EXHIBIT 13-A

SUMMARY OF OPERATIONS
PHASE 1 ASR PROJECT

WATER YEAR 2008

Prepared for:
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

January 2009
DRAFT

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January 30, 2009
Project No. 06-0024

Monterey Peninsula Water Management District
Post Office Box 85
Monterey, California 93942-0085

Attention: Mr. Joe Oliver, Water Resources Manager

Subject: Draft Summary of Operations Report; Phase 1 ASR Project, Water Year 2008.

Dear Mr. Oliver:

For your review and comments, we are transmitting 1 digital image (PDF) of the subject report documenting operations of the Phase 1 ASR Project during Water Year 2008 (WY2008). During WY2008 approximately 60 acre-feet of excess winter flows were diverted from Carmel River system sources for recharge in the Seaside Groundwater Basin via injection at the ASR-1 well. Following its formal rehabilitation as part of the WY2007 project, ASR-1 displayed a more than 300 percent increase in injection performance (compared to pre-rehabilitation performance) during WY2008, and a corresponding restoration of approximately 100 percent of the well's original production performance.

We appreciate the opportunity to provide assistance to the District on this important project, and look forward to discussing the WY2008 results and potential for expansion of the District's Aquifer Storage and Recovery program in the Seaside Basin.

Sincerely,
PUEBLO WATER RESOURCES, INC.

Robert C. Marks, P.G., C.Hg.
Principal Hydrogeologist

Stephen P. Tanner, P.E.
Principal Engineer

Copies submitted: 1 digital (PDF)

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INTRODUCTION

GENERAL STATEMENT

Presented in this report are the principal findings, conclusions, and recommendations resulting from operations at the Phase 1 Aquifer Storage and Recovery (ASR) Project site during Water Year 2008 (WY2008). The Phase 1 ASR Project is part of the Monterey Peninsula Water Management District's (District) ongoing implementation of ASR in the Seaside Groundwater Basin (SGB). The Phase 1 ASR Project site is located on a parcel leased by the District on former Fort Ord property along General Jim Moore Boulevard in the northeast corner of the City of Seaside, California, and is shown on Plate 1 - Site Location Map.

ASR is a form of managed aquifer storage, or "groundwater banking", that involves the conjunctive use of surface and groundwater resources. In general, ASR on the Monterey Peninsula involves the diversion of excess winter and spring time flows from the Carmel River system for conveyance to ASR wells in the SGB. The water is delivered via California American Water's (CAW) existing distribution system, which connects Carmel Valley to the Seaside/Monterey area. The recharged water is temporarily stored underground in the SGB, utilizing the available storage space within the aquifer system. During periods of high demand, the same ASR wells and/or existing CAW production wells are used to recover the "banked" water. The recharged water essentially increases the annual yield of the SGB, which in turn allows for reduced extractions from the Carmel River system during dry periods.

BACKGROUND

The District has been pursuing an ASR project since 1996. The District's efforts have included various technical feasibility investigations, leading to the construction and testing of both pilot- and full-scale ASR test wells to demonstrate the viability and operational parameters for ASR in the SGB. The first full-scale ASR well in the SGB was the Santa Margarita Test Injection Well No. 1 (now known at ASR-1), which was constructed in the spring of 2001. Since its construction, a total of approximately 1,340 acre-feet (AF) of water has been diverted from the Carmel River system to support injection testing operations at ASR-1. The testing and analyses have confirmed that the design injection rate of 1,000 gallons per minute (approximately 4.4 acre-feet per day [AFD]) is sustainable for ongoing injection operations at ASR-1.

Based on the success of ASR-1 in demonstrating the feasibility and benefits of ASR, in 2004 the District initiated the initial phase of a permanent ASR project, known as the Phase 1 ASR Project. The Phase 1 ASR Project consists of expanding the original test well project to include the addition of a second ASR well (SMTIW No. 2, now known as ASR-2), a monitoring well (MW-1), and associated facilities in an expanded site area contiguous to the existing site. The ASR-1 well has been incorporated into the Phase 1 ASR Project.

As designed, the Phase 1 ASR Project will be capable of recharging up to 2,426 acre-feet per year (AFY), with an average annual yield of approximately 920 AFY. An Environmental Impact Report/Environmental Assessment (EIR/EA) was recently certified[1] by the District for construction of the Phase 1 ASR Project, and the District has received permanent water rights for the project from the State Water Resources Control Board.

ASR-2 and MW-1 were drilled at the site during WY2007[2] and are located approximately 280 and 90 feet, respectively, from ASR-1. The design recharge capacity of ASR-2 is nominally 1,500 gallons per minute (gpm), and is intended to increase the recharge capacity of the site up to approximately 11 AFD. Although construction of ASR-2 was completed during WY2007, formal recharge testing of ASR-2 could not be performed, as the infrastructural improvements to provide Carmel River system recharge water from the CAW system at rates sufficient for both ASR wells had not yet been completed (infrastructural facilities are scheduled for completion by January 2010). Production testing performed after well construction, however, indicates that ASR-2 should be capable of its design capacities of 1,500 gpm injection and 3,000 gpm production.

PURPOSE AND SCOPE

The overall purpose of the ongoing ASR program is to recharge the SGB with excess treated Carmel River system water when it is available during wet periods for storage and later extraction (recovery) during dry periods. ASR benefits the resources of both systems by raising water levels in the SGB during the recharge and storage periods and reducing extractions from the Carmel River System during dry periods. The associated data collection program is intended to support further demonstration of the capabilities and limitations of injection, storage, and recovery of Carmel River system water in the Santa Margarita Sandstone aquifer of the SGB.

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[1] Final EIR/EA for the Monterey Peninsula Water Management District Aquifer Storage and Recovery Project, State Clearinghouse #20014121065, dated August 2006.

[2] A Summary of Operations Report documenting the drilling, construction and production testing of ASR-2 (SMTIW No. 2) was presented in a separate report, dated February 29, 2008.

The scope of work for the WY2008 program was developed through discussions with Mr. Joseph W. Oliver, C.Hg., Water Resources Manager with the District; and included the following:

- Development of the WY2008 hydrogeologic and water quality testing and data collection program.
- Oversight and field assistance with the implementation of the injection and water quality testing program.
- Engineering and construction management of below ground and interim facilities at the Phase 1 ASR Project site.
- Engineering and design coordination for final permanent facilities at the Phase 1 ASR Project site.
- Assistance with Regional Water Quality Control Board permitting.
- Preparation of this Summary of Operations Report documenting the recharge program, procedures, and results, including recommendations for further analysis and subsequent ASR test phases.

FINDINGS

RECHARGE OPERATIONS

Although WY2008 was classified as a "Normal" hydrologic year[3], the amount of excess Carmel River system water diverted for recharge was limited to a total volume of approximately 60 acre-feet (AF). The diversion and recharge volume was limited this year due to a combination of factors, including CAW system limitations and construction of infrastructure improvements (new below ground pipelines) at the Phase 1 ASR Project site. Recharge operations were performed during the period of February 5 to March 19, 2008. The recharge water was injected at the ASR-1 well into the Santa Margarita Sandstone aquifer of the SGB at average injection rates ranging between approximately 979 to 1,063 gpm (approximately 4.3 to 4.7 AFD).

Recharge Procedures

Recharge into the SGB was accomplished during WY2008 via injection into ASR-1. An as-built schematic of ASR-1 is presented on Plate 2. Injection feed water was potable water provided from the CAW distribution system, and was conveyed from Carmel Valley water sources through the CAW distribution system to

[3] Based on 49,017 AF of unimpaired runoff flow recorded at San Clemente Dam in WY2008.

the CAW Paralta Well site, and finally to ASR-1 through a temporary aboveground 12-inch-diameter HDPE line that was installed as part of the WY2002 capital improvements program.

Injection water was introduced into ASR-1 via the pump column. Injection rates were controlled by a flow control valve at the Luzern booster pump, two gate valves on the ASR-1 wellhead piping, and a downhole flow control valve (FCV) installed on the pump column. Positive gauge pressures were maintained at the wellhead during injection operations to prevent cascading of water into the well. Injection flow rates and total injected volumes were measured with a 12-inch-diameter totalizing meter. Water levels in ASR-1 were measured with the District's pressure transducer coupled to a data logger.

Injection Operations Summary

Injection into ASR-1 occurred during periods of available excess Carmel River system flows from the CAW distribution. Injection generally occurs at ASR-1 on a continuous basis when flows are available, interrupted only for periodic backflushing (discussed in a following section) which typically occurs on a weekly basis. As noted previously, recharge operations during WY2008 were limited by infrastructural factors, and only two injection periods occurred during WY2008. The water level data collected at ASR-1 during WY2008 are presented on Plates 3 through 5. Field data sheets collected during injection operations are presented in Appendix A - Field Data Sheets (not included in draft). A summary of pertinent injection period results is presented below in Table 1.

Table 1. WY2008 Injection Summary, ASR-1

Injection Period No.	Dates (2008)	Duration (days)	Avg. Injection Rate (gpm)	Total Volume (AF)	SWL (ft btoc)	Final IWL (ft btoc)	Final DUP (ft)
1	2/5 - 2/11	5.9	979	25.9	358.1	317.0	41.1
2	3/10 - 3/19	8.9	1,063	33.7	358.1	298.2	59.9
			WY2008 TOTAL	**59.6 AF**			

Table 1 Notes:
SWL - Static Water Level
ft btoc – feet below top of casing
IWL - Injection Water Level
DUP – Water Level Drawup (rise)

As shown above, the total duration of the two injection periods during WY2008 was approximately 15 days, with a total volume of 59.6 AF injected. For comparison, only approximately 8.2 AF were injected during WY2007, which was classified as a "Critically Dry" hydrologic year, whereas during WY2006, which was classified as a "Wet" hydrologic year, approximately 408 AF were injected at ASR-1.

Water level (depth to water) in the well at the end of the two WY2008 injection periods was between approximately 317 to 298 feet btoc, indicating a significant amount of additional available drawup ("freeboard") remained in the well casing during injection. The available "freeboard" would allow for potential additional water level increases (e.g., due to well plugging, regional water level increases, and/or interference from additional ASR wells in the SGB) without limiting the injection capacity of ASR-1.

Aquifer Response to Injection

The response of the regional aquifer system to injection at the Phase 1 ASR Project site has been monitored since the SMTIW project was initiated. Submersible water level transducer/data logger units have been installed at eight existing offsite District monitoring well locations in the SGB. In addition, the recently constructed ASR-2 and MW-1 at the site have been similarly instrumented. The locations of each offsite monitoring well are shown on Plate 1, and water level hydrographs for WY2008 are graphically presented on Plates 6 through 15.

A summary of the water level observations during the WY2008 injection periods is presented in Table 2 below:

Table 2. Summary of Monitoring Well Observations

Well ID	Distance from ASR-1 (feet)	Aquifer Monitored	Injection Period No. 1		Water Level Rise (feet)	Injection Period No. 2		Water Level Rise (feet)
			SWL	IWL		SWL	IWL	
MW-1	87	Tsm	360.8	351.2	9.6	NA	NA	--
ASR-2	282	Tsm	374.3	366.9	7.4	372.4	364.6	7.8
PRTIW	335	QTp	NA	NA	--	261.9	257.1	4.8
Paralta Test	660	QTp & Tsm	NA	NA	--	NA	NA	--
Ord Grove Test	1,600	QTp & Tsm	NR	NR	--	NR	NR	--
Ord Terrace (Deep)	2,260	Tsm	NR	NR	--	NR	NR	--
FO-7 (Deep)	3,420	Tsm	491.5	489.5	2.0	490.3	488.3	2.0
FO-7 (Shallow)		QTp	NR	NR	--	NR	NR	--
PCA East (Deep)	6,400	Tsm	87.1	85.2	1.9	85.9	84.0	1.9
PCA East (Shallow)		QTp	NR	NR	--	NR	NR	--
FO-9 (Deep)	7,280	Tsm	138.4	137.6	0.8	139.3	138.0	1.3
FO-8 (Deep)	7,580	Tsm	395.7	394.2	1.5	394.6	393.0	1.6

Table 2 Notes:

SWL- Static Water Level (depth to water in feet).
IWL – Injection Water Level (depth to water in feet).
Tsm – Santa Margarita Sandstone aquifer.
QTp – Paso Robles Formation aquifer.
NA – Data Not Available due to transducer/datalogger malfunctions.
NR – No Response to injection discernable.

As shown on the water level hydrographs (Plates 6 through 15) and in Table 2, water levels in the Santa Margarita Sandstone (Tsm) aquifer at the start of the WY2008 recharge season ranged between approximately 19 to 35 feet below sea level. Positive response to injection at ASR-1 was observed at six of the nine Tsm monitoring wells, with water level responses ranging between approximately 0.8 to 9.6 feet, generally decreasing with distance from the ASR well. The lack of discernable response to injection at the Ord Grove Test and Ord Terrace wells suggest that the Ord Terrace Fault may represent some degree of a hydraulic barrier in the Tsm. The potential effects of the Ord Terrace Fault on groundwater flow and hydraulic response should be investigated further, as it may have bearing on future analysis (e.g., groundwater modeling) of expanded ASR and/or other basin management strategies for the SGB.

Water level response to ASR-1 injection at wells completed in the Paso Robles Formation (QTp) was limited to the PRTIW, which observed approximately 4.8 feet of water level increase in response to Injection Period No. 2. The lack of response at the other QTp monitor wells is consistent with the fact that water levels in the QTp are approximately 26 to 38 feet higher than in the underlying Tsm (at PCA-East and FO-7, respectively); therefore, the QTp would not be expected to respond to injection into the Tsm until the water levels (piezometric head) in the Tsm were raised enough to equal or exceed the levels in the QTp (i.e., until the downward vertical gradient is reversed).

Backflushing

Most sources of injection water contain trace amounts of solids that slowly accumulate in the pore spaces in the wells gravel pack and adjacent aquifer materials, and the CAW source water is no exception. Periodic backflushing of ASR/injection wells is therefore necessary to maintain well performance by removing materials deposited/accumulated around the well bore during injection. The procedure is similar to backwashing a media filter to remove accumulated material deposited during filtration.

The general rule-of-thumb for ASR wells is to backflush at pumping rates that are at least two times the rate of injection in order to create pore throat velocities sufficient to remove particles that cling to the surfaces of gravel pack and aquifer grains. A typical "trigger" for backflushing is when the amount of water level drawup during injection equals the available drawdown (as measured from the static water level to the top of the pump bowls) in the well for backflushing. This helps to avoid over-pressurization and compression of plugging materials, thereby maximizing the efficiency of backflushing and limiting the amount of residual plugging.

Based on the several years of testing conducted as part of the SMTIW project, a weekly backflushing frequency has been determined to be the best operational practice at ASR-1. The general procedure consists of temporarily stopping injection and then pumping the well at a rate of approximately 2,000 to 2,500 gpm (i.e., at least twice the rate of injection) for a period of approximately 15 to 20 minutes. Backflush water is discharged to the on-site backflush pit, where it percolates back into the groundwater basin.

During WY2008, the initial backflush discharge was usually very turbid and of a deep orange brown color, becoming cloudy after 3 to 5 minutes and then generally clear within 15 to 20 minutes. These observations have been generally consistent throughout the years of operating the SMTIW project. Additional "incidental" backflushing was also conducted during the WY2008 storage period, typically as part of water quality sampling of the stored water. Following routine backflushing operations and brief periods of water level recovery, controlled 10-minute specific capacity tests are typically performed to track well production performance (discussed later in the report).

WELL PERFORMANCE

The performance of ASR-1 has been routinely measured and tracked as part of the SMTIW project. Performance is generally measured by specific capacity, which is the ratio of flow rate to water level change in the well over a specific elapsed time. The value is expressed as gpm per foot of water level change (gpm/ft). The value normalizes well performance by taking into account differing static water levels and flow rates. As such, specific capacity data is useful for comparing well performance over time and at differing flow rates. Decreases in specific capacity are indicative of decreases in the hydraulic efficiency of a well due to the effects of plugging. Both injection and production well performance is tracked at ASR-1, as described below.

Injection Performance

Injection performance has been tracked at ASR-1 since the inception of the testing program by measurement and comparison of 24-hour injection specific capacities. Injection specific capacity is the ratio of injection rate to water level drawup in the well casing. A summary of injection season 24-hour injection specific capacities for WY2002 through WY2008 is presented in Table 3 below:

Table 3. ASR-1 Injection Performance Summary

Water Year	Injection Rate (gpm)	24-hour DUP (feet)	Specific Capacity (gpm/ft)
WY2002			
Beginning Period	1,570	81.7	**19.2**
Ending Period	1,164	199.8	**6.4**
WY2003			
Beginning Period	1,070	70.0	**15.5**
Ending Period	1,007	49.7	**20.3**
WY2004			
Beginning Period	1,383	183.4	**7.5**
Ending Period	1,072	67.4	**15.9**
WY2005			
Beginning Period	1,045	46.6	**22.4**
Ending Period	976	94.1	**10.4**
WY2006			
Beginning Period	1,039	71.5	**15.0**
Ending Period	1,008	62.2	**17.5**
WY2007			
Beginning Period	1,098	92.4	**11.9**
Ending Period	--	--	**--**
WY2008			
Beginning Period	979	25.5	**38.4**
Ending Period	1,063	33.4	**31.8**

In reviewing the data in Table 3, it should be noted that there have been some differences in the injection methodologies during some of the recharge seasons that affected the well performance. The differences in methodologies are due to various tests that have been conducted over the years to determine the best operational parameters for the ASR well. For example; in WY2002 the FCV had not yet been installed to control gas binding; recovery pumping was conducted only in

WY2003 and WY2004; and, during WY2005 the injectate was dechlorinated (refer to the Summary of Operations Reports for those Water Years for additional details).

Nonetheless, as shown in Table 3, the 24-hour injection specific capacity of ASR-1 generally fluctuated during the six WY2002 to WY2007 injection seasons between approximately 6 and 22 gpm/ft. By the end of WY2007, the well had lost approximately 40 percent of its injection performance as a result of residual plugging.

As mentioned previously, most sources of injection water contain some amount of plugging constituents. Routine backflushing is rarely 100 percent effective at removing all plugging materials; therefore, some amount of residual plugging can be expected at any ASR well. Mitigation of residual plugging is accomplished by periodic formal rehabilitation of the well to remove residual plugging material and restore well performance. The procedure is similar to rehabilitation typical for municipal production wells, but specifically tailored to the plugging mechanisms associated with dual-purpose injection/extraction wells. ASR-1 underwent formal rehabilitation as part of the WY2007 program (documented in the WY2007 Summary of Operations Report).

As shown in Table 3, the 24-hour injection specific capacity had declined to approximately 11.9 gpm/ft by WY2007. Following rehabilitation, the well displayed an injection specific capacity of approximately 38.4 gpm/ft at the beginning of WY2008, corresponding to an over 300 percent increase in injection performance, indicating that rehabilitation was extremely successful in removing residual plugging and restoring the hydraulic performance of ASR-1. The 24-hour injection specific capacity declined in Injection Period No. 2 to approximately 31.8 gpm/ft, reflecting residual plugging from Injection Period No. 1.

Production Performance

Production performance has also been tracked at ASR-1 (SMTIW No. 1) since the inception of the SMTIW testing program by measurement and comparison of production specific capacities. Production specific capacity is the ratio of pumping rate to water level drawdown in the well casing. Following routine backflushing operations and periods of water level recovery, controlled 10-minute specific capacity tests are typically performed to track well production performance, similar to the tracking of injection performance from 24-hour injection specific capacities.

A summary of injection season beginning and ending 10-minute production specific capacities for WY2002 through WY2008 is presented below in Table 4 - Production Performance Summary:

Table 4. ASR-1 Production Performance Summary

Water Year	Pumping Rate (gpm)	10-min DDN (feet)	Specific Capacity (gpm/ft)
WY2002			
Pre-Injection	2,825	45.1	**62.6**
Post- Injection	2,800	95.3	**29.4**
WY2003			
Pre-Injection	2,775	81.9	**33.9**
Post- Injection	2,600	91.7	**28.4**
WY2004			
Pre-Injection	2,000	51.8	**38.6**
Post- Injection	1,700	81.2	**20.9**
WY2005			
Pre-Injection	1,900	49.8	**38.1**
Post- Injection	1,500	87.1	**17.2**
WY2006			
Pre-Injection	1,500	82.4	**18.2**
Post- Injection	1,600	74.1	**21.6**
WY2007			
Pre-Injection	1,500	81.7	**18.4**
Post- Injection	1,500	79.4	**18.9**
WY2008			
Pre-Injection	1,980	31.0	**63.8**
Post- Injection	2,000	55.6	**36.0**

As shown in Table 4, the production specific capacity declined from approximately 63 to 18 gpm/ft over the course of the six year period of WY2002 through WY2007, an overall decline of approximately 70 percent. This compares to the 40 percent overall decline observed in injection performance during this period. Following rehabilitation, the production specific capacity increased to approximately 63.8 gpm/ft, slightly greater than the pre-injection specific capacity. These results are comparable to the injection performance, similarly indicating the efficacy of rehabilitation in restoring the well's hydraulic performance. Costs of the rehabilitation program totaled approximately $110K (inclusive of plans and specifications, field oversight, and C-57 contractor costs), corresponding to an annualized operations and maintenance cost of approximately $22K (assuming a 5-year rehabilitation interval as recommended in the WY2007 report).

WATER QUALITY

General

As in previous years, water quality was monitored at ASR-1 during injection and aquifer storage operations (no water recovery was implemented during the WY2008 period). With the completion of a proximate monitoring well (MW-1), water quality was also observed at this identically-completed, small diameter well; samples were collected through a dedicated down-hole sample pump with a production (purging) rate of 3 to 5 gpm. Summaries of the collected water quality data at ASR-1 and MW-1 during WY2008 are presented in Tables 5 and 6 below. Analytic laboratory reports are presented in Appendix B (not included in the draft).

As discussed earlier, WY2008 operations were atypical due to a relatively limited injection total of only 59.6 AF that was stored in two short injection periods in early February (25.9 AF) and mid-March (33.7 AF). The small injection volumes and split injection periods resulted in a reduced monitoring program, small monitoring dataset, and somewhat atypical results compared to normal or wet-year operations.

Baseline Water Quality

Because injection operations have occurred at ASR-1 for the past 6 years, the proximate groundwater has been altered from the natural subsurface conditions, making a clear distinction of "native" and "non-native" waters somewhat complex. The selection of a water-quality baseline to assess water-quality changes during aquifer storage therefore requires careful consideration, and will vary to some degree on what distinctions between in-situ and injected waters are of importance. For ASR operations, it is often the case that "baseline" or starting groundwater quality is different from native groundwater quality, particularly when no recovery or extraction has occurred since the previous injection cycle. For WY2008 data, baseline conditions were also affected by the recent chemical/mechanical well rehabilitation performed on ASR-1 in the Fall of 2007. Collection of baseline water-quality data in February 2008, just prior to the commencement of injection operations, showed residual evidence of well acidization, including depressed pH, high iron, and high manganese. Increased levels of these constituents is consistent with acidic rehabilitation procedures, even after thorough purging of the well has been implemented. In addition to the above constituents, an elevated level of Haloacetic Acids (HAAs) was measured, particularly monochloroacetic acid (MCA). The formation of MCA during well rehabilitation was likely a result of residual Glycolic Acid (monohydroxyacetic acid), present in the aquifer after the well acid-cleaning process, reacting with free chlorine present in the subsequent shock-chlorination step of the rehabilitation process. Although measured at over 80 ug/L in the February analysis, the condition was not considered problematic as MCA degrades rapidly in the subsurface, as has been evidenced in the past 6 years of ASR operations.

Because the previous year (WY2007) was an exceptionally dry year, with only 8.2 AF of water injected, the effects of aquifer gradient, natural dispersion, pumping during rehabilitation, and extended equilibration time resulted in the initial WY2008 groundwater quality (February 2008) being very similar to original native Tsm water quality (with the exception of the acidified constituents noted above). In general terms, the starting point of groundwater quality was that of Tsm native water for the WY2008 injection season; anions and cations were moderately high, redox levels were moderately negative (anaerobic), and the typical Tsm reduced redox species were present (Fe, Mn, and H_2S). WY2007 starting conditions, by comparison, showed a mix of approximately 43% Native Groundwater (NGW) and 57% Injected (CAW) water; redox conditions were positive (aerobic) and no reduced species were present. As would be expected under these conditions, residual Trihalomethanes (THMs) from WY2006 were also present at 46 ug/L.

Injection Water Quality

Source water for injection at ASR-1 was supplied from the CAW municipal water system, primarily from Carmel River system wells which are treated at the CAW Begonia Iron Removal Plant (BIRP) for iron and manganese removal. Injection water quality was typical of recent years, with the exception of chloride and sulfate levels being elevated by approximately 20-25% from previous years. This is attributed to the drier hydrologic conditions relative to most earlier injection years and corresponding lack of Carmel River system natural recharge. An additional (and possibly significant) difference in injection water quality in WY2008 was the absence of ortho-phosphate; this compound is typically present at 0.3 to 0.5 milligrams per liter (mg/L) in the CAW system, and its presence can be contributed by the addition of a phosphate-based corrosion inhibitor at the BIRP treatment facility prior to delivery into the municipal distribution system. It is unknown at this time if CAW discontinued the use of ortho-phosphate or if another type of corrosion inhibitor is being used at BIRP.

Water Quality During Aquifer Storage

Table 5 presents a summary of water quality data collected at ASR-1, while Table 6 presents similar data collected at MW-1. Data for ASR-1 include original 2001 native groundwater results obtained when the well was first constructed, "baseline" water quality taken immediately prior to WY2008 injection, WY2008 injection water quality, and "stored" water quality collected periodically after injection operations were completed. As discussed earlier, the background water quality closely resembled native Tsm groundwater. To track the general mixing, dilution, and interaction between injected and native groundwaters, chloride ion (Cl) was used as a natural tracer. Chloride ion is a very stable, highly soluble and is present in both waters; albeit at a 400% concentration differential. Although sulfate ion is a stable and useful natural tracer as well, the SO_4 concentrations of injected and native waters are very close (within 10%), which precludes its utility to accurately differentiate between the injected and in-situ waters. Review of Cl data collected during the 6-month storage period shows that the injected "bubble" of CAW water remained essentially intact for approximately 2.5 months (i.e., until June 2008) before dilution and intermixing with proximate native groundwaters occurred. June 2008 is also the same period when CAW seasonal production from their proximate wells in the SGB commenced (production commenced in earnest in late May 2008; by June, water levels at the ASR site had dropped by approximately 10 feet due to CAW SGB pumping). Plate 16 shows Chloride variation during the aquifer storage period; concentrations characteristic of injected waters persisted for approximately 10 weeks before intermixing with NGW became pronounced, (i.e., corresponding to CAW Seaside well pumping). At 6 months, the water in storage at ASR-1 was a mixture of approximately 44% CAW and 56% NGW. Related general water-quality data are also presented on Plate 16.

Review of the other major anions and cations (Ca, Mg, SO_4, and K) shows similar trends of increased mixing/dilution over time. When Cl data are used to correct the data for dilution/mixing, the anions, cations, and bulk parameters such as electrical conductivity show consistent concentrations over time. These trends demonstrate that, as in previous injection/recovery cycles, no significant ion exchange, acid-base, or precipitation reactions are occurring at the site.

As part of the WY2008 water-quality investigations, geochemical modeling and bench-scale aquifer mineralogy leaching tests were performed to assess the stability of injected water as it is stored in the aquifer, and to determine if mineral leaching (particularly of undesirable constituents) was likely during aquifer storage. The test and modeling results indicated that adverse leaching was not occurring, largely due to the inert materials composing most of the Tsm aquifer; the complete technical memoranda for the study is presented in Appendix C (not included in draft).

As found in previous ASR operations at the site, the only significant aqueous reactions observed during aquifer storage were redox-related (and possibly biologically mediated); these included changes in HAAs, THMs and sulfide compounds. The results showed the following:

- HAAs degraded completely during storage, after a short "ingrowth" period.
- THMs showed characteristic and significant ingrowth initially, followed by a gradual decline after peaking at 17 weeks of storage.
- As redox potential (ORP) dropped, THM degradation increased.
- Hydrogen Sulfide (H_2S) levels grew as ORP levels dropped to negative levels, approaching concentrations observed in native Tsm ground waters.

The reaction of HAAs and THMs during storage was typical of previous results at the site. HAAs experienced a brief ingrowth period as a result of free chlorine in the injectate (1.3 mg/L), followed by a rapid and complete degradation process under aerobic conditions; HAAs were undetectable by week 14 of aquifer storage. The initial concentration of THMs averaged 37 micrograms per liter (ug/L), but ingrowth caused by the reaction of free chlorine in the injectate with organic compounds occurred rapidly and steadily over the next 17 weeks. Maximum THM levels observed in samples were measured at 125 ug/L; however, when corrected for mixing/dilution effects correlated by chloride-ion data, the normalized peak THM concentration was 160 ug/L (corresponding dilution equaled 22% NGW) measured at 112 days of aquifer storage. Plate 17 shows the actual and normalized THM data for ASR-1, along with ORP data.

Subsequent decline in THMs followed the characteristic process: rapid degradation of Bromoform and the highly brominated species with a 50% decline in overall THMs occurring approximately 7 weeks after the cessation of ingrowth. Declines in redox potential of the water during the same time period were observed as in previous years. As the normalized THM levels dropped 50% from their peak value, intermixing/dilution increased by one-third, and ORP dropped by approximately 100 millivolts (mV).

Unlike previous cycles, ortho-phosphate was not detected at all in the injected waters, and nitrogen and/or phosphate species did not correlate with THM degradation; however, both phosphate and nitrogen concentrations were near or below laboratory detection limits throughout the WY2008 program, indicating the need for better low-level detection limits for bio-nutrient related compounds.

Water Quality at MW-1

The recently-constructed monitoring well MW-1 was utilized for tracking changes in stored water quality for a portion of WY2008. MW-1 is perforated similarly to wells ASR-1 and ASR-2, and is located approximately 90 feet east of ASR-1 (one-third the distance between ASR-1 and ASR-2). Because completion of well-head facilities for MW-1 did not occur until May 2008, only the later stages of aquifer storage were able to be monitored; transit time of injected water reaching MW-1 was not available due to this late startup, however, these data will be collected in WY2009.

Review of the water-quality data for MW-1 presented in Table 6 shows many of the trends apparent from ASR-1 storage water quality, i.e., no evidence of ion exchange or precipitation reactions, increased influence of NGW intermixing over time, and similar THM ingrowth and decay trends. The data also provide insight into other aquifer-storage issues previously unavailable from ASR-1 alone, including the following:

Injection Bubble Transport. Although data collection did not commence until mid-May 2008, review of the data shows that even at the 57-day storage time, injected water was moving towards MW-1 and continued until Storage Day 77, when the percentage of injectate water in the aquifer at MW-1 was greatest. The concentration of Chloride, Conductivity, and water temperature all show a low inflection point at this time, followed by trending towards more dispersion and higher contributions of NGW in the samples. Based on Chloride-ion data, the maximum CAW injectate level at MW-1 reached approximately 85% on Storage Day 77 (with 15% NGW still present). The lack of complete envelopment of MW-1 with injectate is understandable when the low injected volume of water and the coincident commencement of SGB well pumping by CAW (commencing on Storage Day 62) are taken into consideration. These data are graphically presented on Plate 18. In general terms, the bubble of injected water which was enveloping MW-1 (to the east of ASR-1) in May 2008 was pulled away (back to the west) by the proximate pumping of the more westerly CAW SGB production wells in June 2008.

Disinfection Byproducts Fate and Transport. Additional geochemical information is indicated by the review of THM data at MW-1, which is graphically presented along with ASR-1 THM data on Plate 19. The THM data suggest several pertinent trends:

- THM levels showed similar ingrowth and decay trends to those observed in ASR-1 during aquifer storage.

- When corrected for dilution/dispersion by normalization with Chloride-ion data, the peak of THM ingrowth reached only 90 ug/L at MW-1, as opposed to 160 ug/L at ASR-1. This may be due to the greater availability of organic carbon (i.e., biomass) at ASR-1, or the higher concentration of free chlorine at ASR-1 (or both). Additional investigation of this phenomenon is needed in WY2009 testing.

- Comparison of total THMs and individual THM species from both wells shows that the ingrowth phase peaked at the same time (Storage Day 112) for both ASR-1 and MW-1. This finding is important, as it indicates that THM degradation rate is a function of time only; it also supports the finding that THM adsorption is not occurring during aquifer storage and transport. A functional characteristic of adsorption in porous media flow is that compounds (especially larger molecular weight organics) demonstrate retardation commensurate with adsorption; because there is no observed retardation of THM peaking at MW-1, the occurrence of THM adsorption is unlikely.

Overall, water-quality data provided significant insight into ASR operations in the Tsm aquifer this year, despite the short operating period. Data collection for WY2009 could be enhanced by the following items:

- Lower detection limits for bionutrient-related compounds.

- Addition of low level chloramines analysis to the DBP analyte group in order to assess Chlorine availability for DBP ingrowth.

- Maintenance of a consistent well purge-volume prior to sample collection at both ASR-1 and MW-1.

Table 5. Summary of WY2008 Water Quality Data
ASR-1

Parameter	Unit	PQL	Date 3/21/01	2/5/08	2/6/08	3/11/08	4/17/08	5/9/08	6/3/08	6/25/08	7/8/08	7/29/08	9/12/08
Sample Description			NGW	WY07 Storage	WY08 Injection		WY08 Storage						
Elapsed Storage Time	Days		–	341	–	–	30	52	77	99	112	133	178
Volume Pumped at Sampling	1,000 gals		–	54	–	–	56	59	149	138	163	56	156
Laboratory Results													
Alkalinity, Total (as CaCO3)	mg/l	10	224	220	142	126	133		136		159		196
Ammonia-N	mg/l	0.05	0.33	0.24	ND	ND	ND		ND		ND		ND
Arsenic (Total)	ug/l	1	ND						1				1
Bicarbonate (as HCO3-)	mg/l	10							166				
Boron	mg/l	0.05	0.14	0.56	0.18	0.26	0.16		0.4		0.16		0.2
Bromide	mg/l												
Calcium	mg/l	1	85	88	55	50	48		49		58		68
Carbonate (as CaCO3)	mg/l	10					ND		ND				
Chloramines	mg/l												
Chloride	mg/l	1	120	130	49	38	34		35	40	55	85	88
Conductivity	umho/cm	1	1015	1000	658	574	580		561		661		842
Flouride	mg/l	0.1	0.35				0.31		0.3				
Gross Alpha	pCi/L												3.83+/-1.18
Haloacetic Acids (Total)	**ug/l**			**88**	**10**	**12**	**20**	**4.4**	**2.9**	**ND**	**ND**	**ND**	**ND**
Monobromoacetic Acid	*ug/l*	*1*		*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Monochloroacetic Acid	*ug/l*	*2*		*78*	*ND*	*ND*	*7.6*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Dibromoacetic Acid	*ug/l*	*1*		*ND*	*3.8*	*3.5*	*3.2*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Dichloroacetic Acid	*ug/l*	*1*		*10*	*4.1*	*4.7*	*ND*	*1.5*	*1.1*	*ND*	*ND*	*ND*	*ND*
Trichloroacetic Acid	*ug/l*	*1*		*ND*	*2.3*	*3.6*	*9.1*	*2.9*	*1.8*	*ND*	*ND*	*ND*	*ND*
Iron (Dissolved)	ug/l	100		1620	ND	ND	201		ND		ND		118
Iron (Total)	ug/l	100	120	1950	ND	ND	201		107		100		121
Kjehldahl Nitrogen (Total)	mg/l	0.5		0.5	ND	ND	ND		ND		ND		ND
Magnesium	mg/l	1	19	23	18	15	14		14		17		18
Manganese (Dissolved)	ug/l	20		151	ND	ND	ND		ND		ND		ND
Manganese (Total)	ug/l	20	40	160	ND	ND	ND		ND		ND		ND
Methane	ug/l	0.4											2.4
Molybdenum	ug/l	10											4
Nitrate as NO3	mg/l	1	ND	ND	ND	1	1		1		1		1
Nitrite as NO2-N	mg/l	0.1		ND	ND		ND		ND				
o-Phosphate-P	mg/l	0.2	0.46	ND	ND	ND	ND		0.2		ND		0.2
Potasium	mg/l	0.5	5.3	5.8	3.4	3.2	3		2.9		3.7		4.3
pH	Std Units		7.1	7.0	7.3	7.1	7.1		7.4		7.0		7.1
Radium 226	pCi/L												1.27+/-0.709
Selenium	ug/l	5	ND										4.0
Sodium	mg/l	1	88	91	52	45	40		37		48		76
Sulfate	mg/l	1	95	90	100	91	89		86		89		90
Total Dissolved Solids	mg/l	10	618		397		351		362				
Organic Carbon (Total)	mg/l	0.2	6.3	1.9	1.5	1.3	1.2		1.4		1.1		0.9
Organic Carbon (Dissolved)	mg/l	0.2		2.1	1.3	1.4	1.1		1.2		1.1		0.71
Phosphorous (Total)	mg/l	0.03		0.61	0.25	0.21	0.21		0.18		0.19		0.17
Trihalomethanes (Total)	**ug/l**	**1**		**3.2**	**43**	**31**	**80**	**67**	**73**	**97**	**125**	**54**	**30**
Bromodichloromethane	*ug/l*	*0.5*		*1*	*14*	*11*	*29*	*23*	*26*	*31*	*41*	*17*	*9.2*
Bromoform	*ug/l*	*0.5*		*ND*	*3.6*	*2.1*	*2.4*	*3.3*	*2.4*	*3.9*	*3.9*	*1.5*	*2.1*
Chloroform	*ug/l*	*1*		*2.2*	*8.8*	*7.9*	*31*	*23*	*31*	*43*	*60*	*25*	*13*
Dibromochloromethane	*ug/l*	*0.5*		*ND*	*16*	*9.7*	*18*	*18*	*14*	*19*	*20*	*10*	*6*
Uranium (by ICP/MS)	ug/l	1											1
Vanadium (Total)	ug/l	10											2
Field Parameters													
pH	Std Units			6.7	7.2	7.3	6.8	7.1	6.9	7.4	6.8	6.7	6.2
ORP	mV			-116	736	749	121	125	7	86	113.5	108.8	-31.1
Temp	°C			22.5	14.9	15.5	16.5	16.0	16.3	16.8	17.6	18.8	20.6
EC	uS			610	490	553	565	541	571	613	652	815	870
H2S	mg/l			0.35	ND	ND	0.05	0.04	0.03	ND	0.01	0.05	0.14
Free Chlorine Residual	mg/l			ND	1.1	1.3	1.4	ND	ND	<0.1	<0.1	<0.1	<0.1
Dissolved Oxygen	mg/l			0.2	4.5	3.5	3.0	3.0	>1.0	2.0	2.0	2.0	2.0

Table 6. Summary of WY2008 Water Quality Data MW-1

Parameter	Unit	PQL	Date						
			3/27/07	5/14/08	6/3/08	6/25/08	7/8/08	7/29/08	9/12/08
Sample Description			NGW	WY08 Storage					
Elapsed Storage Time	Days		--	**57**	**77**	**99**	**112**	**133**	**178**
Volume Pumped at Sampling	gals		--	**768**	**1640**	**1030**	**920**	**270**	**85**
Laboratory Results									
Alkalinity, Total (as CaCO3)	mg/l	10	225	149		168		184	
Ammonia-N	mg/l	0.05	0.28	0.09		ND		ND	
Arsenic (Total)	ug/l	1	ND			2		2	
Barium (Total)	ug/l	10	20					34	
Bicarbonate (as HCO3-)	mg/l	10	274	182		205		224	
Boron	mg/l	0.05	0.098	0.22		0.28		0.24	
Bromide	mg/l								
Calcium	mg/l	1	92	58		61		68	
Carbonate (as CaCO3)	mg/l	10	ND	ND		ND		ND	
Chloramines	mg/l								
Chloride	mg/l	1	131	55	48	63	72	82	100
Conductivity	umho/cm	1	1035	700		690		762	
Flouride	mg/l	0.1	0.23	0.19		0.13		0.1	
Gross Alpha	pCi/L							4.44+/-2.18	
Haloacetic Acids (Total)	**ug/l**		**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Monobromoacetic Acid	*ug/l*	*1*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Monochloroacetic Acid	*ug/l*	*2*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Dibromoacetic Acid	*ug/l*	*1*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Dichloroacetic Acid	*ug/l*	*1*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Trichloroacetic Acid	*ug/l*	*1*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Iron (Dissolved)	ug/l	100		ND		ND		ND	
Iron (Total)	ug/l	100	ND	ND		ND		ND	
Kjehldahl Nitrogen (Total)	mg/l	0.5	0.5	ND		ND		ND	
Magnesium	mg/l	1	19	13		14		17	
Manganese (Dissolved)	ug/l	20		24		23		ND	
Manganese (Total)	ug/l	20	42			25		ND	
Methane	ug/l	0.4						0.58	
Molybdenum	ug/l	10						5	
Nitrate as NO3	mg/l	1	0.9	2		4		4	
Nitrite as NO2-N	mg/l	0.1	ND	ND		ND		ND	
o-Phosphate-P	mg/l	0.2	ND	ND		ND		ND	
Potasium	mg/l	0.5	5.0	4.1		3.7		3.9	
pH	Std Units		7.1	7.1		7.3		7.2	
Selenium	ug/l	5	ND					4.0	
Sodium	mg/l	1	86	60		55		60	
Strontium (Total)	ug/l	5	427					332	
Sulfate	mg/l	1	107	93		74		71	
Total Dissolved Solids	mg/l	10	647	439		423		486	
Organic Carbon (Total)	mg/l	0.2	0.68	3.3		0.51		0.73	
Organic Carbon (Dissolved)	mg/l	0.2	0.96			0.7		0.71	
Phosphorous (Total)	mg/l	0.03	ND	0.07		ND		0.02	
Trihalomethanes (Total)	**ug/l**	**1**	**5.8**	**11**	**39**	**51**	**54**	**28**	**12**
Bromodichloromethane	*ug/l*	*0.5*	*1.8*	*3.3*	*14*	*18*	*21*	*11*	*4.7*
Bromoform	*ug/l*	*0.5*	*ND*	*1.1*	*1.6*	*1.9*	*ND*	*ND*	*ND*
Chloroform	*ug/l*	*1*	*2.4*	*3.3*	*15*	*22*	*26*	*14*	*7.4*
Dibromochloromethane	*ug/l*	*0.5*	*1.6*	*3.2*	*8.1*	*9.4*	*7.1*	*2.7*	*ND*
Uranium (by ICP/MS)	ug/l	1						1	
Vanadium (Total)	ug/l	10						4	
Field Parameters									
pH	Std Units		7.0	6.7	7.0	6.2	6.7		6.8
ORP	mV		-96	15	67	55	40.5	-9.3	-109
Temp	^{0} C		24.9	23.4	20.1	20.1	20.6	21.0	21.6
EC	uS		1108	699	650	703	790		862
H2S	mg/l		0.42	ND	0.05		0.03	0.03	0.11
Free Chlorine Residual	mg/l		ND	ND	ND	ND	<0.1	<0.1	<0.1
Dissolved Oxygen	mg/l			0.1	>1.0	2.0	2.0		1.0

CONCLUSIONS

Based on the findings from the Phase 1 ASR Project during WY2008, we conclude the following:

Recharge Operations

Although WY2008 was a "Normal" hydrologic year, due to various infrastructural constraints, a limited total of approximately 60 AF of water was recharged into the Seaside Groundwater Basin via injection at ASR-1 during WY2008. This volume is somewhat greater than the volume injected during WY2007 of 8.2 AF. Injection volumes during WY2007 and WY2008 contrast with the approximate 408 AF recharged in WY2006, which was a "Wet" hydrologic year and had corresponding greater availability of excess Carmel River flows.

Well Performance

Prior to WY2008, hydraulic well performance in both injection and production modes had declined approximately 40 to 70 percent, respectively, since injection operations began in WY2002 as a result of residual plugging. It is noted that, despite the plugging that occurred, the well consistently maintained its design injection capacity of 1,000 gpm with significant "freeboard" remaining. Formal rehabilitation of ASR-1 was performed prior to the WY2008 injection operations to remove residual plugging that had accumulated in the well during six years of operation. Rehabilitation consisted of both mechanical and chemical treatments (documented in the WY2007 Summary of Operations Report).

Following formal rehabilitation, ASR-1 displayed significant increases in hydraulic performance. Production performance was approximately equal to that observed prior to any injection occurring at ASR-1, and injection performance during WY2008 was actually greater than the initial performance observed during WY2002. These WY2008 results further support the WY2007 report conclusions that the formal well rehabilitation program was extremely successful in mitigating six years of residual plugging and restoring well performance.

Water Quality

Significant conclusions regarding the water-quality investigation during WY2008 include the following:

- Consistent with previous observations, no significant ion exchange, acid-base, or precipitation reactions were observed at the site.

- Unlike previous years, ortho-phosphate was not detected in the injectate. As of this writing, it is unknown if this observation reflects CAW's discontinuation of the use of phosphate-based corrosion inhibitor at the BIRP facility.
- Following a short "ingrowth" period, HAAs degraded completely during aquifer storage.
- THMs showed characteristic and significant initial "ingrowth" that peaked after approximately 17 weeks of storage, followed by a gradual decline. The rate of THM degradation increased as redox potential (ORP) declined.
- Hydrogen Sulfide levels increased as ORP levels declined to negative redox levels (i.e., anaerobic conditions).
- Despite the short operating period, water-quality data from MW-1 provided significant additional insights into ASR operations in the Tsm aquifer this year, including the following:
  - THM levels showed similar ingrowth and decay trends to those observed in ASR-1 during aquifer storage.
  - The peak of THM ingrowth reached only 90 ug/L at MW-1, as opposed to 160 ug/L at ASR-1. Additional investigation of this phenomenon is needed in WY2009 testing.
  - Comparison of total THMs and individual THM species from both wells shows that the ingrowth phase peaked at the same time (Storage Day 112) for both ASR-1 and MW-1. This finding is important, as it indicates that the THM degradation rate is a function of time only; it also supports the finding that THM adsorption is not occurring during aquifer storage and transport because there is no observed retardation of THM peaking at MW-1. Accordingly, the occurrence of THM adsorption is considered unlikely.

RECOMMENDATIONS

Based on the WY2008 ASR program results and our experience with similar ASR projects, we offer the following recommendations for continued and future operations of the Phase 1 ASR Project:

- ASR-1 should continue to be operated at a maximum injection rate of approximately 1,000 gpm (4.4 AFD) to avoid excessive plugging during injection.
- During the recharge season, routine backflushing should continue to be performed on an approximate weekly basis, or when the amount of water level drawup in the casing reaches approximately 100 feet (i.e., equal to the amount of available drawdown for pumping); whichever occurs first, in order to avoid excessive residual plugging between injection periods and maintain well performance.
- WY2009 testing should include ASR-1 and the recently installed ASR-2 operating simultaneously to determine appropriate dual-well operational parameters for the Phase 1 ASR Project.
- Continue concurrent water-quality sampling at MW-1 along with sampling at ASR-1 and -2.
- The Sampling and Analysis Plan (SAP) for WY2009 should include the following refinements:
  - Lower laboratory detection limits for bionutrient-related compounds.
  - Addition of low-level chloramines analysis to the DBP analyte group to assess Chlorine availability for DBP growth.
  - Maintain a consistent well purge-volume prior to sample collection at both ASR-1 and MW-1.
- Perform recovery-pumping operations at ASR-1 during WY2009 to further assess DBP degradation.

CLOSURE

This report has been prepared exclusively for the Monterey Peninsula Water Management District for the specific application to the District's Phase 1 Aquifer Storage and Recovery Project in the Seaside Groundwater Basin. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeologic and engineering practices. No other warranty, express or implied, is made.

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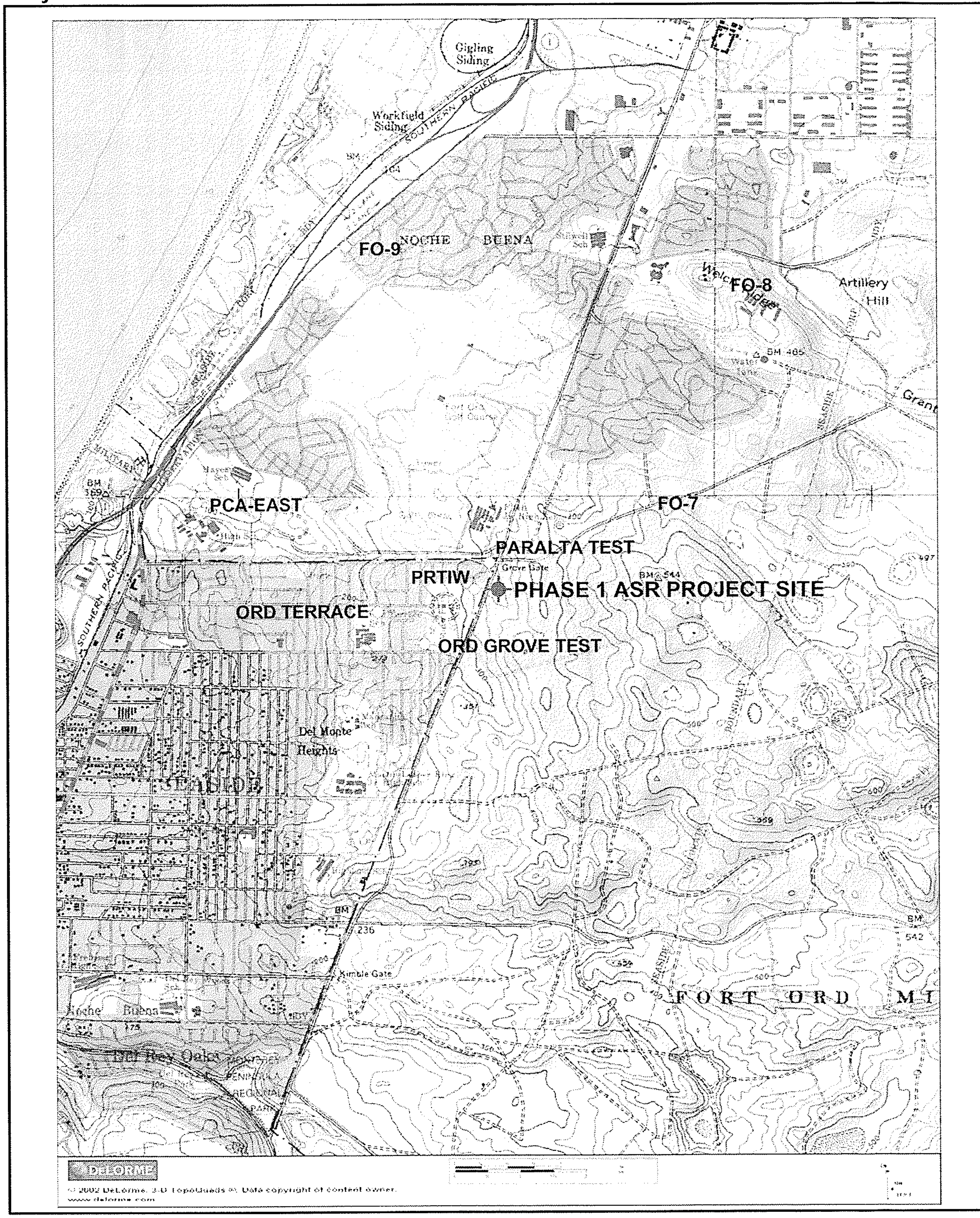
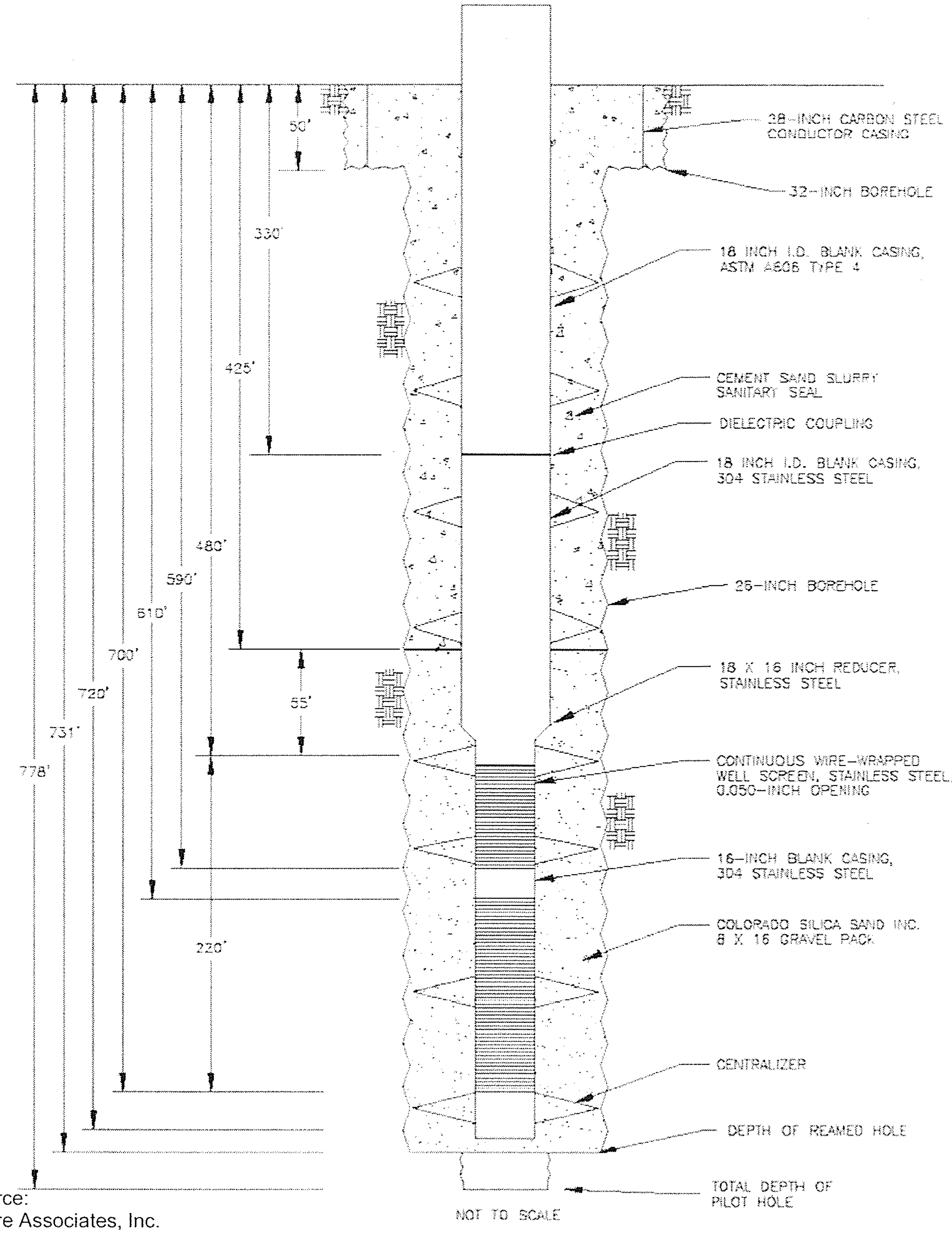
PLATES

January 2009
Project No. 06-0024



PUEBLO water resources

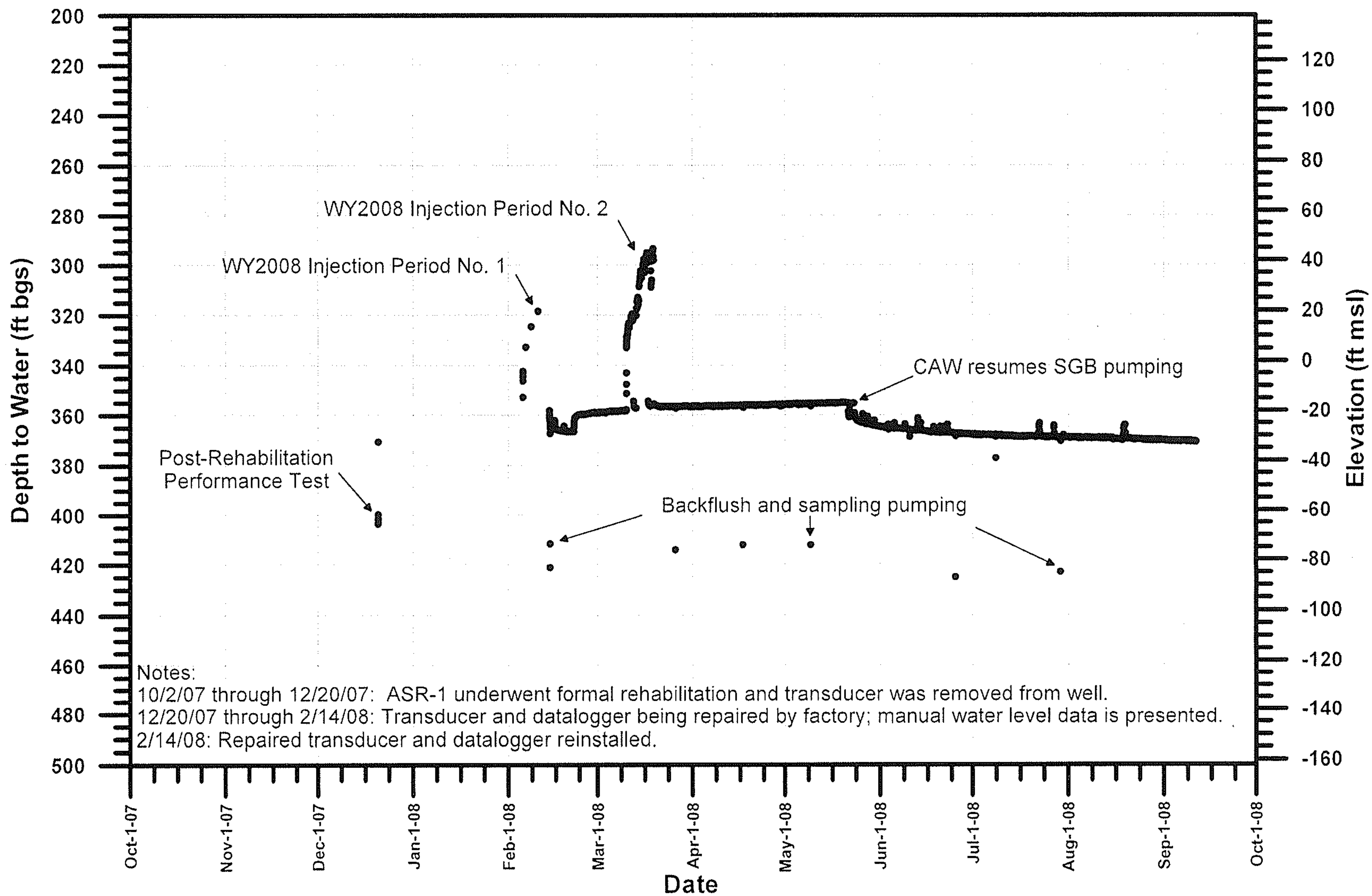
SITE LOCATION MAP
PLATE 1



Source:
Padre Associates, Inc.
May 2002

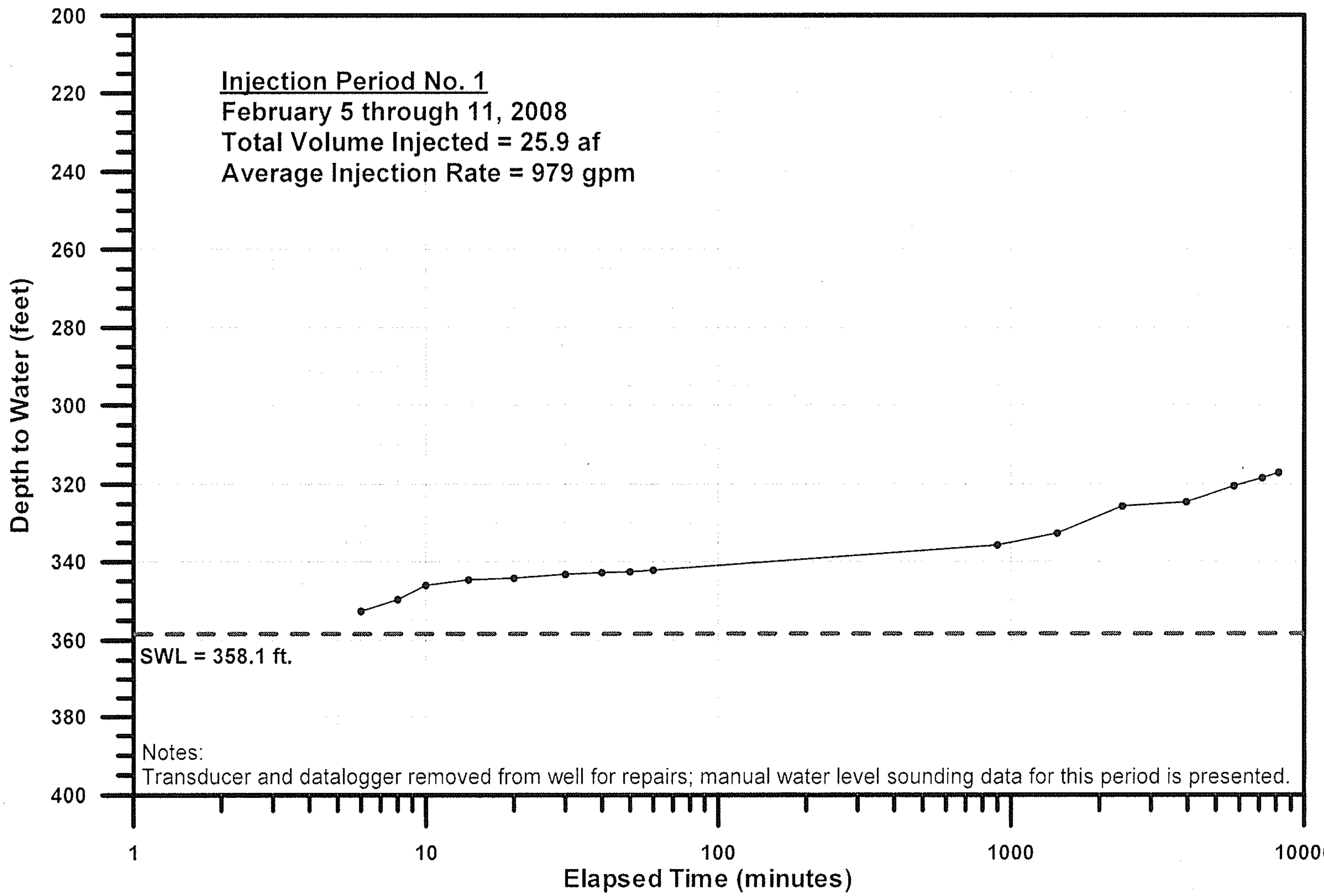
PUEBLO water resources

ASR-1 AS BUILT SCHEMATIC
PLATE 2

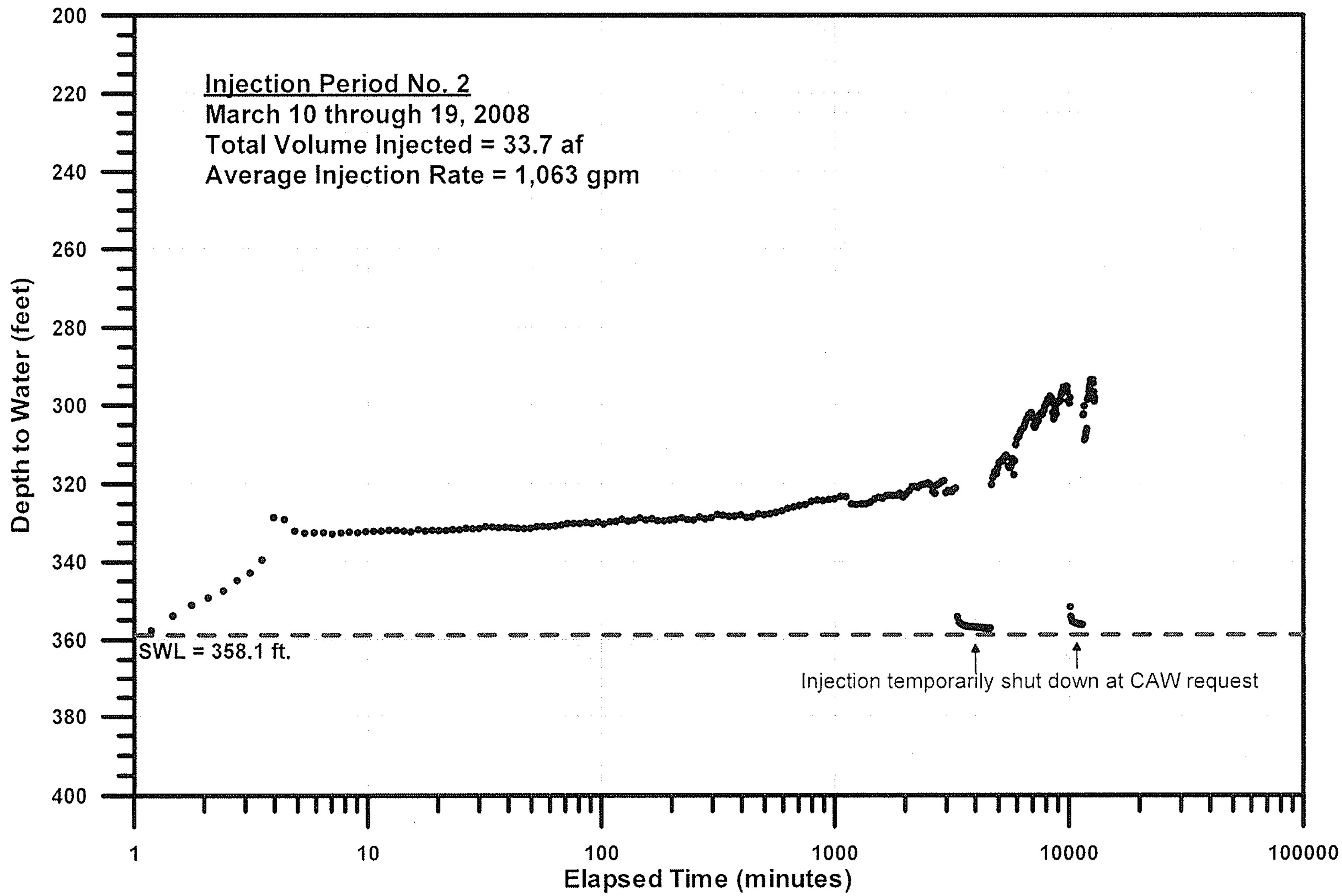


PUEBLO water resources

WY2008 ASR PROGRAM
ASR-1 WATER LEVEL DATA
PLATE 3

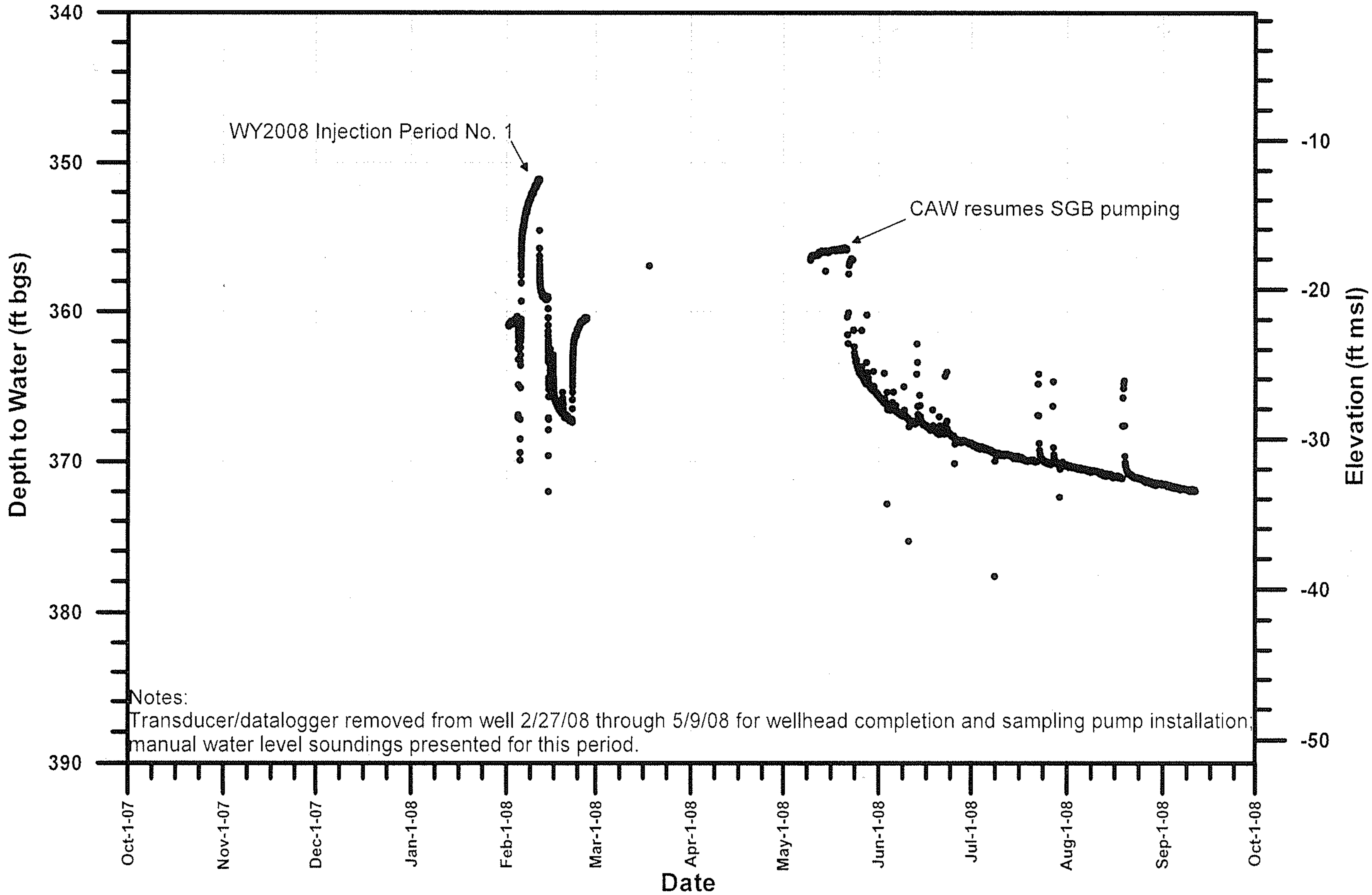


WY2008 ASR PROGRAM
ASR-1 WATER LEVEL DATA
INJECTION PERIOD NO. 1
PLATE 4

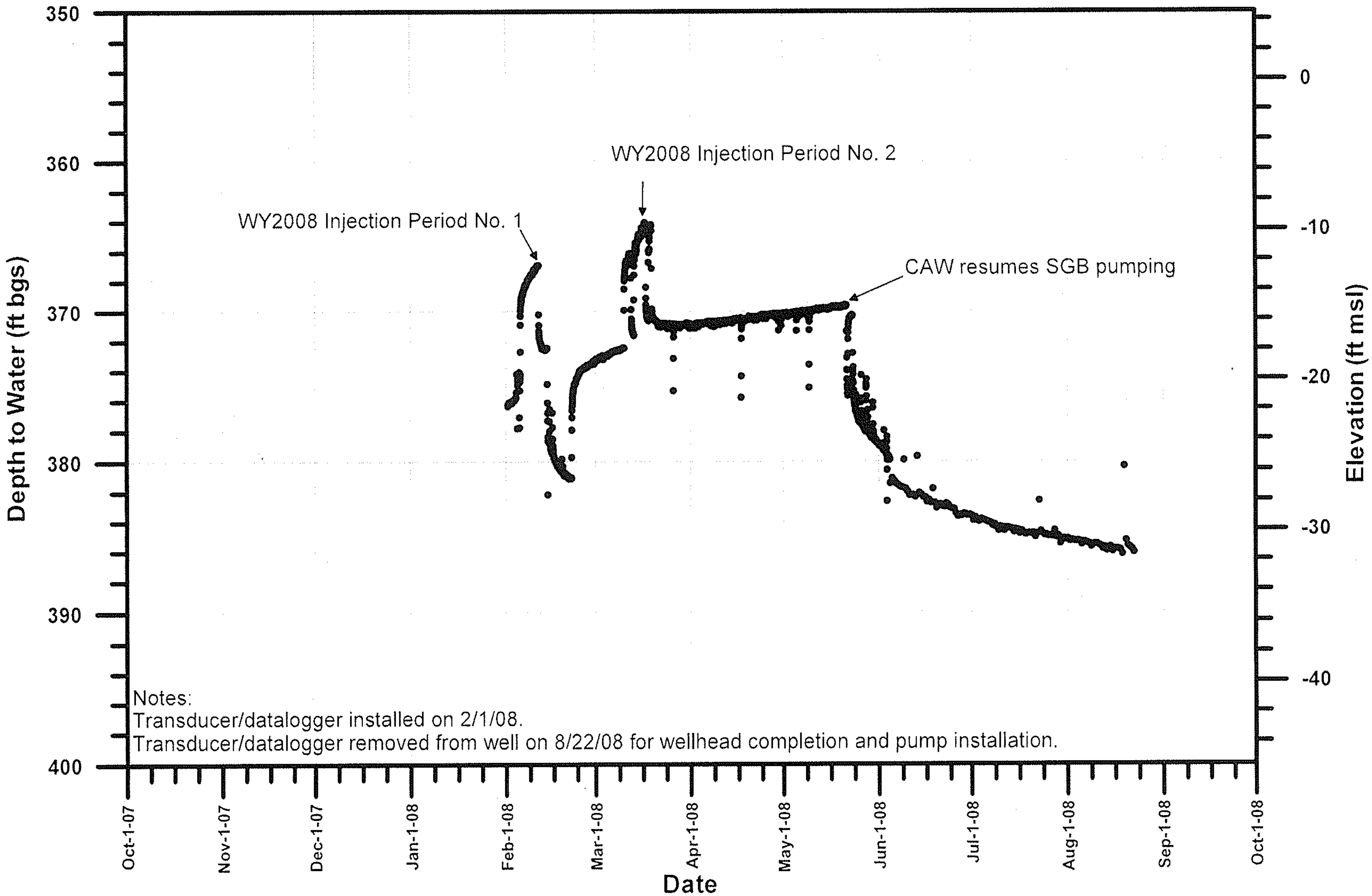


PUEBLO water resources

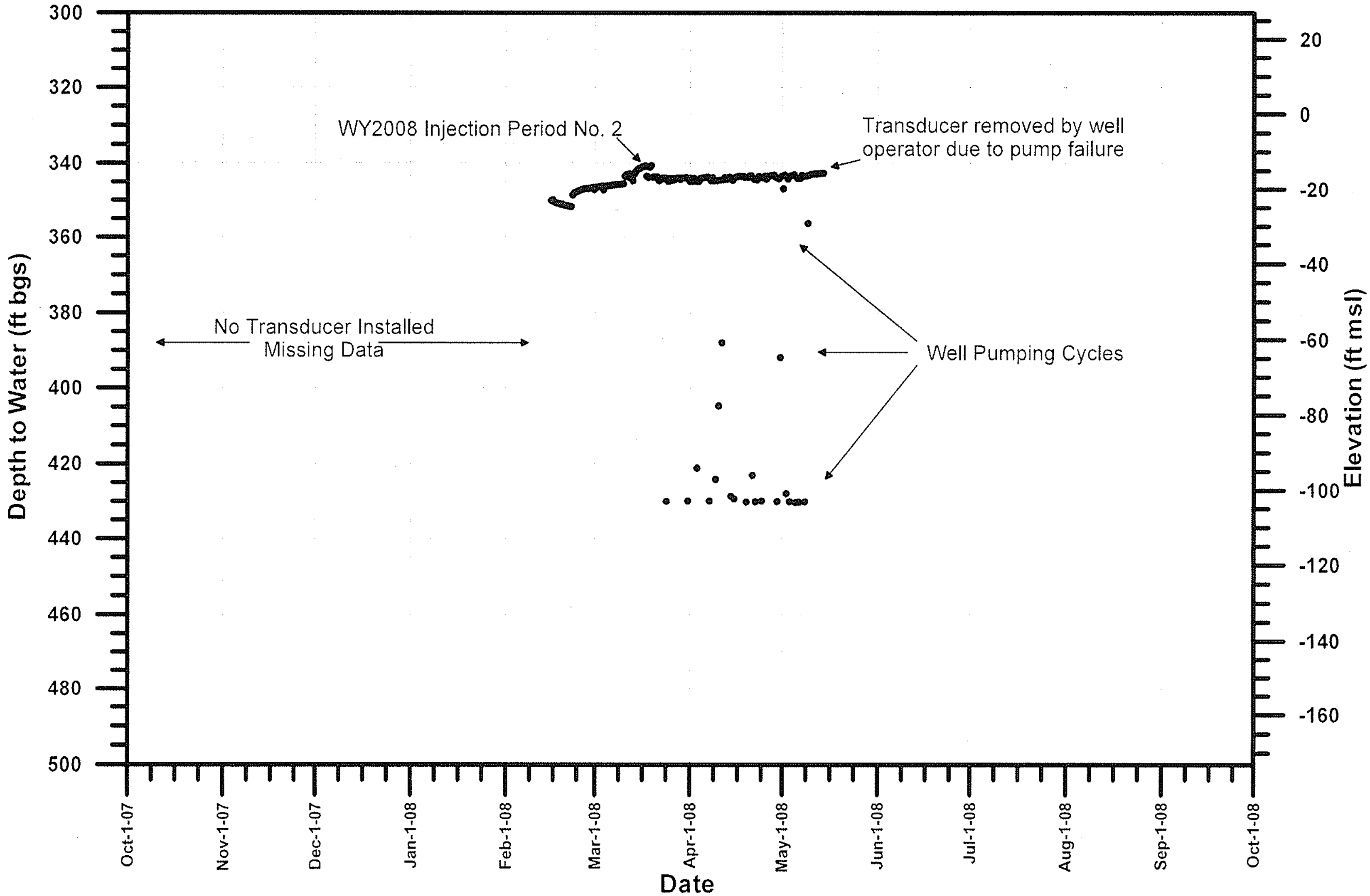
WY2008 ASR PROGRAM
ASR-1 WATER LEVEL DATA
INJECTION PERIOD NO. 2
PLATE 5



WY2008 ASR PROGRAM
MW-1 WATER LEVEL DATA
PLATE 6



WY2008 ASR PROGRAM
ASR-2 WATER LEVEL DATA
PLATE 7



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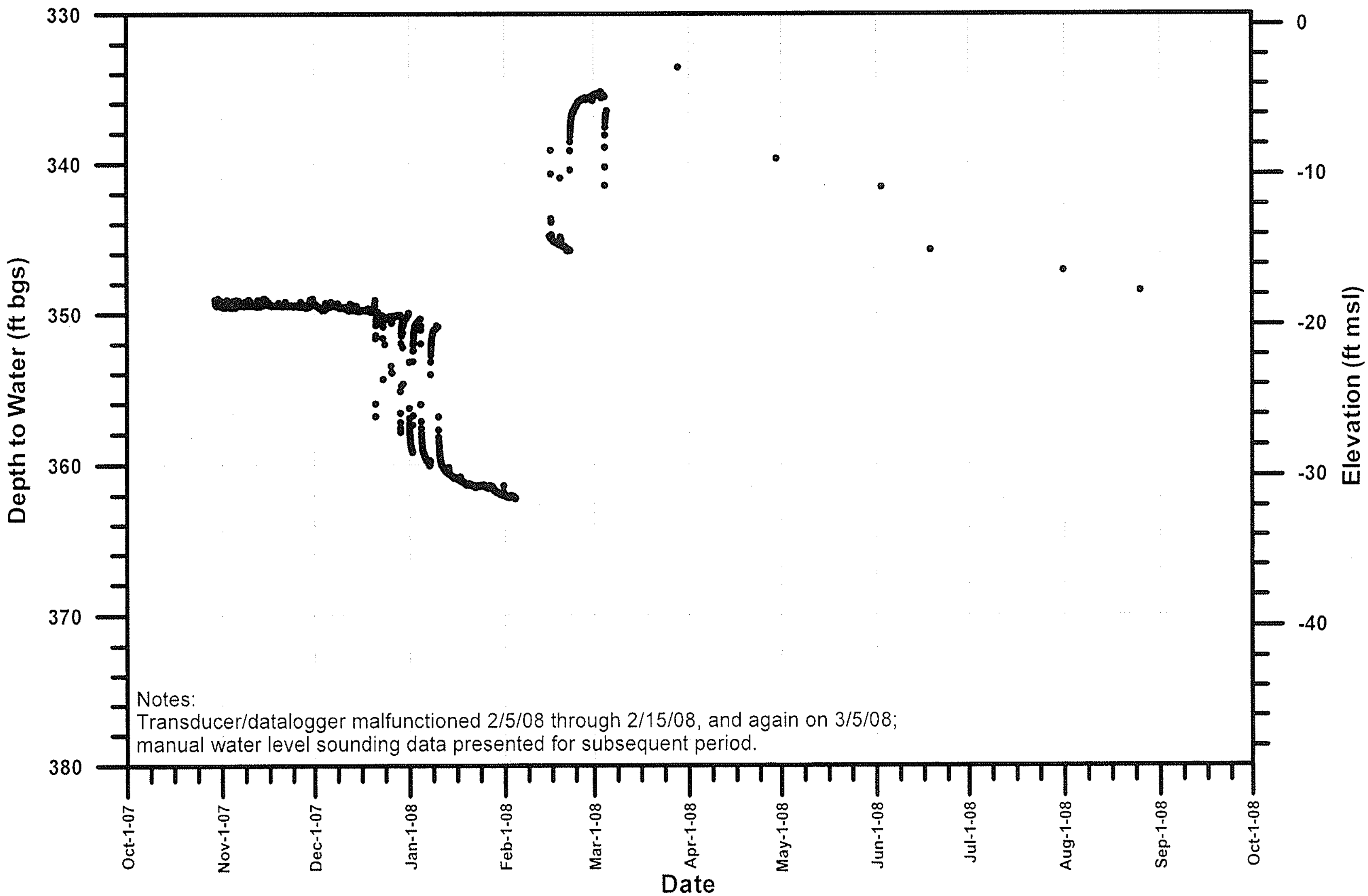
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
PRTIW WATER LEVEL DATA
PLATE 8

January 2009
Project No. 06-0024



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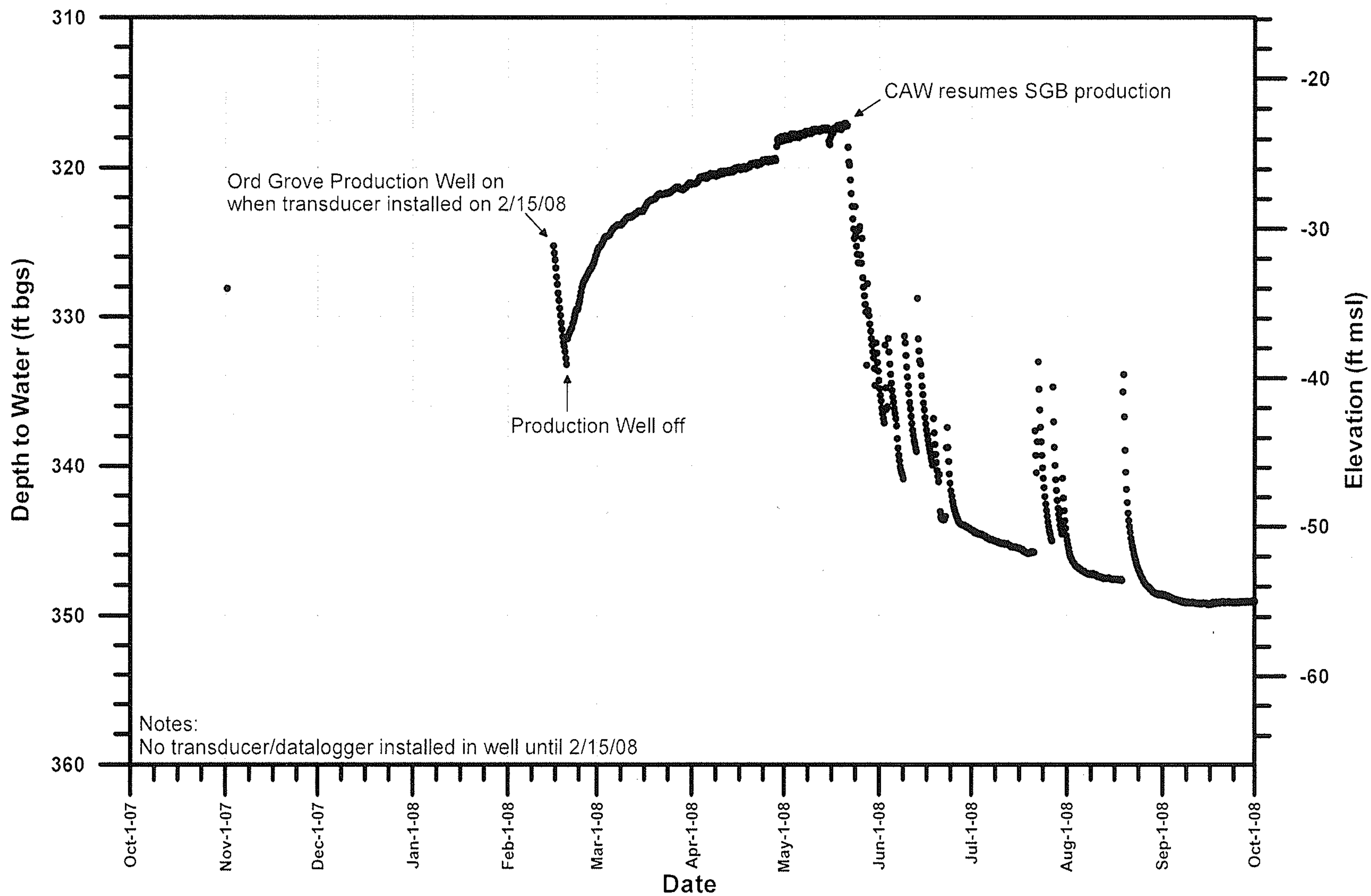
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
PARALTA TEST WATER LEVEL DATA
PLATE 9



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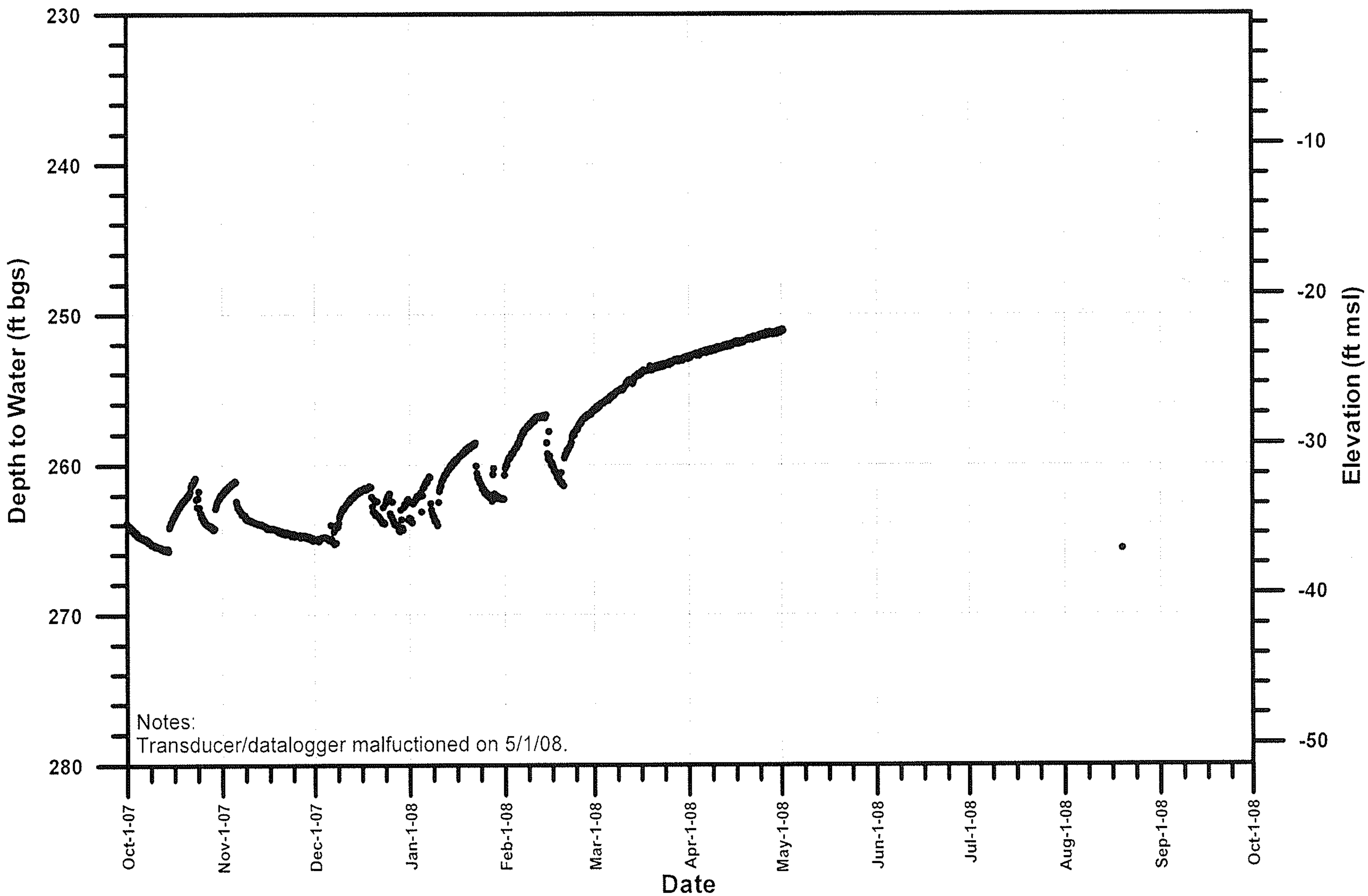
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
ORD GROVE TEST WATER LEVEL DATA
PLATE 10



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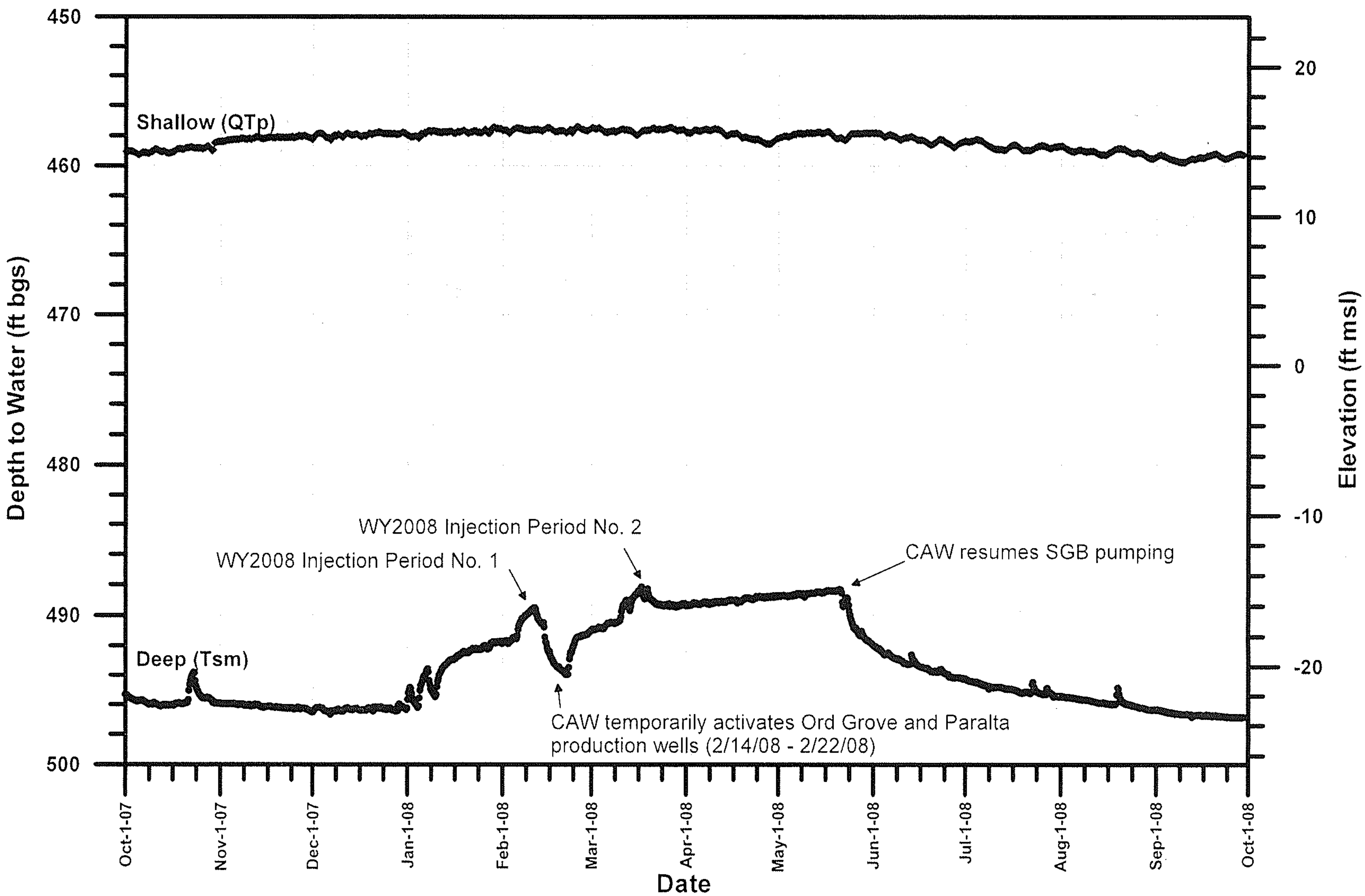
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
ORD TERRACE WATER LEVEL DATA
PLATE 11

January 2009
Project No. 06-0024



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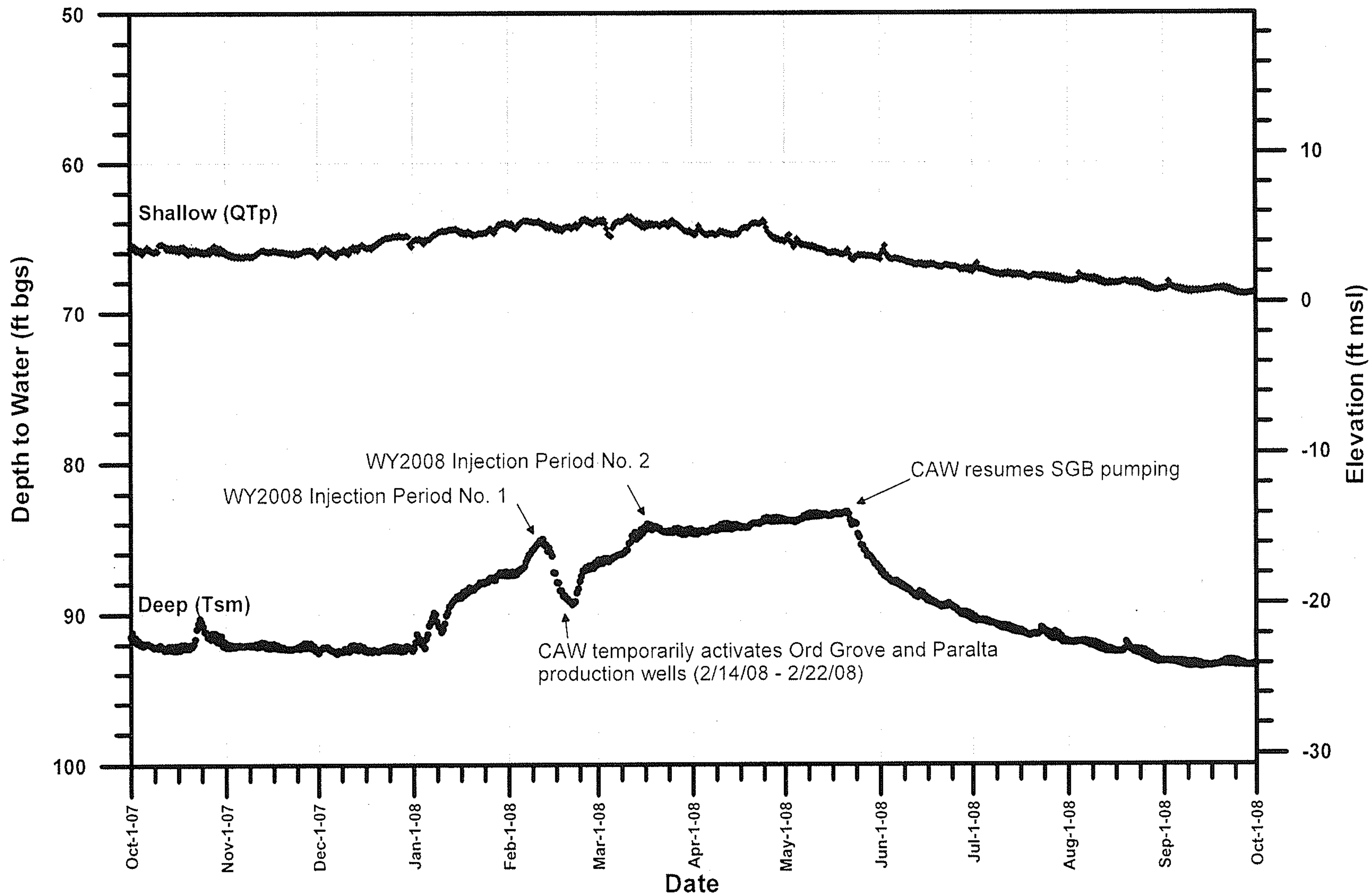
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
FO-7 WATER LEVEL DATA
PLATE 12



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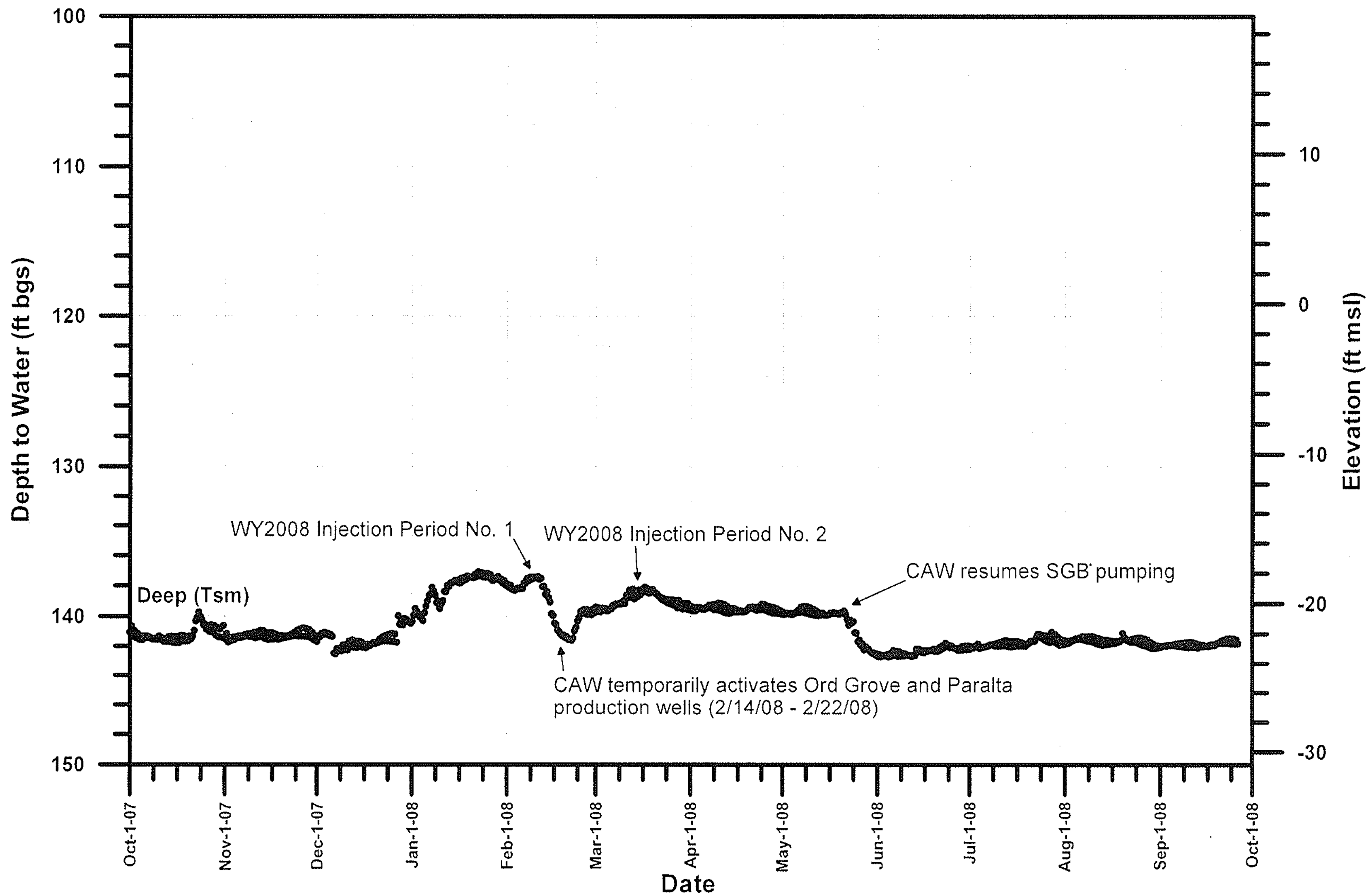
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
PCA-EAST WATER LEVEL DATA
PLATE 13



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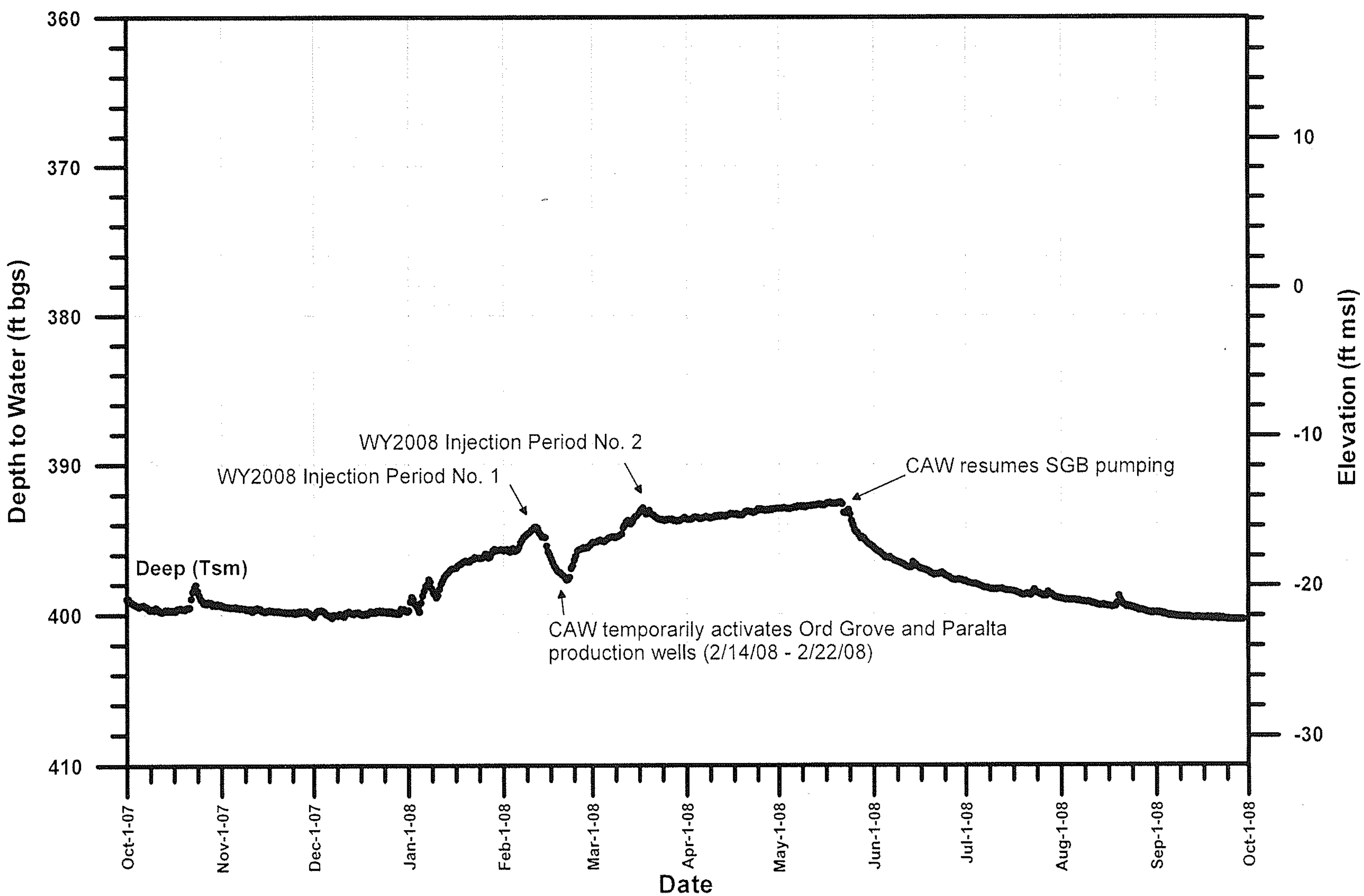
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
FO-9 WATER LEVEL DATA
PLATE 14



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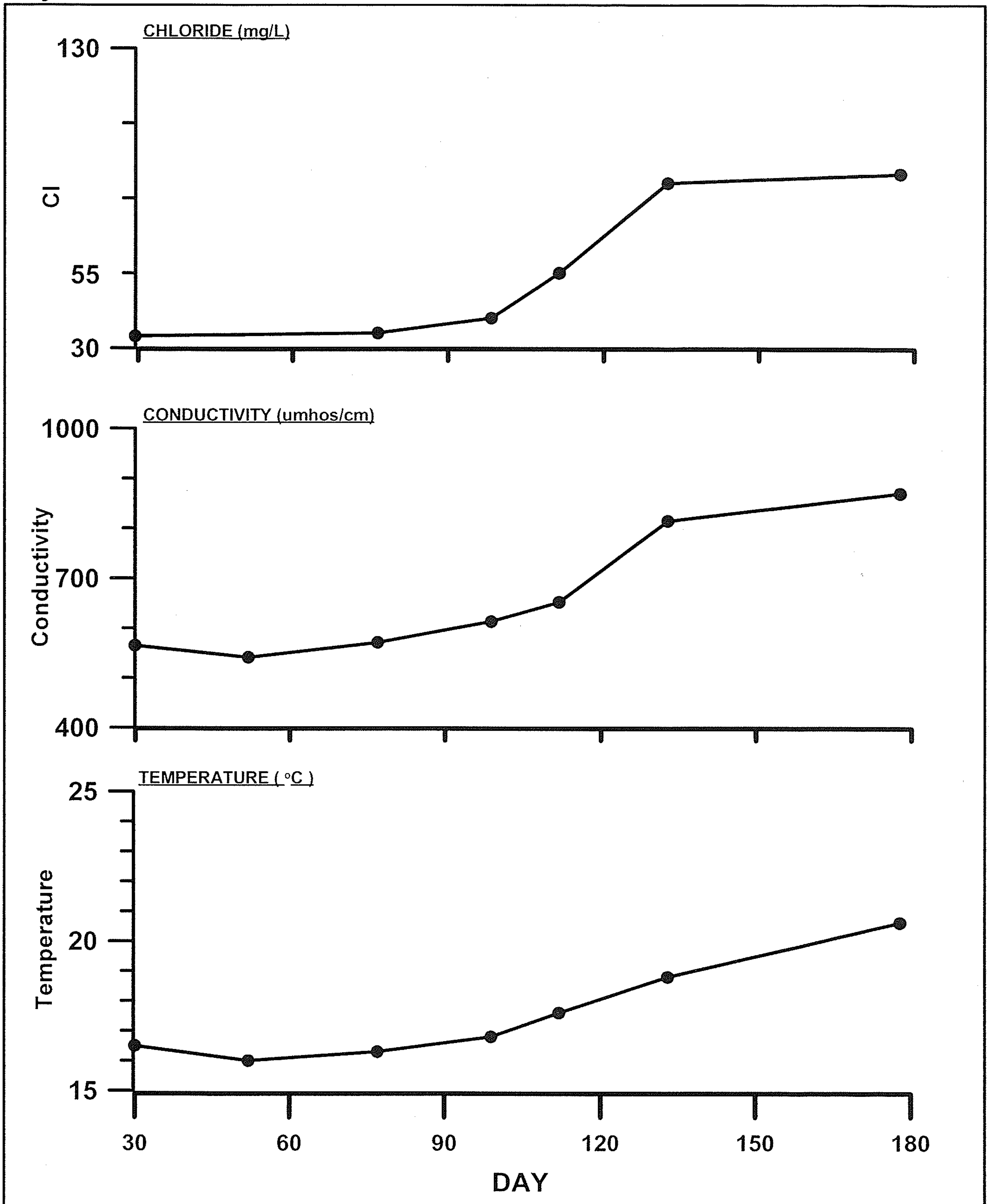
Monterey Peninsula Water Management District - Phase 1 ASR Project

WY2008 ASR PROGRAM
FO-8 WATER LEVEL DATA
PLATE 15



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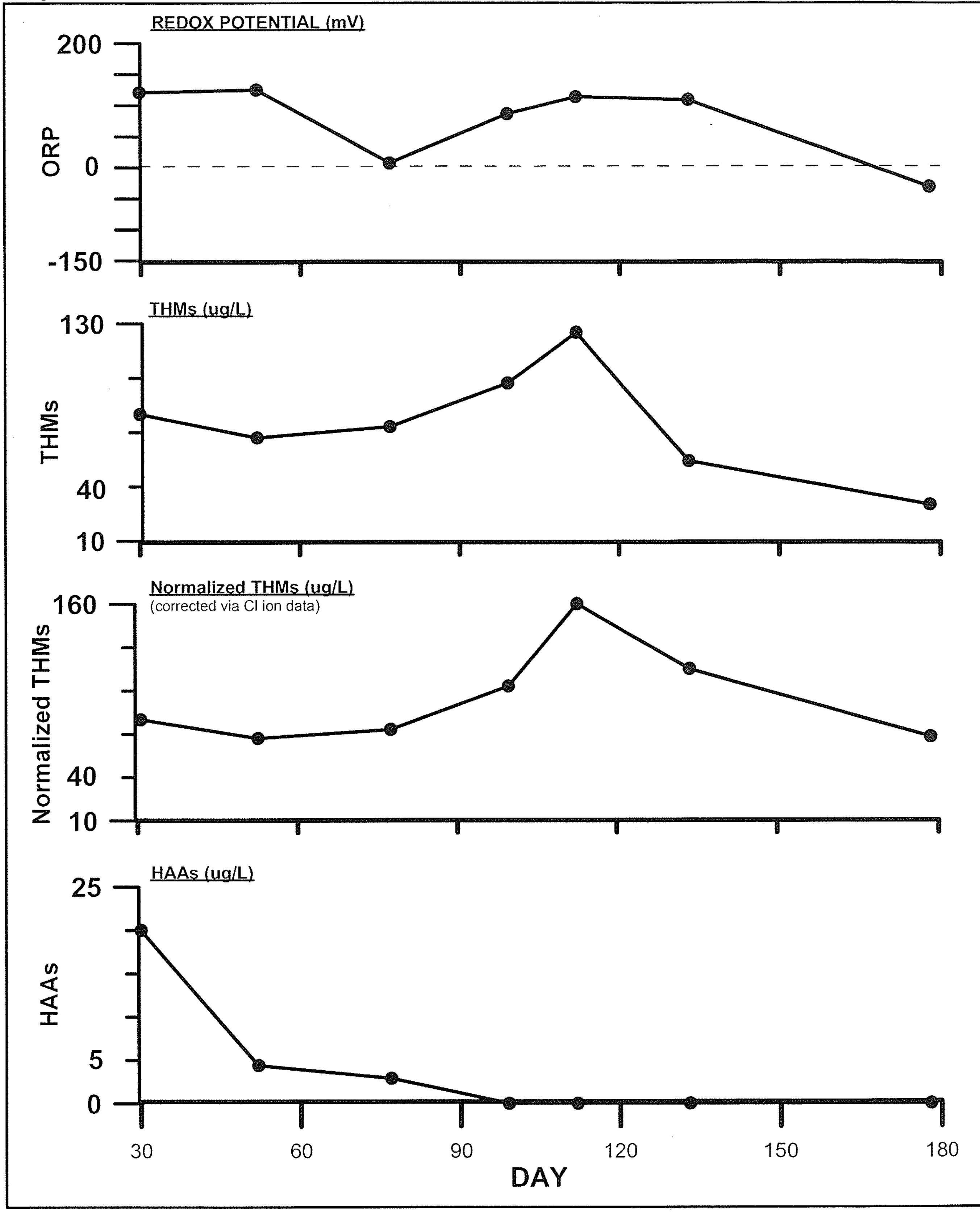
WY2008 ASR PROGRAM
ASR-1 GENERAL WATER QUALITY PARAMETERS
PLATE 16

January 2009
Project No. 06-0024



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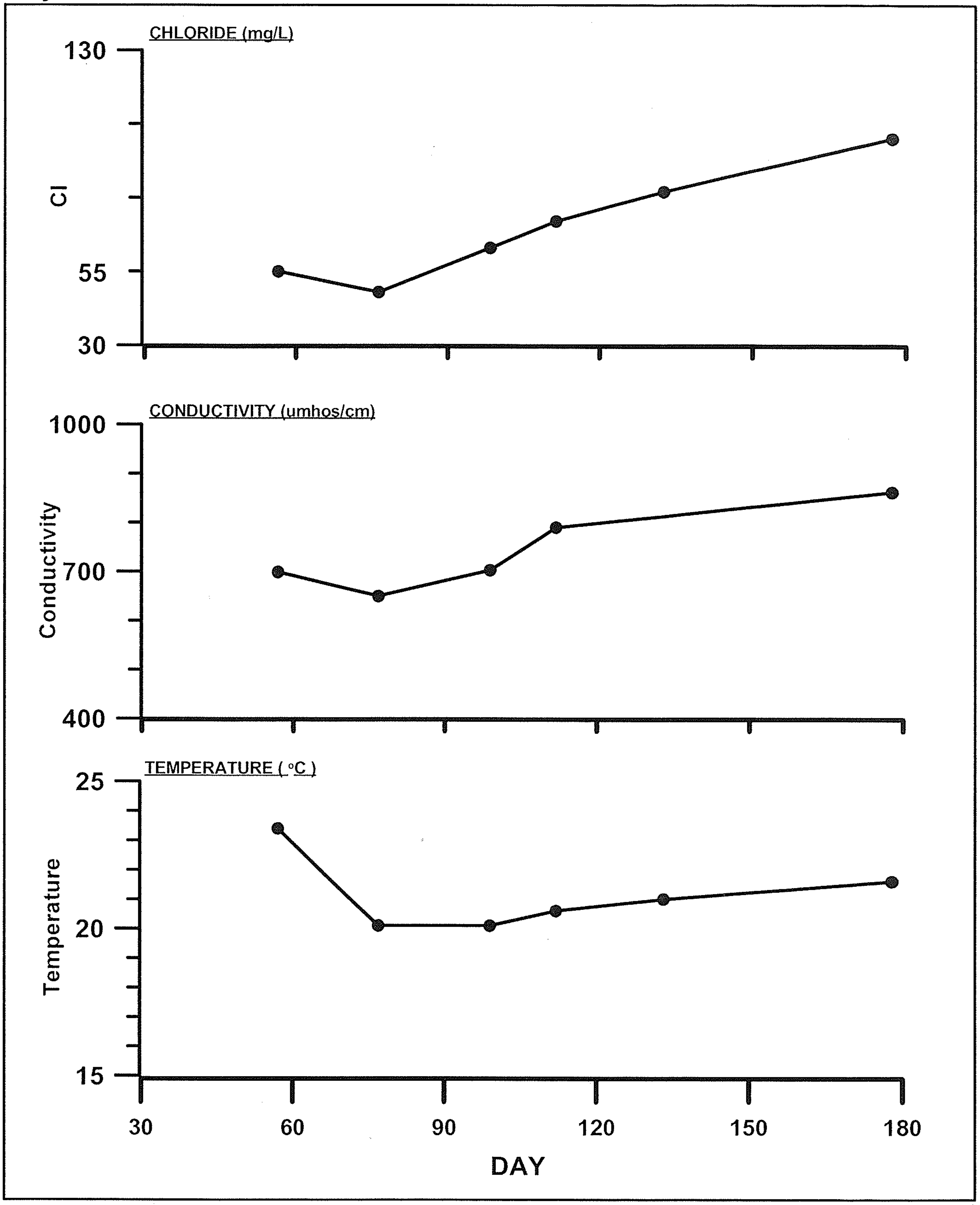
WY2008 ASR PROGRAM
ASR-1 DISINFECTION BYPRODUCTS
PLATE 17



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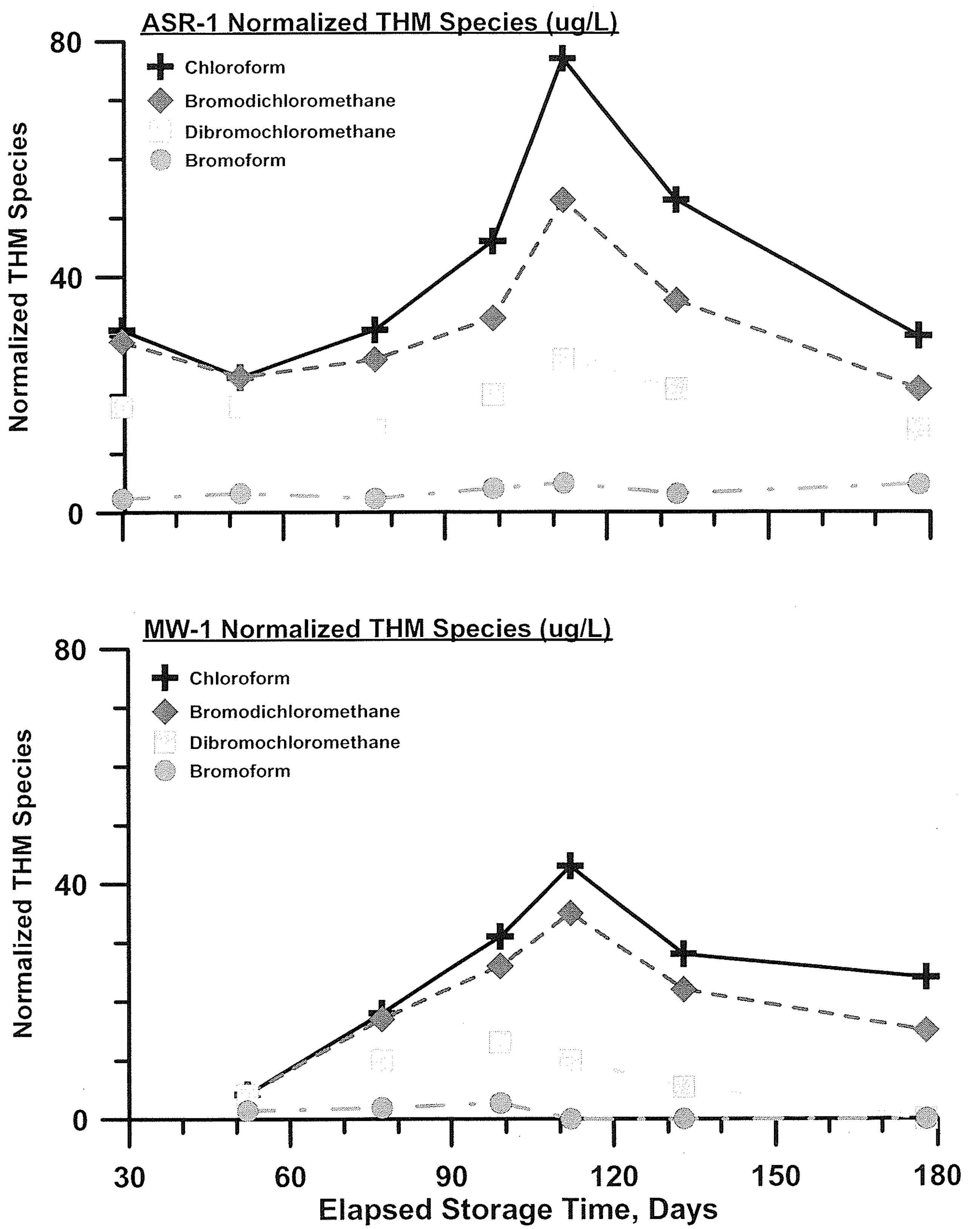
WY2008 ASR PROGRAM
MW-1 GENERAL WATER QUALITY PARAMETERS
PLATE 18

January 2009
Project No. 06-0024



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WY2008 ASR PROGRAM
DISINFECTION BYPRODUCTS COMPARISON
PLATE 19

APPENDIX A
FIELD DATA SHEETS
(not included in draft)

APPENDIX B
WATER QUALITY DATA
(not included in draft)

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APPENDIX C
TECHICAL MEMORANDUM
ASSESSMENT OF GEOCHEMICAL EFFECTS
(not included in draft)