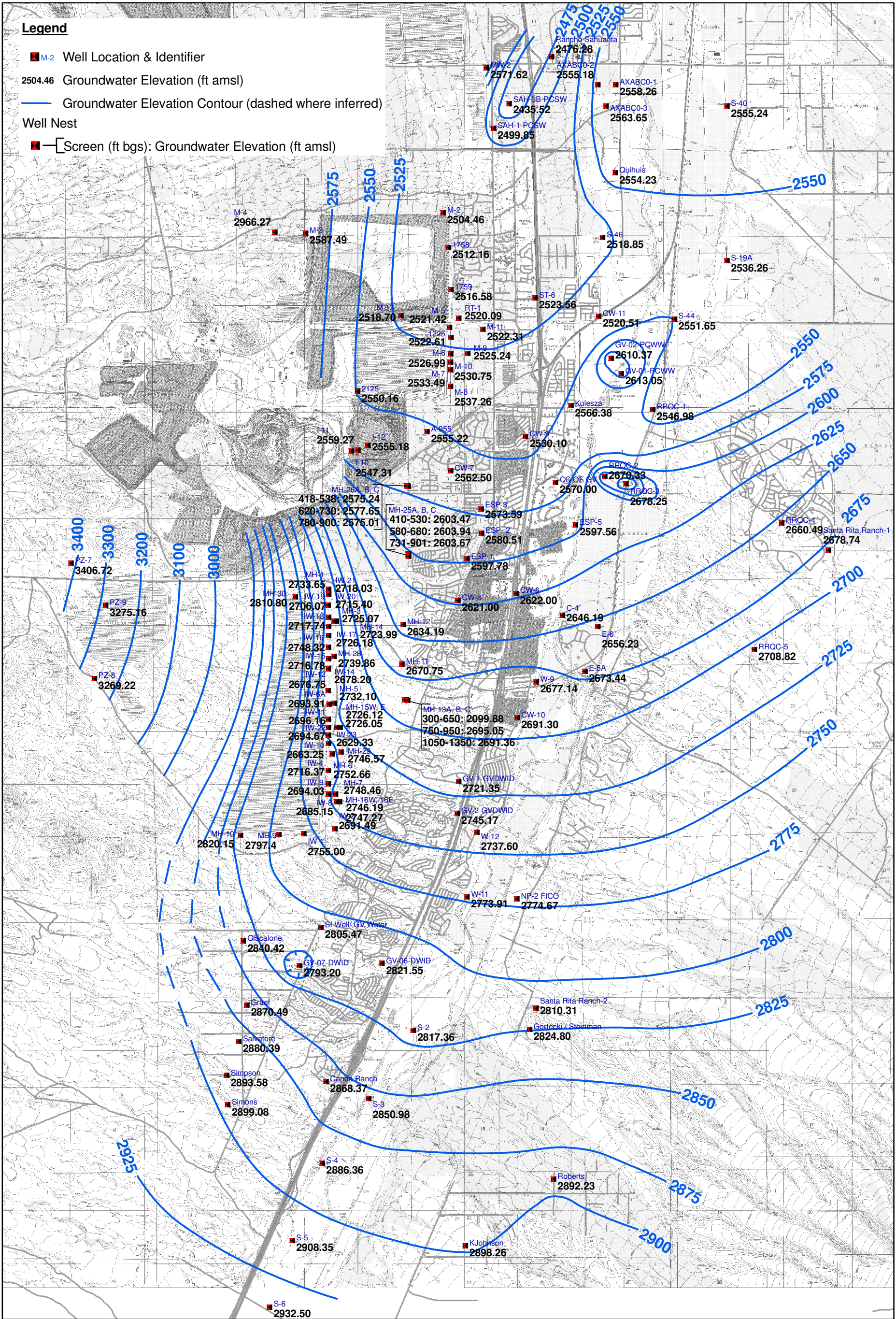
PROJECTION: UTM ZONE 12N NAD83



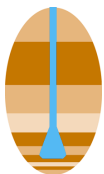
**HYDRO
GEO
CHEM, INC.**

**REVISED SULFATE CONCENTRATIONS IN
GROUNDWATER SAMPLES COLLECTED IN
JANUARY AND FEBRUARY 2007
[FIRST QUARTER 2007]**

Approved	Date	Author	Date	File No.	Figure
KAG	05/30/07	RAM	05/30/07	7830132G	A.1



PROJECTION: UTM ZONE 12N NAD83



**HYDRO
GEO
CHEM, INC.**

**REVISED GROUNDWATER ELEVATIONS FOR
JANUARY THROUGH FEBRUARY 2007
[FIRST QUARTER 2007]**

Approved	Date	Author	Date	File No.	Figure
KAG	06/04/07	RAM	06/04/07	7830101G	A.2

APPENDIX B

**SECOND QUARTER 2007 DATA VERIFICATION REPORT FOR SAMPLES
COLLECTED BY PHELPS DODGE SIERRITA, INC.
AND HYDRO GEO CHEM, INC.**

APPENDIX B

SECOND QUARTER 2007

DATA VERIFICATION REPORT FOR GROUNDWATER SAMPLES

COLLECTED BY PHELPS DODGE SIERRITA, INC. AND

HYDRO GEO CHEM, INC.

Prepared for:

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June 28, 2007

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TABLE

B.1 Relative Percent Difference (RPD) of Duplicate Field Samples

1. INTRODUCTION

This report summarizes the data verification review of groundwater samples collected and analyzed for sulfate during the second quarter 2007 (Q2-2007) by Phelps Dodge Sierrita, Inc. (PDSI) and Hydro Geo Chem, Inc. (HGC) pursuant to Mitigation Order on Consent Docket No. P-50-06. PDSI conducted groundwater sampling and analysis at wells under its control, whereas HGC collected groundwater samples from wells outside the control of PDSI. All analytical results for groundwater samples collected for this project during the second quarter of 2007 were provided to HGC either by PDSI or by the analytical laboratory, ACZ Laboratories Inc (ACZ) for preparation of the Q2-2007 Groundwater Monitoring Report.

Quality assurance (QA) and quality control (QC) procedures are specified in the *Quality Assurance Project Plan for Aquifer Characterization Plan (QAPP)* (Appendix E of HGC, 2006) for field sampling, chain-of-custody (COC) documentation, laboratory analysis, and reporting. Because field sampling procedures were reviewed by PDSI following the provisions of *Quality Assurance / Quality Control Plan for Water Monitoring, Phelps Dodge Sierrita, Inc.* (PDSI, 2005), field sampling for wells sampled by PDSI is not reviewed in this report. This report does review field sampling for samples collected by HGC. Additionally, sample handling and laboratory QA/QC data are evaluated according to the data quality indicators (DQIs) given in the QAPP.

Appendix D of the main text of this report contains laboratory reports for Q2-2007 samples collected by PDSI and HGC including COC forms, laboratory correspondence,

QC summaries, data qualifiers, and any case narratives. The Q2-2007 analytical results for all samples collected pertain to fifty-eight samples collected by PDSI and HGC and are contained in fourteen reports having the following ACZ Project numbers:

ACZ Project ID	Wells Reported
<i>Number of wells sampled by PDSI: <u>42</u></i> <i>Number of duplicate samples collected: <u>3</u></i> <i>Number of Blank samples collected: <u>1 travel blank, 1 equipment blank</u></i>	
L61914	IW-1, IW-2, IW-3A, IW-8, MH-10, MH-12, MH-25A, MH-25B, MH-26A, MH-26B, MH-26C
L61943	PZ-7, MH-30, IW-11, IW-19, IW-21, IW-22, DUP040907A
L61970	EQB041007A, TB041007A
L62004	MH-11, IW-4, IW-6A, IW-10, IW-23
L62040	MH-25C, IW-13, IW-14, IW-16, IW-17, IW-18, DUP041607A
L62062	I-10, M-8, M-10
L62112	IW-9, IW-12, IW-15, IW-20, MH-28, MH-29, PZ-8, MH-13A, MH-13B, MH-13C, DUP041807A
L63014	ESP-4

Number of wells sampled by HGC: 16
Number of duplicate samples collected: 2
Number of Blank samples collected: 2 (1 travel blank (U) & 1 equipment blank (F))

L60630	GW-623105 (F & U)
L62047	GW-515867 (F & U), GW-501760 (F & U)
L61960	GW-603429 (F & U), GW-603428 (F & U), GW-208825 (F & U)
L62584	GW-627485 (F & U), GW-502546 (F & U), GW-543600 (F & U), GW-588121 (F & U), GW-207982 (F & U), GW-623102 (F & U), GW-623103 (F & U), GW-623104 (F & U), TB051407A, EQ051407A, DUP051407A, DUP051407B
L63026	GW-605898 (F & U)
L63094	GW-627483 (F & U)

Notes:

- 1) All samples collected by PDSI were filtered in the field using one disposable 0.45-micron filter per sample.*
- 2) Samples collected by HGC were both filtered (F) and unfiltered (U), and all filtered samples were collected using a 0.45-micro filter.*

2. HGC FIELD OPERATIONS

Field operations for this project consisted of the following for all plume monitoring wells sampled by HGC:

- Static water level monitoring,
- Well purging (minimum of 3 wetted casing volumes),
- Collection of water quality field parameters (pH, electrical conductivity (EC), and temperature in degrees Celsius (°C)),
- Collection of groundwater samples for sulfate analysis, and
- Equipment decontamination.

All documentation of field activities was evaluated for quality assurance, and have been deemed to have met the documentation requirements stated in the QAPP.

2.1 Water Level Monitoring

Static water level measurements were collected by HGC at sixteen wells during the second quarter of 2007. In all cases, the wells were allowed to come to static conditions before collecting the water level measurement. Before measuring the static water level at each well, the battery on the water level indicator was checked and the sensitivity level was adjusted, if necessary. Each measurement was collected and verified by measuring the depth to water multiple times in order to obtain a consistent reading and accurate measurement.

2.2 Groundwater Sampling

During this monitoring period, filtered and unfiltered groundwater samples were collected from seventeen¹ plume monitoring wells not under the control of PDSI. Filtered and unfiltered groundwater samples were collected concurrently by using a container to collect an initial sample for separation into bottles for filtered and unfiltered analysis. After collecting the initial sample, the unfiltered sample was collected by pouring a 250-milliliter aliquot of the initial sample into a non-preserved bottle for sulfate analysis. Then each filtered sample was collected by filtering the remaining portion of the initial sample using a clean filtration apparatus².

2.2.1 Pre-Sampling Field Activities

The pre-sampling field activities performed during this quarter included well development at wells NP-2, CW-3, and the PC Parks³ well where there was no existing pump or where the pump was not operational, and the more routine activities related to QA/QC requirements such as meter calibration, calibration verification, equipment decontamination, and use of the proper preservative and sample collection containers.

¹ Analytical data from one of these wells (PC Parks, #55-616156) is not included as part of this data verification report because results have not yet been received from the analytical laboratory.

² The filtration apparatus consists of a manual vacuum pump, a pre-cleaned vacuum flask, pre-cleaned plastic tubing, and a 0.45 micron filter.

³ The PC Parks well (55-616156) is also referred to as the TMM-1 well on the GW Sampling forms contained in Appendix D of the main text.

2.2.1.1 Well Development

During this monitoring period, well development included subcontracting a well development pump rig and crew to pump three wells (NP-2, CW-3, and PC Parks) in order to collect filtered and unfiltered groundwater samples. Filtered and unfiltered samples were collected from each well for the following analysis: calcium, magnesium, sodium, potassium, alkalinity, total dissolved solids, chloride, fluoride, nitrate, nitrite, and sulfate. Video logs were also taken at two of the three wells, NP-2 and CW-3. Data collected from wells NP-2 and CW-3 are included in this monitoring report, but data for samples collected from the PC Parks well is currently not available. This data will be provided in the next quarterly report due on September 30, 2007. A data verification review of the additional analytes (calcium, magnesium, sodium, potassium, alkalinity, total dissolved solids, chloride, fluoride, nitrate, and nitrite) is included in Appendix C of the main text.

2.2.1.2 Routine Pre-Sampling Field Activities

On each day of sampling, the pH⁴ and EC⁵ probes were calibrated. In addition, the water level indicator was checked for a signal, which indicates a working meter and battery strength. On each day where sampling extended for more than half a day, a mid-day calibration check was performed on the pH and EC probes to ensure their accurate measurement.

⁴ Field pH meter was calibrated using a two point calibration and pH buffers 4 and 7.

⁵ Field EC meter was calibrated using a standard stock solution of 1413 µS/cm (microsiemens per centimeter).

In addition to calibrating the instruments each day, measures were taken to 1) properly decontaminate field equipment, 2) ensure the appropriate storage and transport temperature of the samples, and 3) document all activities related to the collection of groundwater samples as part of this project. These objectives were met by 1) replenishing or obtaining supplies of de-ionized water and ice daily, 2) properly packing the samples on ice during field activities, 3) using de-ionized water to properly decontaminate field equipment prior to the start of sampling each day and after sampling at each well, and 4) obtaining the appropriate field notebook in order to thoroughly document all field activities related to the PDSI groundwater monitoring program.

2.2.2 Well Purging, Field Measurements, and Sample Collection

In all but one instance where groundwater samples were collected, three or more wetted casing volumes were purged prior to sample collection. For samples collected from the PC Parks well, only 89.4 percent of the purge volume was discharged prior to sample collection. In this case, the purge volume was approximately 290 gallons, and the calculated purge volume was 324.3 gallons. In some cases, purging was unnecessary because the well had been operating for a number of hours prior to arrival. This information was noted on the groundwater sampling form at each well for which this was the case. In cases where purging was necessary prior to sample collection the purge water was discharged to the ground surface.

During this monitoring period, filtered and unfiltered groundwater samples were collected for sulfate analysis from wells not under the control of PDSI. All filtered samples were

collected using a clean filtration apparatus and one unused, disposable 0.45-micron filter. All sample containers were provided by ACZ prior to sample collection, and all bottles were checked for the correct preservative and maintained in a clean, secure work area until they were used in the field.

2.2.3 Post-Sampling Field Activities

Post sampling field activities consisted of equipment decontamination, sample storage, and sample shipping. Each piece of field equipment that comes into contact with the sample was decontaminated using a small amount of Alconox detergent and de-ionized water. After washing, the equipment was rinsed thoroughly with de-ionized water. Field documentation included in the field notebook indicated consistent adherence to this requirement.

After sample collection, samples from each well were placed into a plastic bag and stored on ice until they could be packed securely for shipping to ACZ. Samples were shipped using a secure double bag method consisting of an inner bag containing the samples and ice and an outer bag containing the inner bag. In addition, each set of three samples collected from each well was individually bagged (without ice) to prevent the label from getting soaked with water and rubbing off or becoming illegible.

2.3 Well Survey

During the first and second quarters of 2007, a ground surface and measuring-point elevation survey was completed for wells in the monitoring program that lacked survey coordinates. The survey was conducted by Aztec Land Surveying, Inc.

3. SAMPLE HANDLING

All samples collected by PDSI were surrendered by Bill Dorris and shipped to ACZ. Samples collected by HGC were surrendered by either Kimberly A. Garcia, QA Manager or Mark Arneson, Environmental Field Technician and shipped to ACZ for analysis. COC documentation accompanied all samples submitted and included the sample name, collection date and time, and the date and time the samples were received by ACZ. As noted on the analytical data reports from ACZ, all of the sample bottles were received intact, properly preserved, and in good condition.

The temperatures of the following five samples (identified by their laboratory login numbers) exceeded 4 °C upon receipt at the laboratory:

ACZ Project ID	Sample Collection Date	Sample Relinquished Date	Sample Received Date by ACZ	Sample Temp Upon Receipt (°C)
L62062	4/16/2007	4/17/2007	4/18/2007	5.6
L61943	4/9/9/2007	4/9/9/2007	4/11/2007	5.7
L62004	4/11/2007	4/12/2007	4/13/2007	4.6
L61914	4/4/2007	4/5/2007	4/9/2007	12.3
L63014	6/4/2007	6/4/2007	6/5/2007	4.9

As noted in the above table, all samples were shipped within one day of sample collection, and the time between sample collection and receipt of samples by ACZ ranged from two to five days. Samples having a login ID of L61914 were shipped on April 5, 2007, within one day of sample collection, but due to an error in the shipping department at the UPS shipping station, these samples were inadvertently sent to Canada before being received by ACZ in

Steamboat Springs, Colorado on April 9, 2007. These temperature exceedances are not considered to have a significant impact on the analytical results pertaining to the sulfate analysis for these samples.

4. LABORATORY QUALITY CONTROL

As specified in the QAPP, laboratory QC was maintained for all analysis through proper licensure, the use of approved analytical methods, QC measurements, appropriate turn-around-time for analysis (timeliness), method detection limits (MDLs), and practical quantitation limits (PQLs). Each of these controls is discussed in the following subsections.

The review of laboratory QC included a review to identify any qualified data and an assessment to determine their significance. Additionally, the laboratory QC summaries were reviewed to verify that results met QA criteria.

4.1 Licensure

ACZ is licensed with the Arizona Department of Health Services (license number AZ0102) and is accredited in accordance with the National Environmental Laboratory Accreditation Conference.

4.2 Analytical Methods

All analyses performed used U.S. Environmental Protection Agency (EPA) approved analytical methods that meet the requirements stated in Section 5.3 of the QAPP regarding target methods and target MDLs.

The following list identifies the methods used for sulfate analysis during this monitoring period:

- SM4500 SO4-D (Gravimetric): sulfate
- EPA300.0 (Ion Chromatography): sulfate

4.3 Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs)

The MDLs and PQLs of the analytical methods used by ACZ are shown in the following table. The MDLs for analyses of samples were equal to or less than the target MDLs identified in the QAPP.

Parameter	MDL Range (mg/L)	PQL Range (mg/L)	Target MDL ¹ (mg/L)
Sulfate	0.5 to 10	3 to 50	10

Notes:

¹ *Target MDL from Table E.2 of the QAPP (HGC, 2006)*

mg/L = milligrams per liter

4.4 Timeliness

All samples submitted for sulfate analysis (filtered and unfiltered) were analyzed within the twenty-eight day holding time specified by each of the methods used for analysis.

4.5 Quality Control Measurements

The following QC samples were prepared and analyzed:

- Preparation blanks, calibration blanks, and calibration standards
- Analytical spikes and Laboratory fortified blanks
- Laboratory control samples
- Laboratory duplicate samples
- Trip blank samples

4.5.1 Preparation Blanks, Calibration Blanks, and Calibration Standards

Preparation blanks were run with each group of samples submitted for sulfate analyses using the gravimetric method (SM4500 SO₄-D). All preparation blanks were prepared from analyte-free water and treated as routine samples. Analytical results of all of the preparation blanks showed that no target analytes were detected at the indicated MDL.

Initial calibration blanks and initial calibration verification standards were analyzed for all samples submitted for sulfate analysis using the ion chromatography method (EPA 300.0). The results of each initial calibration blank analyzed showed no detections of the target analyte. All analysis results for the initial calibration verification standards and laboratory fortified blanks that were analyzed showed percent recoveries that were within the acceptance criteria specified by the ACZ QA plan and the QAPP.

4.5.2 Analytical Spikes

Analytical spikes were analyzed for all sulfate samples that were analyzed using the ion chromatography method. The percent recoveries for most analytical spikes for sulfate analysis were between 90.8 and 104.6 percent, and are within the range of acceptability based on the acceptance criteria set by ACZ. The analysis of one analytical spike had a recovery that was outside of the QA criteria set by ACZ. This spike recovery sample is not considered to affect the overall accuracy of the dataset because the recovery of the method control sample was acceptable.

Samples Affected	Recovery (%)	Tolerance		ACZ Qualifier	ACZ ID	ACZ Project ID
		Min (%)	Max (%)			
GW-605898 (F & U)	81	90	110	M2	L62993-04AS	L63026

Notes:

% = percent

Min = Minimum of acceptable range of quality control values

Max = Maximum of the acceptable range of quality control values

M2 = ACZ Qualifier; Matrix spike recovery was low, the method control sample recovery was acceptable.

4.5.3 Laboratory Control Samples

Laboratory control samples were run for each group of samples submitted for sulfate analysis using the gravimetric method of analysis. Recoveries for all laboratory control samples were between 90 and 106 percent, which is within the acceptance criteria specified by ACZ.

4.5.4 Laboratory Duplicate Samples

Analyses of laboratory duplicate samples were also reviewed as part of this quality data verification report. Field duplicate samples are discussed in Section 5.1. The RPDs for the laboratory duplicate samples ranged from 0.1 to 9.5 percent, which is acceptable based on the QA criteria set forth in the QAPP and the acceptance criteria specified by ACZ. In one case, the data was flagged with an “RA” qualifier, which means that the RPD was not used for data validation because the sample concentration was too low for accurate evaluation. In this case, the data was flagged with an “RA,” but the value was below the 20 percent acceptance criteria set forth in the QAPP. In all cases, where the RPD could be calculated, the results met QA criteria and demonstrate an appropriate level of precision in laboratory analysis of these samples.

4.5.5 Field Blank Samples

During the second quarter of 2007, four field blank samples were collected. Two of these were unfiltered trip blank samples containing de-ionized water (TB041007A and TB051407A), and two were equipment blank samples collected using filtered de-ionized water (EQ041007A and EQ051407A). All of these samples were collected in the field using de-ionized water, and were submitted along with other samples to evaluate the potential for contaminant introduction under field conditions. As required by Section 4.2.1.5 of the QAPP, a minimum of one trip blank sample was collected for every 20 samples collected. This requirement was exceeded during this monitoring period by the collection of two field equipment blank samples. Analytical results from all field blank samples submitted showed no detections of sulfate.

5. DATA QUALITY INDICATORS

The QAPP provides several DQIs for assessing the overall quality of the data. These DQIs include the following:

- Precision
- Bias
- Accuracy
- Representativeness
- Comparability
- Completeness
- Sensitivity

Each of these DQIs is discussed below in relation to the Q2-2007 groundwater sampling and analysis conducted by PDSI.

5.1 Precision

Precision indicates how well a measurement can be reproduced. Precision is quantified by calculating the RPD between duplicate samples. For the purposes of QA/QC, precision was quantified by calculating the RPDs between duplicates among the following groups of duplicate samples:

- Laboratory duplicate samples
- Field samples and field duplicate samples

As discussed in sections 3.3.2 and 3.3.4, there were no exceedances of RPD QA criteria for any laboratory duplicates.

During this monitoring period, a total of five field duplicate samples were collected. Three of these (DUP040907A, DUP041607A, DUP041807A) were collected by PDSI for filtered analysis, whereas the other two (DUP051407A and DUP051407B) were collected by HGC for filtered and unfiltered sulfate analysis.

The collection of three duplicate samples exceeds the QAQC goal of collecting one duplicate sample for every twenty groundwater samples collected, as stated in Section 4.2.1.5 of the QAPP.

Results for the five duplicate field samples collected are provided in Table B.1. The range of RPD values was between zero and 1.12 percent, and none of the values exceed 20 percent. All data for duplicate samples collected is tabulated in Table B.1. Overall, the DQI for precision is deemed to be met.

5.2 Bias

Bias is a systematic distortion of measurements causing consistent errors in one direction. Bias is managed in this data set by the consistent application of standardized sample collection and analysis procedures.

5.3 Accuracy

Accuracy is a measure of the agreement of a measurement to a known value and is measured using the recoveries from laboratory control samples. As discussed in Sections 4.5.1, 4.5.2, and 4.5.3 respectively, there were no significant exceedances of the recovery QA criteria for any of the calibration standards, analytical spikes, or laboratory control standards. Based on this information, the overall accuracy of the data is judged sufficient for the purpose of aquifer characterization.

5.4 Representativeness

All samples were taken from locations specified in the Work Plan (HGC, 2006) using sampling procedures specified in the QAPP. Therefore, the samples are judged to provide a good representation of groundwater quality at the locations. The analytical data are judged to be representative of groundwater conditions because the analyses used standard procedures and methods that met QA/QC guidelines of the QAPP.

5.5 Comparability

All samples were collected using standardized procedures (HGC, 2006 and PDSI, 2005) and were analyzed by ACZ using standardized methods. Insofar as standardized sample collection and analytical methods are adhered to, the sample results should be comparable.

5.6 Completeness

All samples collected by PDSI and HGC were subsequently analyzed and reported by ACZ Laboratories. All samples collected by PDSI and analyzed by ACZ are judged to satisfy the QA/QC criteria for this project and are deemed usable for aquifer characterization. Thus, the completeness of analytical results is 100 percent.

5.7 Sensitivity

The analytical methods used to analyze the PDSI samples meet the MDL requirements specified in Table E.2 of the QAPP. Therefore, the analytical sensitivity is considered acceptable for use in aquifer characterization.

6. LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and the party for whom this report was originally prepared. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

7. REFERENCES

- Hydro Geo Chem, Inc (HGC). 2006. Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona. August 11, 2006, revised October 31, 2006.
- Phelps Dodge Sierrita, Inc. 2005. Quality Assurance/Quality Control Plan for Water Monitoring, Phelps Dodge Sierrita, Inc. June 2005.

TABLE

TABLE B.1
Relative Percent Difference (RPD) of Duplicate Field Samples

Well Name	Sample ID	ACZ Login Number	Sulfate Concentration (mg/L)	RPD (%)
PDSI DUPLICATES				
IW-11	IW-11	L61943-03	1760	0
IW-11 [DUP]	DUP040907A	L61943-07	1760	
MH-13C	MH-13C	L62112-10	20	0
MH-13C [DUP]	DUP041607A	L62112-11	20	
IW-16	IW-16	L62040-04	1770	1.12
IW-16 [DUP]	DUP041807A	L62040-07	1790	
HGC DUPLICATES				
ESP-3 (F)	FGW-623104-051407	L62584-15	36.6	0
ESP-3 (F) [DUP]	DUP051407B	L62584-20	36.6	
ESP-3 (U)	UGW-623104-051407	L62584-16	36.7	0.27
ESP-3 (U) [DUP]	DUP051407A	L62584-19	36.8	

Notes:

% = percent

DUP = duplicate sample

F = Filtered

U = Unfiltered

HGC = Hydro Geo Chem, Inc.

PDSI = Phelps Dodge Sierrita, Inc.

mg/L = milligrams per liter

RPD = Relative Percent Difference

APPENDIX C

**SECOND QUARTER 2007
DATA VERIFICATION REPORT FOR GROUNDWATER SAMPLES
COLLECTED FOR EXTENDED PARAMETERS
BY PHELPS DODGE SIERRITA, INC.
AND HYDRO GEO CHEM, INC.**

APPENDIX C

**SECOND QUARTER 2007
DATA VERIFICATION REPORT FOR GROUNDWATER SAMPLES
COLLECTED FOR EXTENDED PARAMETERS
BY PHELPS DODGE SIERRITA, INC.
AND HYDRO GEO CHEM, INC.**

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June 28, 2007

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1. INTRODUCTION

This report summarizes the data verification review of groundwater samples collected and analyzed for extended parameters¹ from two wells, NP-2 and CW-3, during the second quarter 2007 (Q2-2007). Groundwater samples from these two wells were collected by Hydro Geo Chem, Inc. (HGC) pursuant to Mitigation Order on Consent Docket No. P-50-06. Analytical results for groundwater samples collected from these wells were provided to HGC either by Phelps Dodge Sierrita, Inc. (PDSI) or by the analytical laboratory, ACZ Laboratories Inc (ACZ) for preparation of the Q2-2007 Groundwater Monitoring Report.

Quality assurance (QA) and quality control (QC) procedures are specified in the *Quality Assurance Project Plan for Aquifer Characterization Plan* (QAPP) (Appendix E of HGC, 2006) for field sampling, chain-of-custody (COC) documentation, laboratory analysis, and reporting. This report does not review field sampling or sample handling for samples collected by HGC from these two wells since this information is evaluated in Appendix B of the main text. Laboratory QA/QC data for water quality samples submitted for wells NP-2 and CW-3 and analyzed for extended parameters are evaluated in this report according to the data quality indicators (DQIs) given in the QAPP.

Appendix D of the main text of this report contains laboratory reports for samples reviewed as part of this data verification report and includes COC forms, laboratory correspondence, QC summaries, data qualifiers, and any case narratives. The analytical results

¹ The list of extended parameters consists of the following analytes: calcium, magnesium, sodium, potassium, alkalinity, total dissolved solids, chloride, fluoride, nitrate, and nitrite.

for samples collected as part of this data verification report pertain to four samples collected by HGC and are contained in two reports having the following ACZ Project numbers:

ACZ Project ID	Wells Reported
<i>Number of wells reviewed as part of this report: <u>2</u></i>	
L63026	GW-605898 (F & U)
L63094	GW-627483 (F & U)

Note:

All wells were sampled for both filtered (F) and unfiltered (U) analysis, and all filtered samples were collected using a 0.45-micro filter.

2. LABORATORY QUALITY CONTROL

As specified in the QAPP, laboratory QC was maintained for all analysis through proper licensure, the use of approved analytical methods, QC measurements, appropriate turn-around-time for analysis (timeliness), method detection limits (MDLs), and practical quantitation limits (PQLs). Each of these controls is discussed in the following subsections.

The review of laboratory QC included a review to identify any qualified data and an assessment to determine their significance. Additionally, the laboratory QC summaries were reviewed to verify that results met QA criteria.

2.1 Licensure

ACZ is licensed with the Arizona Department of Health Services (license number AZ0102) and is accredited in accordance with the National Environmental Laboratory Accreditation Conference.

2.2 Analytical Methods

All analyses were performed using US Environmental Protection Agency (EPA) analytical methods that meet the target MDL requirements of the QAPP (Section 4.5):

- EPA 300.0 [Ion-Chromatography (IC)]: sulfate, chloride, fluoride

- EPA 200.7 [Inductively Coupled Plasma (ICP)]: calcium, magnesium, potassium, sodium
- EPA 353.2 [Automated Cadmium Reduction (ACR)]: nitrate/nitrite
- EPA SM2320B [Titration]: alkalinity
- EPA 160.1 [Gravimetric]: TDS

Two of these methods, ion chromatography (EPA 300.0) and ICP (EPA 200.7), involve direct injection of the sample into the analytical instrument, which do not require the analysis of preparation blanks. The other methods listed are classical wet chemistry techniques that require the use of preparation blanks under the ACZ quality assurance plan and the QAPP.

2.3 Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs)

The MDLs and PQLs of the analytical methods used by ACZ are shown in the following table. The MDLs for analyses of samples were equal to or less than the target MDLs identified in the QAPP.

Parameter	MDL (mg/L)	PQL (mg/L)	TARGET MDL¹ (mg/L)
Sulfate	0.5	3	10
Calcium	0.2	1	0.2
Magnesium	0.2	1	0.2
Potassium	0.3	2	0.3
Sodium	0.3	2	0.3
Alkalinity	2	20	2
Chloride	0.5	3	1
Fluoride	0.1	0.5	0.1
Nitrate/Nitrite	0.02	0.1	0.02
Total Dissolved Solids	10	20	10

Notes:

¹ Target MDL from Table E.2 of QAPP

mg/L = milligrams per liter

2.4 Timeliness

All samples submitted for analysis (filtered and unfiltered) were analyzed within the specified holding time for each of the methods.

2.5 Quality Control Measurements

The following QC samples were prepared and analyzed:

- Preparation blanks, calibration blanks, and calibration standards
- Analytical spikes and Laboratory fortified blanks
- Laboratory control samples
- Laboratory duplicate samples
- Field blank samples

2.5.1 Preparation Blanks, Calibration Blanks, and Calibration Standards

Preparation blanks were run with each group of samples submitted for wet chemistry analysis. All preparation blanks were prepared from analyte-free water and treated as routine samples. Analytical results of all of the preparation blanks showed that no target analytes were detected at the indicated MDL.

Initial calibration blanks and initial calibration verification standards were analyzed for all samples submitted for analysis using the following methods: IC (EPA 300.0), ICP (EPA 200.7), and ACR (EPA 353.2). The results of each initial calibration blank analyzed showed no detections of any target analytes. All analysis results for the initial calibration

verification standards and laboratory fortified blanks that were analyzed showed percent recoveries that were within the acceptance criteria specified by the ACZ QA plan and the QAPP.

2.5.2 Analytical Spikes

Analytical spike and spike duplicate samples were analyzed for the following methods: IC (EPA 300.0), ICP (EPA 200.7), and ACR (EPA 353.2). Spike recoveries for most analytes were within quality control criteria set by the laboratory. Recoveries for the analysis of chloride and fluoride on ACZ project number L63026 were outside of the acceptable range of quality control criteria set by the laboratory. Recoveries for magnesium on samples run under ACZ project number L63094 were also outside of the quality control criteria set by the laboratory. These recoveries are not considered to affect the overall accuracy of the dataset because the recovery of the method control samples were acceptable. Details regarding these qualified data are in the following table.

ACZ Project ID	Analyte	Samples Affected	Recovery (%)	Tolerance		ACZ Qualifier	ACZ ID
				Min (%)	Max (%)		
L63026	Chloride	FGW-605898	75.7	90	110	M2	L62993-04AS
L63026	Fluoride	FGW-605898	77.3	90	110	M2	L62993-04AS
L63094	Magnesium	FGW-627483	117.8	85	115	MA	L63071-02ASD

Notes:

% = percent

Min = Minimum of acceptable range of quality control values

Max = Maximum of the acceptable range of quality control values

M2 = ACZ Qualifier; Matrix spike recovery was low, the method control sample recovery was acceptable.

MA = Recovery for either spike or spike duplicate was outside of the acceptance limit; the RPD was within acceptance criteria.

2.5.3 Laboratory Control Samples

Laboratory control samples were run for each group of samples submitted for alkalinity and total dissolved solids. Recoveries for all laboratory control samples were within the acceptance criteria specified by ACZ.

2.5.4 Laboratory Duplicate Samples

Analyses of laboratory duplicate samples were also reviewed as part of this quality data verification report. Field duplicate samples are discussed in Section 5.1. The RPDs for most laboratory duplicate samples analyzed were within the range of acceptable criteria set by the laboratory.

In several instances, the data was flagged with an “RA” qualifier, which means that the RPD was not used for data validation by the laboratory because the sample concentration was too low for accurate evaluation. In all but one of these cases, the data was flagged with an “RA,” but the RPD value was within the acceptance criteria set forth in the QAPP. In all cases, where the RPD could be calculated, the results met QA criteria and demonstrate an appropriate level of precision in laboratory analysis of these samples.

2.5.5 Field Blank Samples

Field blanks for the analysis of the extended parameters analyzed were not submitted. Field blanks were submitted for the analysis of sulfate and are discussed in Section 4.5.5 of Appendix B in the main text.

3. DATA QUALITY INDICATORS

The QAPP provides several DQIs for assessing the overall quality of the data. These DQIs include the following:

- Precision
- Bias
- Accuracy
- Representativeness
- Comparability
- Completeness
- Sensitivity

Each of these DQIs is discussed below in relation to the Q2-2007 groundwater sampling and analysis conducted by PDSI.

3.1 Precision

Precision indicates how well a measurement can be reproduced. Precision is quantified by calculating the RPD between duplicate samples. For the purposes of QA/QC, precision was quantified by calculating the RPD between the laboratory duplicates for each parameter analyzed. As discussed in section 2.5.4, there were no exceedances of RPD QA criteria for any laboratory duplicates, and the DQI for precision is deemed to be met.

3.2 Bias

Bias is a systematic distortion of measurements causing consistent errors in one direction. Bias is managed in this data set by the consistent application of standardized sample collection and analysis procedures.

3.3 Accuracy

Accuracy is a measure of the agreement of a measurement to a known value and is measured using the recoveries from laboratory control samples. As discussed in Section 2.5, there were no significant exceedances of the recovery QA criteria for any of the calibration standards, analytical spikes, or laboratory control standards. Based on this information, the overall accuracy of the data is judged sufficient for the purpose of aquifer characterization.

3.4 Representativeness

All samples were taken from locations specified in the Work Plan (HGC, 2006) using sampling procedures specified in the QAPP. Therefore, the samples are judged to provide a good representation of groundwater quality at the locations. The analytical data are judged to be representative of groundwater conditions because the analyses used standard procedures and methods that met QA/QC guidelines of the QAPP.

3.5 Comparability

All samples were collected using standardized procedures (HGC, 2006 and PDSI, 2005) and were analyzed by ACZ using standardized methods. Insofar as standardized sample collection and analytical methods are adhered to, the sample results should be comparable.

3.6 Completeness

All samples collected by PDSI and HGC were subsequently analyzed and reported by ACZ Laboratories. All samples collected by PDSI and analyzed by ACZ are judged to satisfy the QA/QC criteria for this project and are deemed usable for aquifer characterization. Thus, the completeness of analytical results is 100 percent.

3.7 Sensitivity

The analytical methods used to analyze the PDSI samples meet the MDL requirements specified in Table E.2 of the QAPP. Therefore, the analytical sensitivity is considered acceptable for use in aquifer characterization.

4. LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and the party for whom this report was originally prepared. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

5. REFERENCES

- Hydro Geo Chem, Inc. (HGC). 2006. Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona. August 11, 2006, revised October 31, 2006.
- Phelps Dodge Sierrita, Inc. (PDSI) 2005. Quality Assurance/Quality Control Plan for Water Monitoring, Phelps Dodge Sierrita, Inc. June 2005.

