Alamitos Barrier Project

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Annual report on the control of seawater intrusion

2007 - 2008

Member Agencies:

Orange County Water District

Water Replenishment District of Southern California

Long Beach Water Department

Golden State Water Company

Los Angeles County Flood Control District

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INTRODUCTION

The Alamitos Barrier Project (ABP) was designed and constructed to protect the groundwater supplies of the Central Basin of the County of Los Angeles and the southwest portion of the Coastal Plain area in Orange County from the intrusion of seawater through the Alamitos Gap area. The project facilities are located near the Los Angeles-Orange County line about two miles inland from the mouth of the San Gabriel River. The original facilities included injection wells to form a freshwater pressure ridge and extraction wells to form a saltwater trough. The freshwater ridge that was intended to block the landward gradient of intruding seawater has proven to be historically effective. However, the saltwater trough that was intended to reverse the landward gradient of intruding seawater has proven to be historically ineffective. As a result, the extraction wells are currently not in operation. A map showing the supply pipeline, injection wells, extraction wells, and observation wells is shown on page A-24.

The County of Los Angeles Department of Public Works (Public Works) operates and maintains the project and its physical facilities under the direction and approval of the Joint Management Committee (JMC), acting on behalf of the Los Angeles County Flood Control District (LACFCD) and the Orange County Water District (OCWD).

This report summarizes design and construction issues, operation and maintenance activities, hydrologic effects, groundwater chloride concentrations, and project costs for Fiscal Year (FY) 2007-08 (i.e., July 1, 2007 through June 30, 2008).

The JMC is aware that the new depiction of the mergence zones (first implemented in the FY 2006-07 Annual Report) conflicts with the labeled “Recent Zone Boundary” and has determined to resolve this conflict soon.

SUMMARY

During this reporting period, a total of 5,971.1 acre-feet of water were injected at an average rate of 8.2 cubic feet per second and a total cost of $3,018,740. The OCWD purchased 1,504.1 acre-feet (25% of the total) at a cost of $762,279. The Water Replenishment District of Southern California (WRD) purchased 4,467.0 acre-feet (75% of the total) at a cost of $2,256,461. The significant increase in the quantity of water injected compared to the previous fiscal year is a result of resumed barrier operations following multiple shut downs for repairs that occurred throughout FY06-07. At least one leg of the barrier was shut down for about 10 of the 12 months in FY06-07 while both legs of the barrier operated for the majority of FY07-08. A timeline detailing the main dates, durations, and events of the shutdowns is presented in the Injection Operations Section of both the FY06-07 Annual Report and the July 2007 to December 2007 Semi-Annual Report. No timeline is included in this report since no major shutdowns occurred in this reporting period and all minor shutdowns are detailed in Appendix A-34.

The cost of services and supplies for injection, excluding the costs of water, was $588.49/acre-foot this year and significantly less than the $1,825.39/acre-foot last year (FY06-07). The lower cost in FY07-08 is the result of resumed barrier operations (i.e., a much larger quantity of injected water) while continuing with a similar work load as in FY06-07. Public Works has continued with multiple repair and improvement projects, the latest cycle of observation well cleanouts, the reclaimed water program, and various fixed costs that don't necessarily depend on the amount of water being injected. Only the reclaimed water program costs will continue to regularly impact the cost of services and supplies for injection. The project management costs continue to vary from year to year depending on the need to repair or improve the barrier facilities. The observation well cleanout costs and injection well redevelopment costs will not be incurred evenly each fiscal year because they are based on cyclical activities.

As expected, the resumed injections during the reporting period resulted in significant increases to the average groundwater levels at internodal wells in all aquifers. Similarly, chloride concentrations at many of the wells throughout the barrier system have decreased. Details concerning the areas that recorded low groundwater elevations and/or increased chloride concentrations are discussed in detail later on.

DESIGN AND CONSTRUCTION

The current improvement projects and their status are briefly summarized below. The general location of each project is identified on the map in Appendix A-24 and further project details are included in the table in Appendix A-33.

Barrier Water Supply Facilities Improvements Project Phase 1

This project involves bonding the pipe joints and installing sacrificial anodes along a portion of the water supply pipeline. It was originally anticipated that construction of this cathodic protection system (known as the Barrier Water Supply Facilities Improvements project) would begin in FY 2005-06. However, the project was postponed for budgetary reasons and final design plans and specifications were not completed in time. As a result, design plans and specifications were further modified throughout FY 2006-07 to identify specific joint locations and up-to-date utilities. Due to right of way and funding complications, portions of the project were pulled out to be completed at a later date as Phase 2. The contract for Phase 1 of this project was awarded near the end of FY 2006-07 and was completed during FY 2007-08.

Barrier Water Supply Facilities Improvements Project Phase 2

This project is identical in scope and history to that of Phase 1 but covers different portions of the same water supply pipeline. These portions were separated out during FY 2006-07 due to complications with right of way and funding. Design plans and specifications were initiated near the end of FY 2006-07 and continued through this

reporting period. It is anticipated that the project will be awarded near the beginning of FY2008-09 and that construction and completion will occur in the same year.

ABP Telemetry System Phase 2

Phase 2 of the ABP Telemetry System includes the installation of the communications cables, the instrumentation, and the software to monitor the well sites remotely. During the FY 2006-07 reporting period, design plans and specifications were completed and the project was advertised. The project was awarded and completed during this reporting period.

INJECTION OPERATIONS

The total amount of water injected into the ABP during this reporting period was 5,971.1 acre-feet. Of this total, 22% (1,294.5 acre-feet) was reclaimed water and 78% (4,676.6 acre-feet) was imported water. Even though the barrier was back in operation after the FY06-07 repairs, the proportion of reclaimed injection was still lower than typical because the reclamation plant did not come online until August 2007 and did not operate near full capacity until November 2007. There were also occasional periods where the reclaimed water was not injected because either the total flow was lower than the reclaimed plant's minimum operational flow or the reclaimed plant was undergoing some maintenance.

According to the California Regional Water Quality Control Board (CRWQCB) permit, File No. 93-076 of Order No. R4-2005-0061, the running percentage of reclaimed water into the ABP for up to a 60-month period cannot exceed 50 percent. Since ABP reclaimed injections began in October 2005, the 60-month period includes injections prior to the delivery of reclaimed water into the barrier. Through this reporting period, WRD's calculated 60-month running percentage of reclaimed water into the barrier was 12.1% and therefore in compliance. Public Works' calculation through this period (which is consistent with the volumes identified throughout this report) is 12.8%. The

slight discrepancy is due to differences in the timing and calculation method of the monthly meter readings for both imported and recycled deliveries.

The maximum monthly injection of 633.9 acre-feet (408.3 acre-feet imported and 225.6 acre-feet reclaimed) occurred in May 2008. The minimum monthly injection of 265.7 acre-feet (265.7 acre-feet imported and 0.0 acre-feet reclaimed) occurred in July 2007 since the barrier was off and/or operating partially (to allow a gradual recharge of the supply pipeline) for a time following the ABP PRV replacement. The injection volumes and costs from July through June of both FY 2006-07 and FY 2007-08 are shown in Table 1. Please note that the reclaimed unit costs included in Table 1 (as well as those from earlier reporting periods) were recalculated by WRD and so older reports therefore show different unit costs. A complete historical record of the corrected representative reclaimed unit costs is available from any JMC agency, but old reports (and related invoices between agencies) were not revised. The Table shows an increase in total injection amount from FY 2006-07 to FY 2007-08, which was expected due to the resumed operations following the extensive shutdowns to the barrier throughout FY 2006-07.

The two most recent JMC reports (the FY06-07 Annual Report and the July 2007 to December 2007 Semi-Annual Report) included a summary of events regarding the ABP operational status from the end of FY 2005-06 through their respective reporting periods. From this report on, however, such information will be summarized in Appendix A-34 and only be expounded upon in the body of this report if there are aspects requiring more detailed commentary or discussion. Since no major shutdowns occurred in the second half of FY 2007-08 please refer to A-34.

TABLE 1. INJECTION OPERATIONS

	Imported Water Injections			Reclaimed Water Injections			Total Injections		
	FY06-07	FY07-08	Percent Change From Previous Year	FY06-07	FY07-08	Percent Change From Previous Year	FY06-07	FY07-08	Percent Change From Previous Year
	VOLUME OF WATER INJECTED IN ACRE-FEET								
OCWD[1]	366.3	1,156.5	215.7	150.2	347.6	131.4	516.5	1,504.1	191.2
WRD[2]	592.2	3,520.1	494.4	156.4	946.9	505.4	748.6	4,467.0	496.7
TOTAL	958.5	4,676.6	387.9	306.6	1,294.5	322.2	1,265.1	5,971.1	372.0
	UNIT COST OF WATER PER ACRE-FEET [3]								
JULY - DEC	$458.00	$483.00	5.5	$528.03	$509.40	-3.5			
JAN - JUN	$483.00	$513.00	6.2	$524.38	$539.40	2.9			
	COST OF WATER PURCHASED								
OCWD[1]	$173,463	$578,315	233.4	$78,835	$183,964	133.4	$252,298	$762,279	202.1
WRD[2]	$282,658	$1,755,231	521.0	$82,083	$501,230	510.6	$364,741	$2,256,461	518.6
TOTAL	$456,121	$2,333,546	411.6	$160,918	$685,194	325.8	$617,039	$3,018,740	389.2
	AVERAGE INJECTION RATE IN CFS								
OCWD[1]	0.5	1.6	215.7	0.2	0.5	131.4	0.7	2.1	191.2
WRD[2]	0.8	4.9	494.4	0.2	1.3	505.4	1.0	6.2	496.7
TOTAL	1.3	6.5	387.9	0.4	1.8	322.2	1.7	8.2	372.0

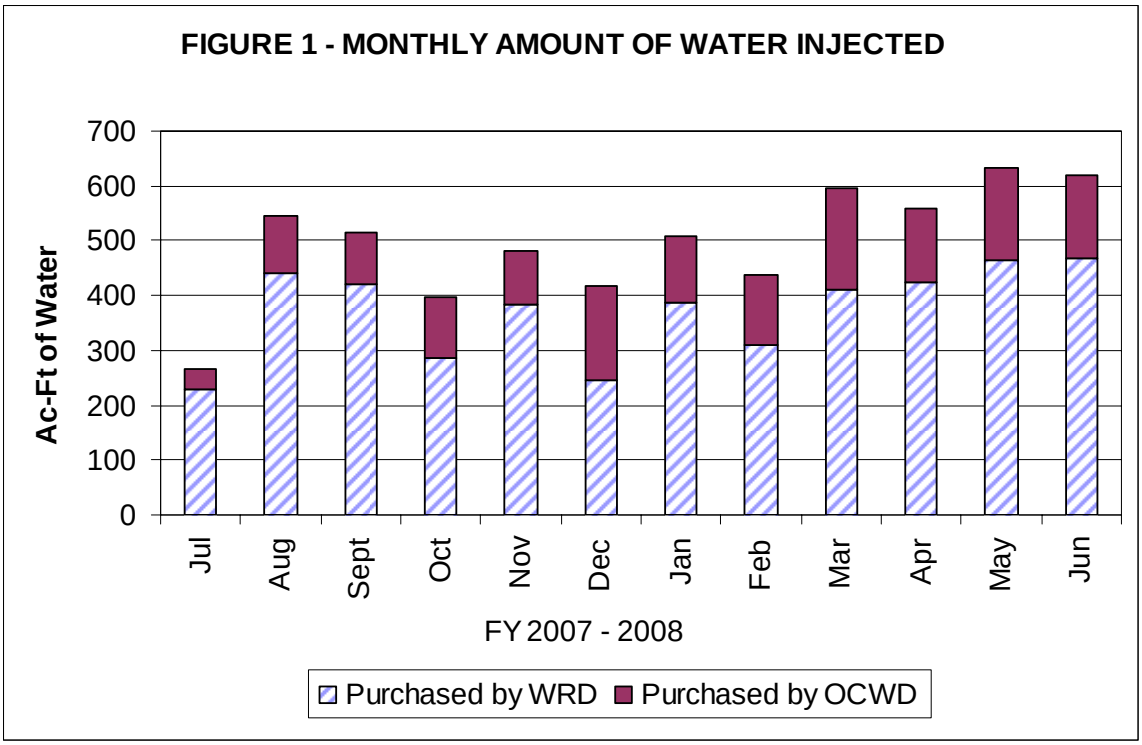
[1] Orange County Water District

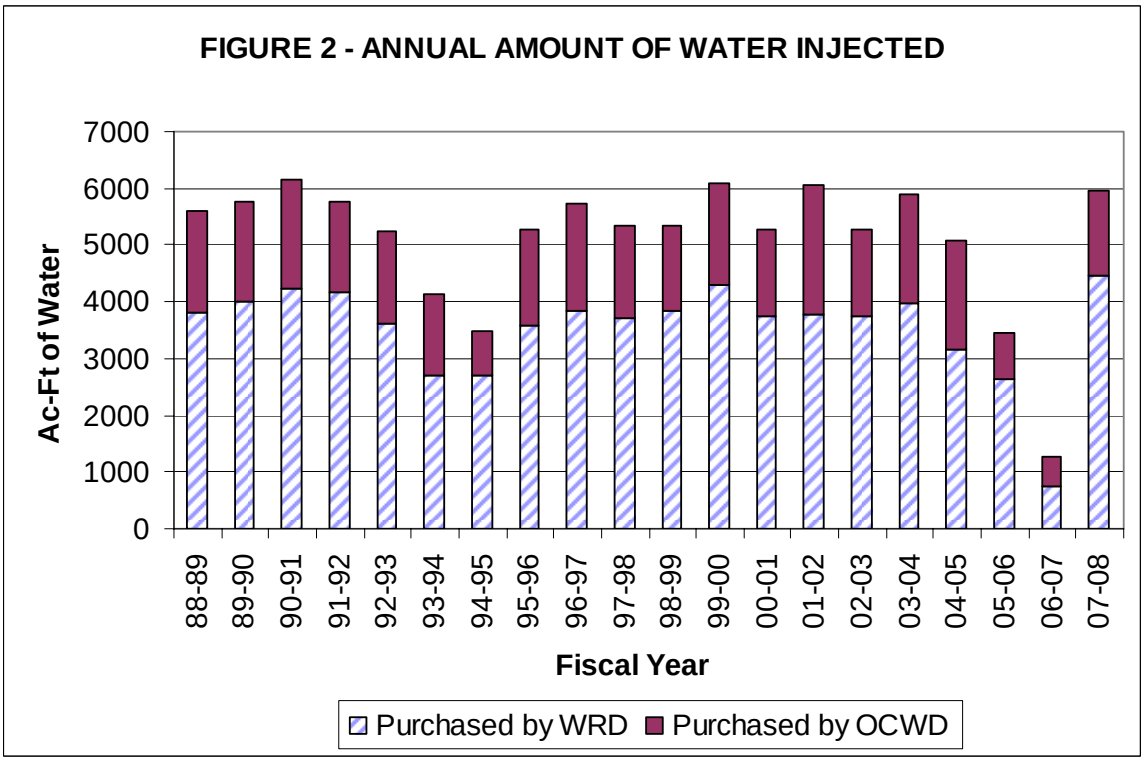
[2] Water Replenishment District

[3] Note:

The Unit Cost of Reclaimed Water per Acre-Foot for July to December 2006 was previously reported as $499.77 (corrected from $498.50 in the July - December 2006 JMC Report), for January to June 2007 was previously reported as $483.00, and for July to December 2007 was previously reported as $483.00. The values shown are corrected in accordance with WRD's latest calculations. Note that all historical values have also been recalculated with WRD's latest method for FY07-08 but that previous reports (and invoices) have not and will not be adjusted.

Figure 1 presents the monthly amounts of water injected during FY 2007-08. Figure 2 illustrates the annual amounts of water injected over the last 20 years.





EXTRACTION OPERATIONS

There were no extraction activities during FY 2007-08. As recommended by the JMC Committee, these wells were taken out of operation in FY 2002-03. This decision was based on results of the one-year extraction well efficiency study, which demonstrated that the chloride levels in the area decreased when the extraction wells were turned off. The extraction wells will continue to receive minimal maintenance so that they can be turned back on if deemed necessary in the future. Since there has been no extraction activity since FY 2002-03, the traditional summary tables are no longer being included in the annual reports.

MAINTENANCE

The purpose of observation well cleanouts is to remove accumulated sediment at the bottom of the well screens to facilitate better chloride sampling of the wells. Observation well sediment accumulation is typically analyzed every two years for all 177 active observation wells. All wells determined to have obstructed perforations then receive the necessary cleanout services. Afterwards, the cleanout logs for each casing are typically analyzed to determine the success and any resulting recommendations. During this reporting period, there were no ABP observation well casings cleaned out. A new cycle of observation well cleanouts is set to begin early in FY08-09.

The purpose of injection well redevelopments is to remove accumulated sediments and organic build-up from the well casings to enable each well to operate at its maximum injection capacity. Each of the applicable 45 injection well casings is routinely developed once every two years. During FY 2007-08, Public Works completed the redevelopment of the following 27 injection well casings[1]: 35F(I), 34Z(I), 34S(I), 34S(B, C), 34S(A), 34H(I), 34H(A), 34F(I), 34F(A), 34E(I), 34E(C, B), 34L(C, B, A, I), 34J(A&I),

[1] The capital letters in parenthesis represent the aquifer(s) receiving injections from that well casing. For example, (A) = A Zone aquifer, (A,I) = A and I Zone aquifers, and so forth.

34G(A), 33Z(C, B, A, I), 33Y(C, B, A, I), 35G(A, I), 35H1(A), 35H1(I), 35H2(A), 33X(C, B, A, I), 33W(C, B, A, I), 33V(A, I), 33U(A, I), 33U3(C, B), 33S1(C, B), and 33Q1(B, C). These 27 casings were the beginning of a new two-year ABP redevelopment cycle that is expected to continue until August 2009.

Figure 3 depicts the operating status of each injection and extraction well during FY 2007-08. The figure indicates that the barrier has now resumed a more typical operational pattern following all the extended barrier shut downs that occurred from April 2006 to June 2007. Nonetheless, there were a few instances of nonoperation due to lack of needed protection (33S1), well redevelopments (various), standard repairs (various), and surface leakage (35H1 and 35H2). As indicated, there were also other periods of nonperation due to “Other Circumstances” which are explained in Appendix A-34. The transition time before and after all periods of nonoperation will continue to be minimized as much as possible.

FIGURE 3 - ABP INJECTION AND EXTRACTION WELL STATUS - FY07-08

	2007																								2008																							
Well No.	JUL				AUG				SEP				OCT				NOV				DEC				JAN				FEB				MAR				APR				MAY				JUN			
33G (A,I)							O					O	O	O																	O																	
33J (A,I)							O					O	O	O																	O																	
33L (A,I)							O					O	O	O																	O																	
33N (A,I)							O					O	O	O																	O																	
33Q (A,I)							O					O	O	O																	O																	
33Q1 (C,B)							O					O	O	O																	O															R		
33S (A,I)							O					O	O	O																	O																	
33S1 (C,B)							O				N	O	O	O	N	N	N	N	N	N	N	N	D	D					O				N	N	N			N	N	N	N	N	N	R	R	N
33T (A,I)	O						O					O	O	O																	O														S			
33U (A,I)	O						O					O	O	O																	O													R	R			
33U3 (C,B)	O						O					O	O	O																	O													R	R			
33V (A,I)	O						O					O	O	O																	O										R	R						
33W (C,B,A,I)	O	O	O	O	O	O	O					O	O	O																	O			O						R	R	R						
33X (C,B,A,I)							O					O	O	O																	O							R	R	R								
33Y (C,B,A,I)							O					O	O	O															R	R	R	R																
33Z (C,B,A,I)							O					O	O	O						O							R	R			O																	
33Z2 (A)							O					O	O	O										X	X	X	M	M			O	D																
33Z2 (I)							O					O	O	O										X	X	X	M	M			O	D																
34D (C,B,A,I)	O						O												O												O																	
34E (C,B)							O										D	R		O											O																	
34E (I)							O										R	D		O											O																	
34F (A)	O						O							R	R					O											O																	
34F (I)	O						O							D	R	R				O											O																	
34G (A)	O						O													O						R					O																	
34G2 (C,B)	O						O										W			O											O																	
34G2 (I)	O						O													O											O																	
34H (A)	O						O				D	R	R							O											O																	
34H (I)	O						O				D	R	R							O											O																	
34J (A)							O													O		R	R	R							O																	
34J (I)							O													O		R	R	R							O																	
34L (C,B,A,I)							O													O	R	R	X	X	X	M	M			O																	
34S (A)	O						O				R									O			X	X	X	M	M			O																	
34S (I)	O						O				R	R								O			X	X	X	M	M			O																	
34S (C,B)	O						O			R	D									O			X	X	X	M	M			O																	
34V (A)	O	W					O													O											O				O	O	O	O	O									
34V (I)	O	W					O													O											O				O	O	O	O	O	O	O	O	O	O	O	O	O	O
34V (C,B)	O	W					O													O											O				O	O	O	O	O									
34Z (I)	O						O	R												O											O																	
35F (I)	O			R	R	R	O													O											O																	
35G (A,I)							O													O											O	O	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
35H1 (A)	S	S	S	S	S	S	O	S	S	S						S	S	S	S	O	S	S	S	S	S	S					O	S	S	R	S			S	S	S			S	S	S	S	S	S
35H1 (I)	S	S	S	S	S	S	O	S	S	S						S	S	S	S	O	S	S	S	S	S		S	S	S	S	O	S	S	S	R	S					S	S	S	S	S	S	S	S
35H2 (A)							O													O											O					R	S				S	S	S	S	S	S	S	S
* 33V'15P	N	N	N	N	N	N	N	N	N	N	N	N	M	M	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
* 34H'17P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
* 34H'18P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
* 34S'22P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

*Extraction Well

- Well in Operation
- H - Header Repair
- R - Redevelopment
- U - Under Construction
- C - Casing Repair
- M - Misc. Repair
- S - Surface Leakage
- W - Water Quality Sampling
- D - Disassembled
- N - Not Needed
- T - Tremie Repair
- X - Waiting for Repair
- G - Grouted
- O - Other Circumstances (details in Appendix A-34)

HYDROLOGIC EFFECTS

Table 2 summarizes and compares spring-time groundwater elevations by zone and location for both FY06-07 and FY07-08. As expected, the resumed injections during this reporting period resulted in significant increases (i.e., from 49% up to 194% increases) to all the internodal groundwater levels in all aquifers. There were decreases in average groundwater elevations for the Recent Zone and Main Zone, but these aquifers do not directly receive injection water and are therefore largely independent of the barrier operations. However, there was also a decrease in average groundwater elevation at C and B Zone observation wells east (landward) of the Los Alamitos Channel, likely caused in part by the couple shut downs during this period.

Figures 4 through 8 show the average monthly groundwater elevation against the 10-year average groundwater elevation (of the 10 preceding years) in the vicinity of the barrier alignment in the R, C, B, A, and I Zones, respectively. It is important to note that the 10-year average does not represent an injection goal but is simply included for the sake of comparison. The data includes all available semi-monthly, monthly, semi-annual, and annual values for wells within the barrier alignment and landward for approximately 2,000 feet from the barrier. As a result, the semi-monthly values are "weighted" more heavily than the annuals in the calculation of the monthly average. Two graphs were created for each aquifer to account for changes in groundwater elevation trends along the barrier alignment: wells west of the San Gabriel River and wells east of the San Gabriel River.

In each figure, monthly average groundwater elevations during the FY 2007-08 are compared with the averages of the previous 10 years (Fiscal Years 1997-98 to 2006-07). Since groundwater elevations have been below average throughout the Central Basin it is no surprise that the same is true in the area surrounding the ABP. As shown, groundwater elevations were only at or above historical averages only a few times during this entire reporting period. Though elevations have typically been below

historical averages in recent fiscal years, they were predominantly only low in the first half of this fiscal year. It is possible that this general trend of lower than average groundwater elevations despite the barrier being back in operation following the FY06-07 shutdowns is a result of the significantly increased pumping from both the Central and Orange County groundwater basins (both basin-wide as well as local to the barrier) from the first half of FY06-07 to the first half of FY07-08.

It is noted that in nearly all of the figures, there is a small peak in August 2007, a general drop in elevation from September to November 2007, a climb in elevation around February or March of 2008 up to a peak near April or May 2008, and then another drop in June 2008. This pattern is to be expected when compared to the barrier shutdowns (A-34) and common seasonal operational trends. Two examples of this are the small peak in August 2007 following the start-up of the barrier after the PRV replacement project and the November 2007 lows following multiple barrier shutdowns (video inspections on west leg and line breaks from the Gas Co on the east leg). Overall, the FY07-08 values are closer to average than the pervious year and the drops in groundwater elevation are more gradual, perhaps because of the more established and recharged local basin due to resumed operations.

Groundwater elevation contours for the R, C, B, A, and I Zones have been prepared from data taken in March 2008 and are included in the Appendix (A-1 through A-5). A list of all data points used for these contours is also included in the Appendix (A-19 through A-23). As expected, the contours show that the groundwater levels typically decrease as you move either landward or northward of the barrier. The hydraulic barrier is visible on these contours in the various groundwater mounds seen around some of the injection wells. Also, it should be noted that areas typically higher in elevation, especially near the bend at the San Gabriel River, are again demonstrating higher elevations as a result of the resumed operations. Some of these areas are believed to require larger volumes of water to maintain protective elevations, so were therefore more sensitive to the shutdowns. It seems substantial time has now passed

since the extended shutdowns in FY06-07 so that these sensitive wells have adjusted to their surroundings.

For further graphical analyses of the C, B, A, and I Zone groundwater elevations, please reference the Appendices. The graphs included as Appendix A-25 through A-32 present the change in elevations at the internodal wells (measured semi-monthly) with reference to each well's targeted protective elevation (PE). The graphs are divided into the west and east legs of the ABP, cover this entire reporting period, and clearly show the correspondence between low groundwater elevations and the periods that the barrier was shut down. Most of the internodal groundwater elevations respond quickly and significantly to the barrier shutdowns and startups, but there are a few that remain less sensitive. Each of the shut downs identified in Appendix A-34 can be identified by the drop in groundwater elevations shown on these graphs. On the west leg, this is seen in the reduced elevations in October 2007 (west leg shut down for video inspection) and February 2008 (whole barrier shut down for two repairs). On the east leg, this is predominantly seen in the in the reduced elevations in October 2007 for wells near the west leg (west leg shut down for video inspection), in reduced elevations in late November 2007 (east leg shut down for repairs by the Southern California Gas Company) and increased elevations from February to March 2008 (increased injections by about 1.5cfs).

Additionally, the graphs included as Appendix A-35 through A-38 show the average, maximum, and minimum groundwater elevations throughout FY07-08 in relation to the ground surface and the protective elevation. These graphs are new for this reporting period and were requested by the JMC at the technical meeting to potentially replace Appendix A-25 through A-32. However, since A-25 through A-32 were already created and do provide some value throughout the year, they are still included in this report. The JMC will likely only include one set or the other in future reports. As shown in A-35 to A-38, the average groundwater elevations were not met during FY07-08 but do not directly coincide with areas of high chloride concentrations.

TABLE 2. GROUNDWATER ELEVATION SUMMARY

Zones	Description		Spring 2007 (ft)	Spring 2008 (ft)	Change (ft)	Change (%)*
R	Landward of Seal Beach Fault	Maximum	3.0	3.4	0.4	13.3
		Minimum	-4.6	-10.4	-5.8	-126.1
		Average	-1.6	-1.7	-0.1	-5.4
C & B	Internodal Wells West of San Gabriel River	Maximum	-0.5	6.9	7.4	1480.0
		Minimum	-6.9	1.3	8.2	118.8
		Average	-4.5	4.2	8.7	194.2
	Internodal Wells East of San Gabriel River	Maximum	-2.0	4.4	6.4	320.0
		Minimum	-6.9	-13.2	-6.3	-91.3
		Average	-4.8	-2.4	2.5	51.0
	East of Los Alamitos Channel (landward)	Maximum	-1.7	-6.4	-4.7	-276.5
		Minimum	-5.9	-10.3	-4.4	-74.6
		Average	-4.1	-8.4	-4.3	-105.6
A	Internodal Wells	Maximum	-3.2	5.7	8.9	278.1
		Minimum	-8.6	-13.0	-4.4	-51.2
		Average	-6.5	-0.4	6.1	93.7
I	Internodal Wells	Maximum	-3.3	6.2	9.5	287.9
		Minimum	-13.2	-8.9	4.3	32.6
		Average	-10.0	-2.6	7.4	73.8
MAIN	Main Unaffected by Injection Operations	Maximum	4.0	3.3	-0.7	-17.5
		Minimum	-18.5	-49.6	-31.1	-168.1
		Average	-11.8	-24.1	-12.3	-103.8

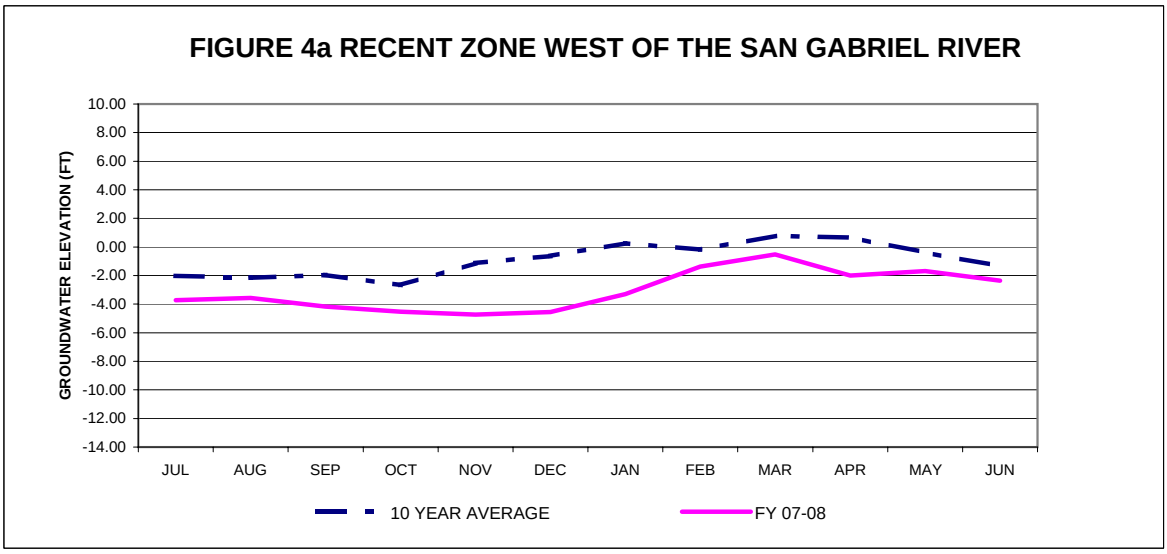


FIGURE 4a RECENT ZONE WEST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

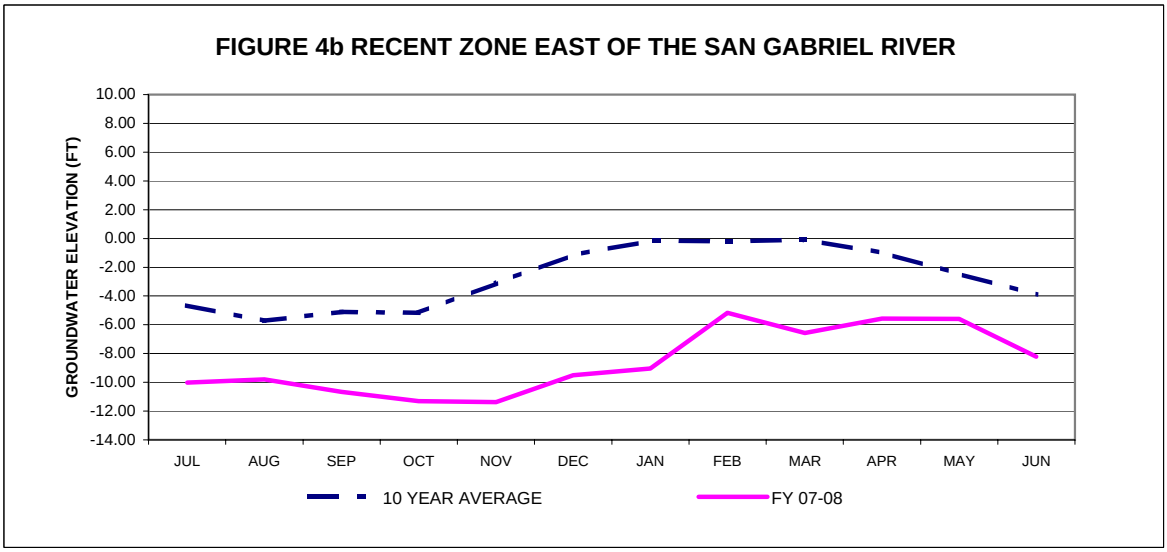


FIGURE 4b RECENT ZONE EAST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

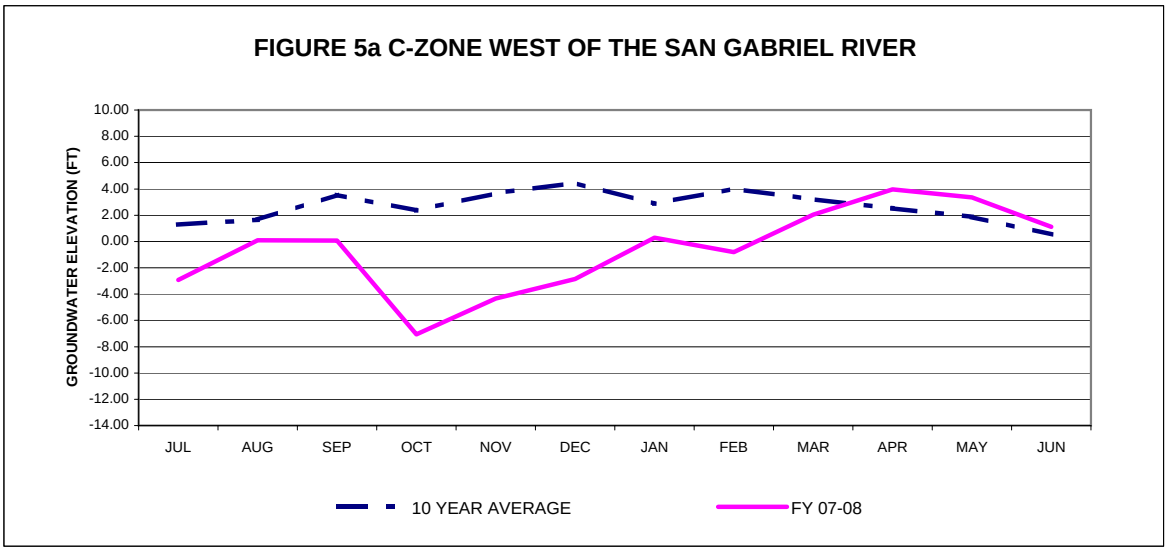


FIGURE 5a C-ZONE WEST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

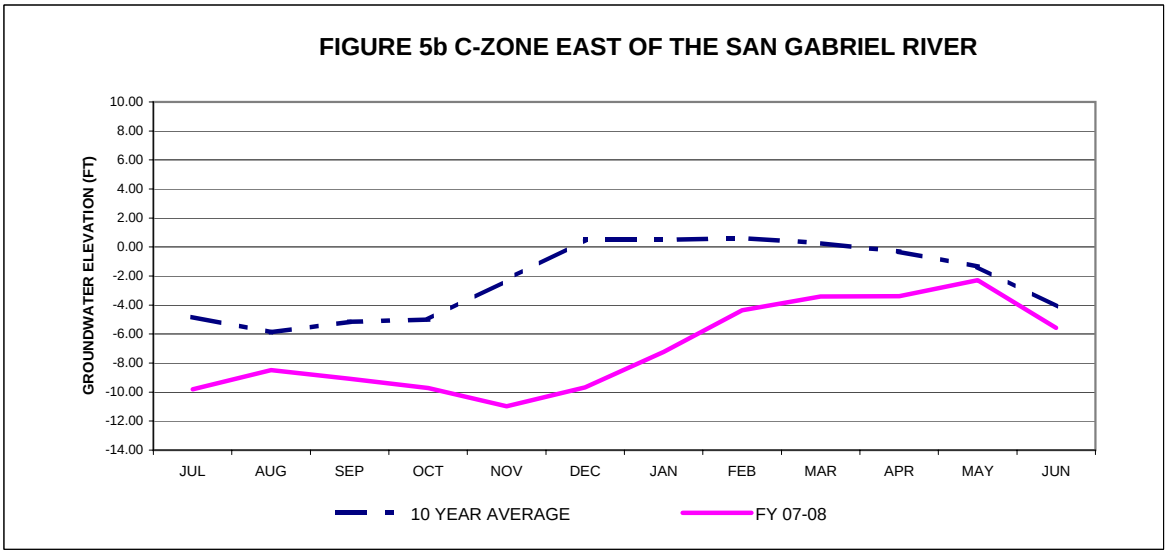


FIGURE 5b C-ZONE EAST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

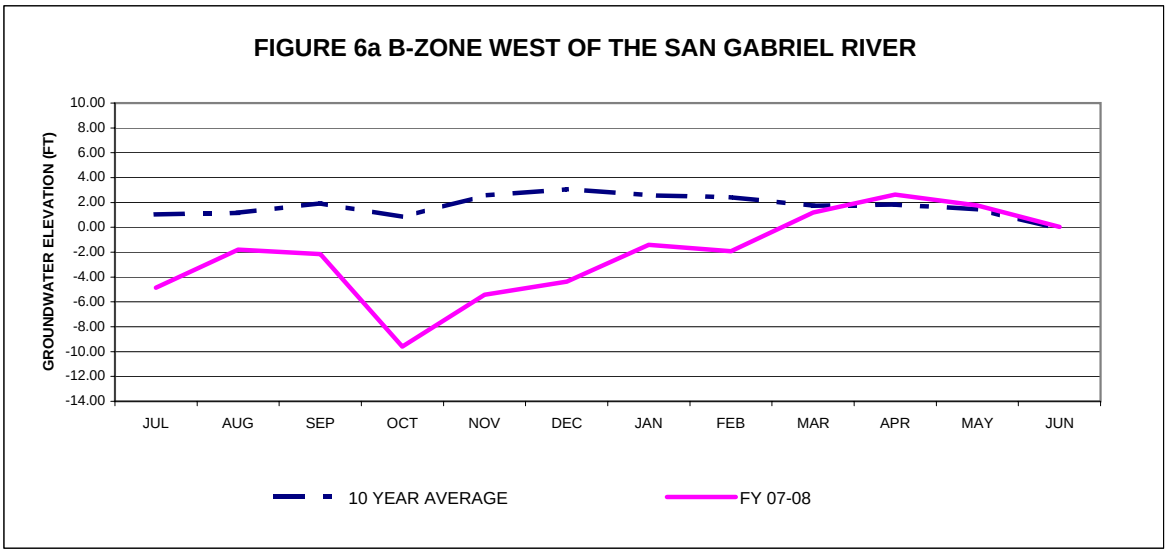


FIGURE 6a B-ZONE WEST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
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OCT
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JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

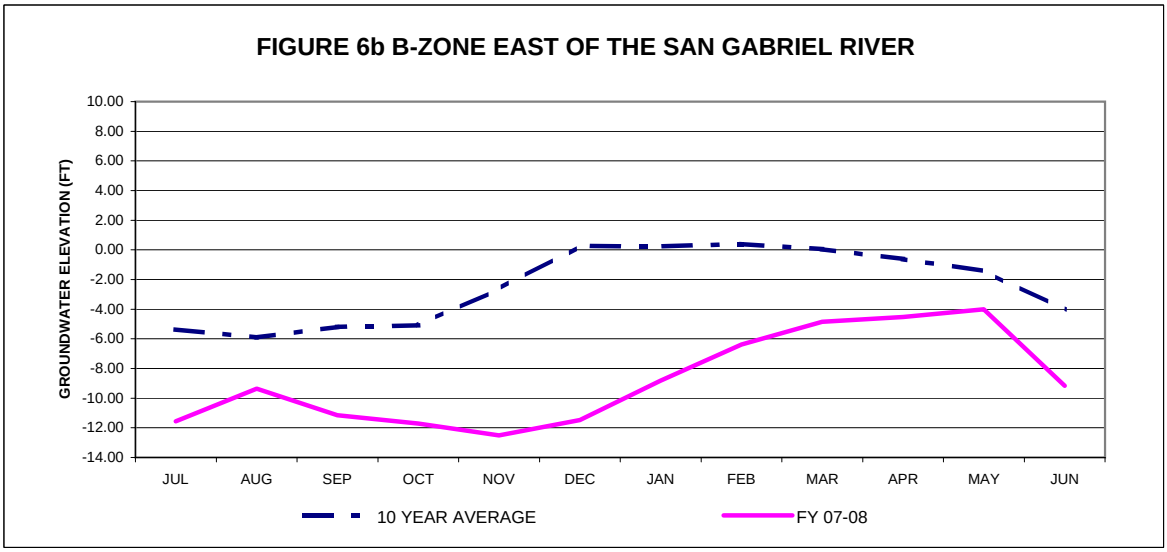
FIGURE 6b B-ZONE EAST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

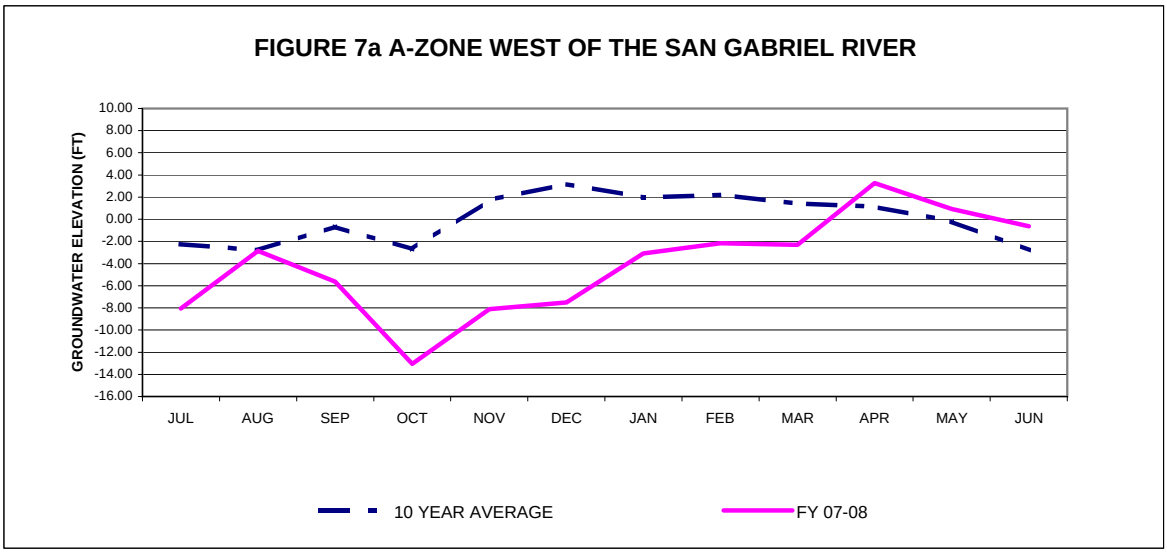
FIGURE 7a A-ZONE WEST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
-16.00
JUL
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MAR
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MAY
JUN
10 YEAR AVERAGE
FY 07-08

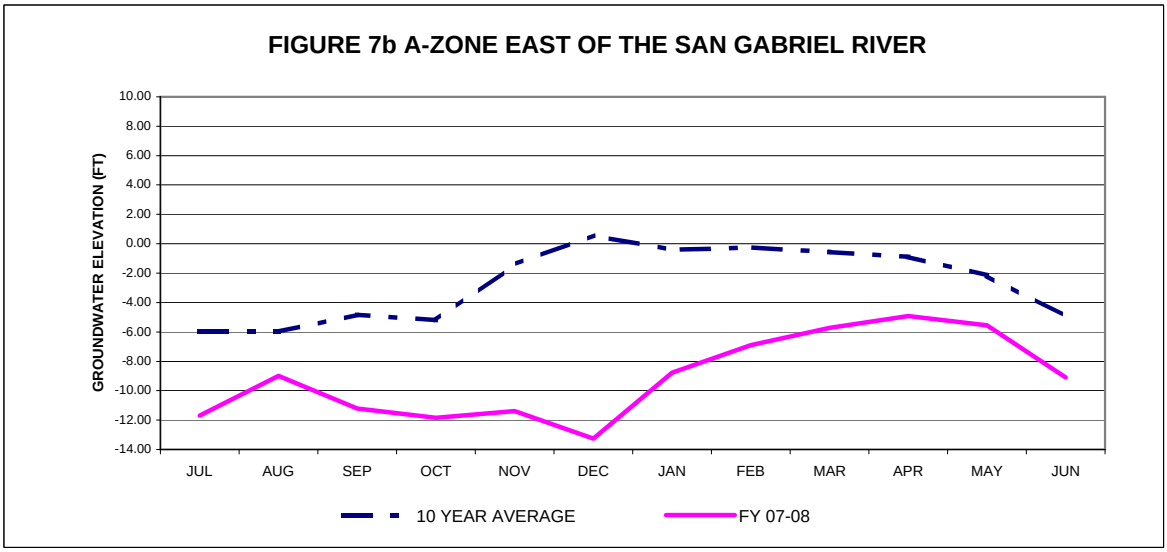


FIGURE 7b A-ZONE EAST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

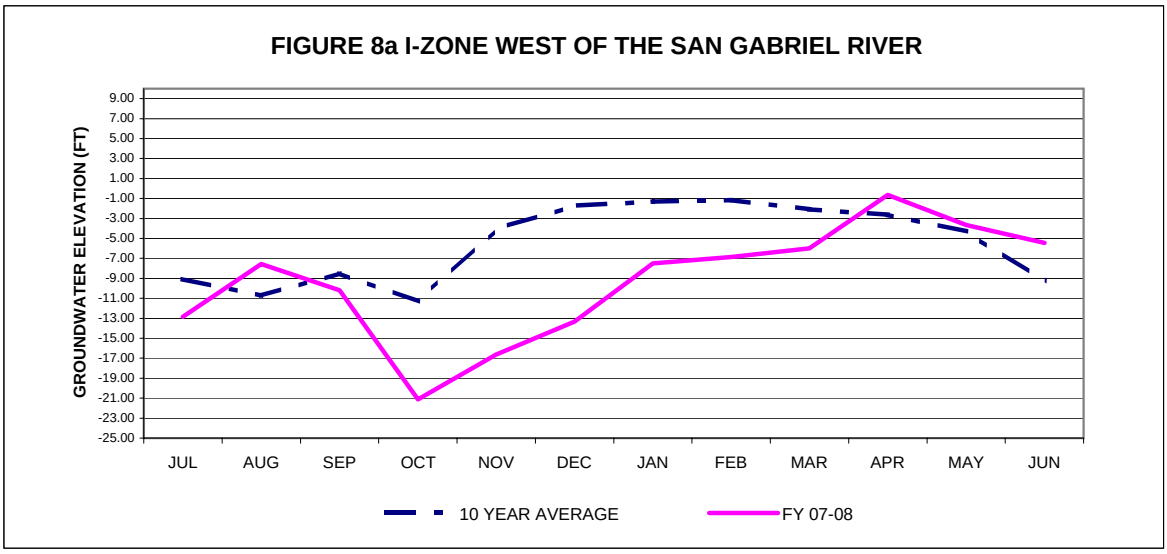


FIGURE 8a I-ZONE WEST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
9.00
7.00
5.00
3.00
1.00
-1.00
-3.00
-5.00
-7.00
-9.00
-11.00
-13.00
-15.00
-17.00
-19.00
-21.00
-23.00
-25.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

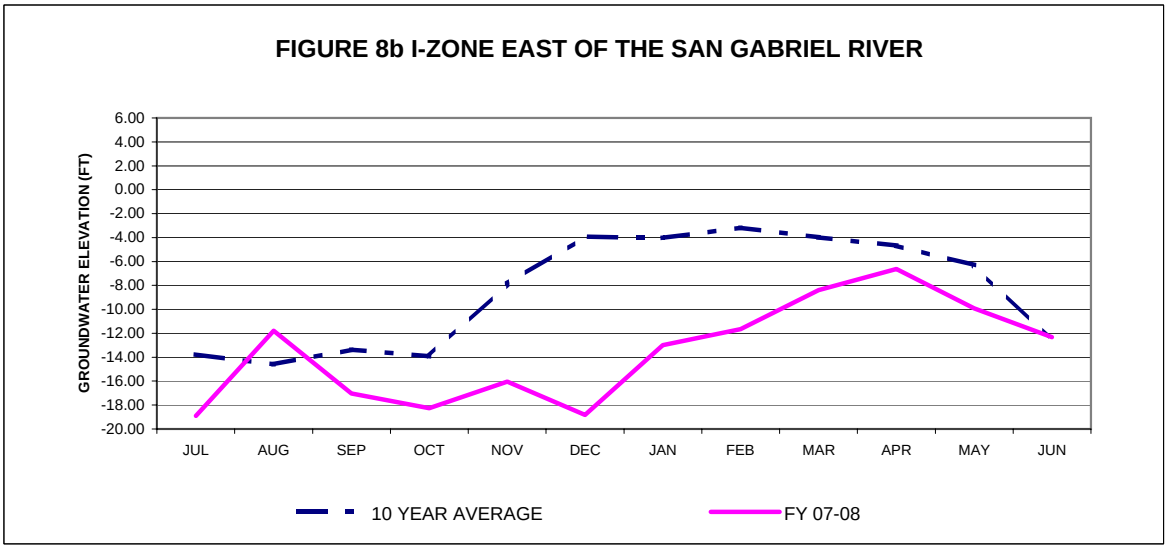


FIGURE 8b I-ZONE EAST OF THE SAN GABRIEL RIVER
GROUNDWATER ELEVATION (FT)
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
-16.00
-18.00
-20.00
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
10 YEAR AVERAGE
FY 07-08

CHLORIDES

Table 3 summarizes and compares the chloride concentrations by Zone and Location for FY 2006-07 and FY 2007-08. As shown, the majority of the average chloride concentrations, both internodal and inland, have decreased from last fiscal year to this fiscal year. In general, this is likely due to resumed operations following the multiple barrier shutdowns in FY06-07. However, the average internodal chloride concentrations for the A and I Zones actually increased. It should be noted that the FY06-07 report recorded that these two aquifers were the only ones whose averages decreased (despite the shutdowns) and that it was a possible indication that these aquifers had not yet been or would not be impacted by the shutdowns. In light of the more recent data collected during this reporting period it seems that this assumption was correct and that the impact on these aquifers may have indeed been delayed (perhaps due to their greater depth). The only other increase in average chloride concentration was the I Zone inland wells which may have also risen due to the delayed impact of the shutdowns.

Figures 9 through 13 show the historical amount of seawater intrusion (based on average annual chloride concentrations) in the individual aquifer zones. The data includes all available annual and semi-annual values for wells within the barrier alignment and landward for approximately 2,000 feet from the barrier. As a result, the semi-annual values are “weighted” more heavily than the annuals in the calculation of the annual average. Two sets of graphs were created for each aquifer to account for changes in chloride concentration trends in the areas west and east of the San Gabriel River, respectively.

In each figure, the average chloride concentration for the last 10 fiscal years (including this year) is shown with respect to the freshwater condition (250 mg/L). As shown, chloride concentrations stayed the same or decreased in nearly all zones both east and west of the San Gabriel River. In fact, the average for the A zone east of the San

Gabriel River (Fig. 12b) dropped below 250 mg/L for the first time in the last ten years. The only three increases in average occurred in the R zone west of the San Gabriel River (Fig. 9a, which hit a 10-year high but is not impacted by ABP injections), the A zone west of the San Gabriel River (Fig. 12a, where the average is still relatively low around 500 mg/L), and the I zone east of the San Gabriel River (Fig. 13b, where the average has remained relatively constant compared to the peak in FY02-03). The decreases are the likely result of resumed barrier operations while the small increases are likely the result of specific wells or areas that have been shut down more regularly.

Chloride contour maps for the R, C, B, A, and I Zones have been prepared as presented in the Appendix (Figures A-6, A-7, A-8, A-9, and A-10, respectively). The chloride contour maps for this reporting period are based on the highest chloride ion concentration (mg/L) measured at each observation well. Chloride data were gathered within the immediate vicinity of the barrier and do not represent basin-wide conditions for the groundwater basin protected by the barrier. Wells with chloride concentrations of 250 mg/L or less are considered fresh. The majority of chloride measurements reported this period were taken March through June 2008. However, as usual, a few older data points were included where necessary and applicable. The incorporation of these points allowed for a more accurate and more complete representation of the conditions around the barrier. A list of all data points used for these contours is included in the Appendix (A-12 through A-18).

The contours (A-6 through A-10) and cross-section (A-11) for this reporting period indicate that intrusion of seawater across the barrier continued to be controlled along most of the alignment. However, several areas recorded high chloride concentrations. For most zones, the southeastern end of the barrier continued to be subject to seawater intrusion. In the shallower aquifers (the C and B Zones), there are simply no injection wells in this southeastern region, though the B Zone actually showed a decrease in chloride concentration in this area. However, in the deeper aquifers (though the A Zone increased and the I Zone decreased), the possible causes of contamination may be the

well shutdowns in that area and the physical limit of our injection rates due to the very thin (and therefore very pressure-sensitive) aquitards in this region. Additional areas of high chloride concentrations and/or notable changes in concentration (since the July to December 2007 JMC Report) are as follows:

- R Zone – High chloride concentrations north of west leg along Los Cerritos Channel and along the barrier at the San Gabriel River.
- C Zone – High (and increased) chloride concentrations at west leg along Los Cerritos Channel. A slight increase occurred at 34T0.1.
- B Zone – High (and increased) chloride concentrations along west side of Los Cerritos Channel. Decreases occurred along most of the east leg of the barrier, most notably at 34JL, 34T0.1, and 35J1.
- A Zone – High chloride concentrations remain northwest of the west leg. An increase occurred around 33UV and 33WX as well as at 34JL and 35H11. However, a significant decrease occurred at the previous intrusion point at the intersection of the barrier and the San Gabriel River, as well as on the southeast end at 35J1.
- I Zone – High chloride concentrations remain on the west leg at Los Cerritos Channel (and have slightly increased) and the east leg around well 34LS. Some inland wells have decreased (34H5) while others have increased (33S40 and 33X10), but most of the southeast end has seen a decrease overall.

There are three possible causes of the high chloride concentrations north of, northwest of, and along portions of the ABP west leg. These include the transportation of seawater inland by the Los Cerritos Channel, a need for greater protection on that end of the barrier, and remaining seawater from previous intrusions. It is likely that an increase in chloride concentrations at other locations is a continued result of the extended barrier shutdowns. The high chlorides remaining around 34LS(I) likely arose from the previous prolonged nonoperation of nearby injection well 34S(I) and have not yet been dissipated despite the resumed full operation of 34S(I). As shown in the three latest sampling events, chloride concentration worsened at 34LS(I) from July 2007 to December 2007 but then improved from December 2007 to May 2008.

The extended shutdowns in FY06-07 are consistent with history in demonstrating that the barrier is effective when in operation. As expected, there were therefore many decreases in chloride concentrations in this reporting period where the barrier resumed more normalized operation. It is imperative that the barrier operate consistently and continuously to best prevent seawater intrusion. The JMC has discussed ways to minimize barrier down time and is continuing to pursue an evaluation of the entire facility that would allow proactive maintenance rather than reactive. This will include establishing faster options for as-needed/emergency contract repair work. The JMC and Public Works will continue to press forward to ensure that the ABP is most efficiently, economically, and continuously protecting the region's groundwater supplies.

TABLE 3. CHLORIDE CONCENTRATION SUMMARY

Zones	Description		Spring 2007 (mg/L)	Spring 2008 (mg/L)	% Change
R	North of Westminster Ave	Maximum	19,600	23,100	17.9
		Minimum	35	34	-2.9
		Average	5,644	5,425	-3.9
C	Internodal Wells	Maximum	17,700	10,200	-42.4
		Minimum	51	80	56.9
		Average	1,706	1,018	-40.3
	Inland Wells	Maximum	1,150	1,150	0.0
		Minimum	82	60	-26.8
		Average	251	183	-27.0
B	Internodal Wells	Maximum	17,700	10,200	-42.4
		Minimum	33	83	151.5
		Average	1,542	962	-37.6
	Inland Wells	Maximum	2,850	2,175	-23.7
		Minimum	40	85	112.5
		Average	372	290	-22.1
A	Internodal Wells	Maximum	4,900	2,200	-55.1
		Minimum	35	55	57.1
		Average	271	305	12.5
	Inland Wells	Maximum	3,850	3,950	2.6
		Minimum	18	60	233.3
		Average	319	250	-21.7
I	Internodal Wells	Maximum	7,750	8,300	7.1
		Minimum	37	60	62.2
		Average	501	598	19.4
	Inland Wells	Maximum	1,150	2,450	113.0
		Minimum	20	30	50.0
		Average	198	364	83.8

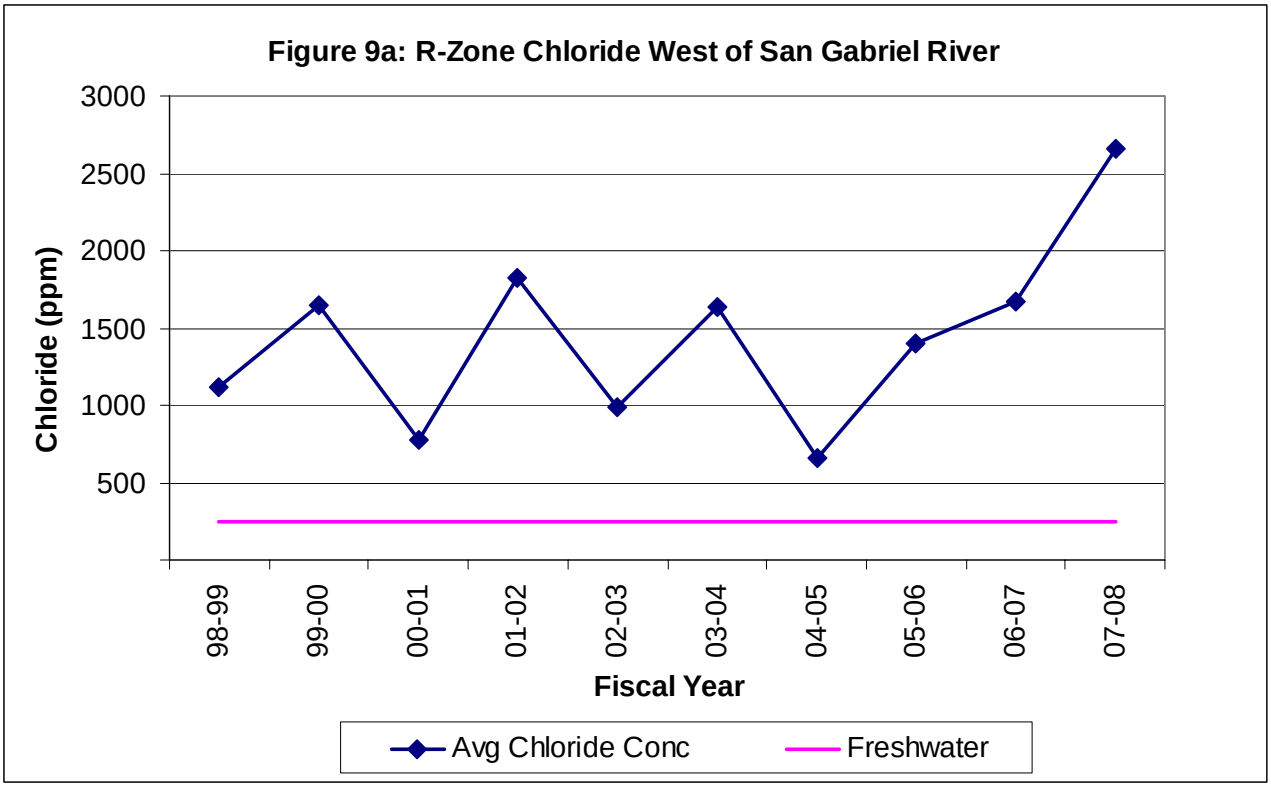


Figure 9a: R-Zone Chloride West of San Gabriel River
Chloride (ppm)
3000
2500
2000
1500
1000
500
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

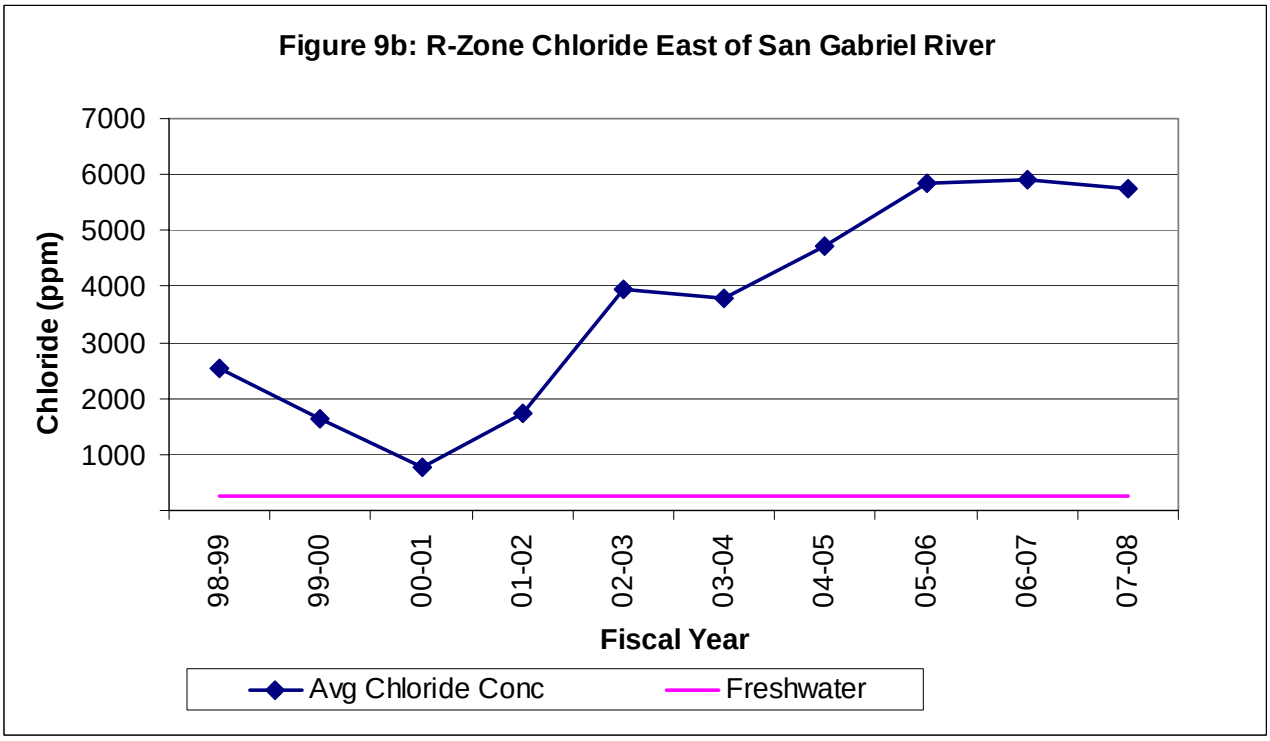


Figure 9b: R-Zone Chloride East of San Gabriel River
Chloride (ppm)
7000
6000
5000
4000
3000
2000
1000
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

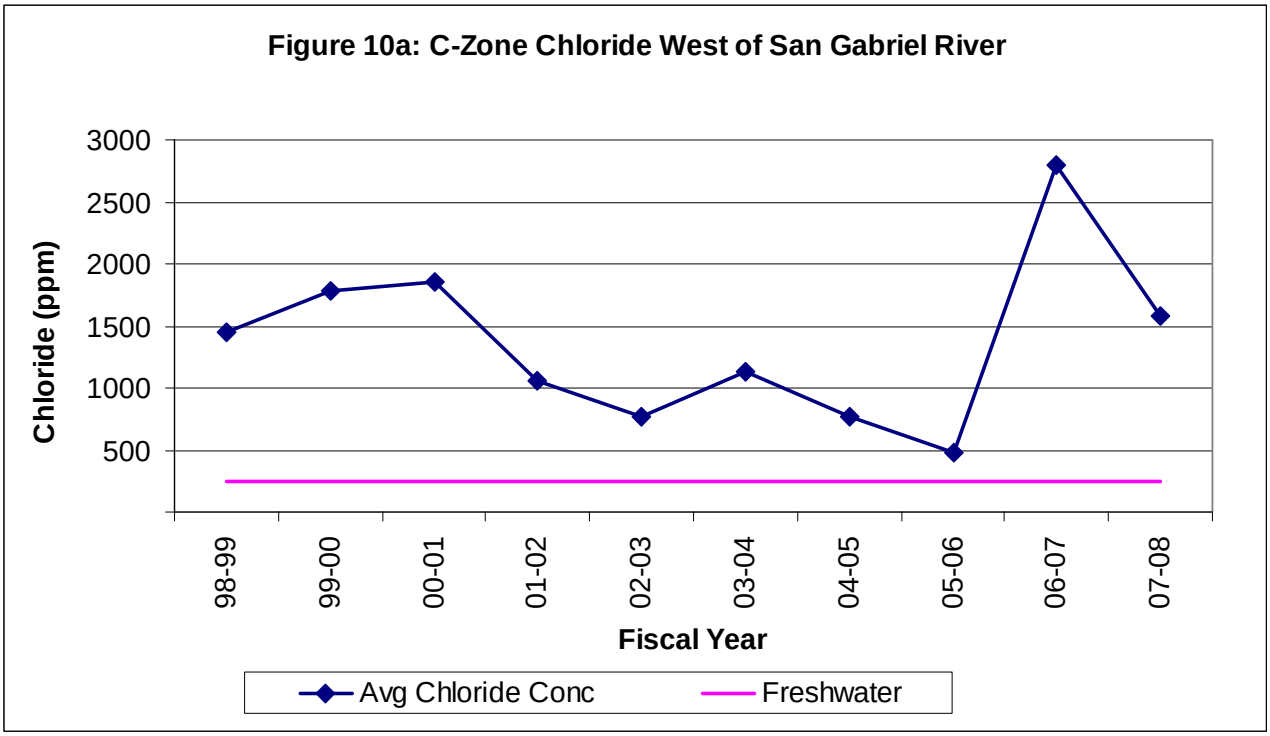


Figure 10a: C-Zone Chloride West of San Gabriel River
Chloride (ppm)
3000
2500
2000
1500
1000
500
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

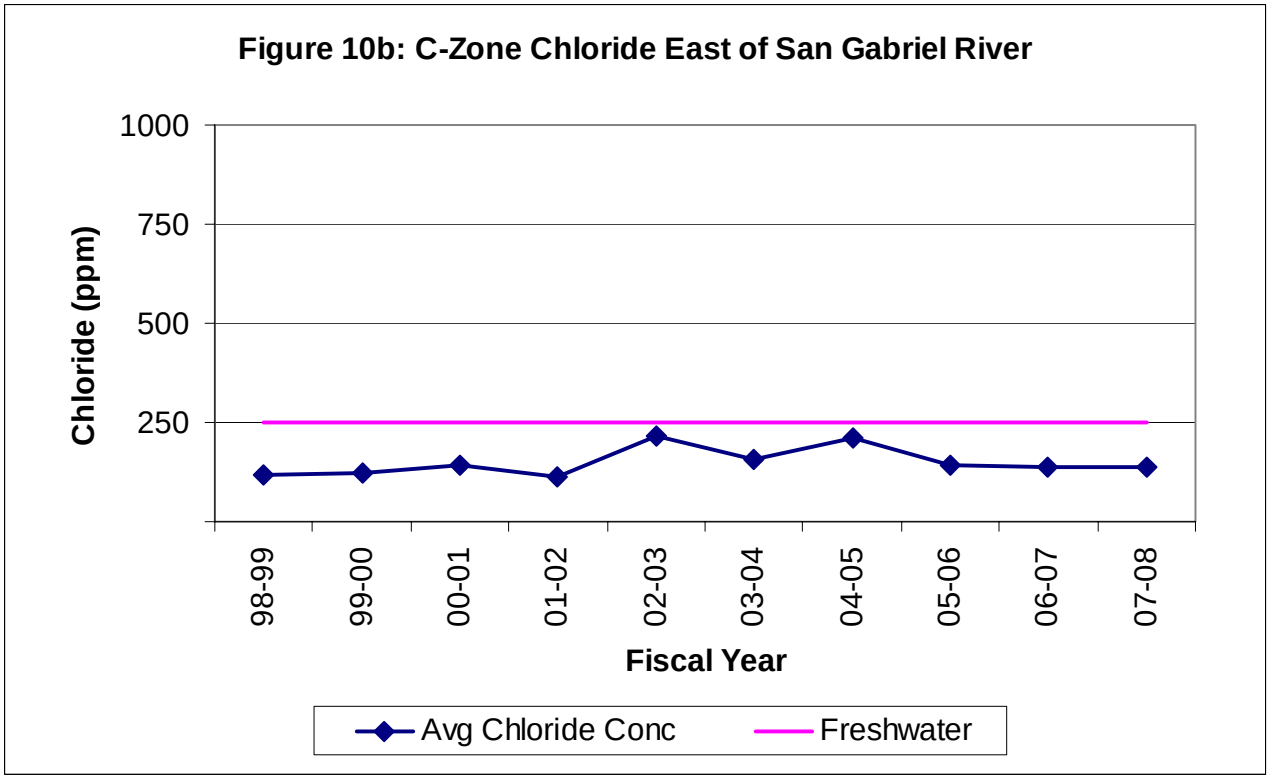


Figure 10b: C-Zone Chloride East of San Gabriel River
Chloride (ppm)
1000
750
500
250
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

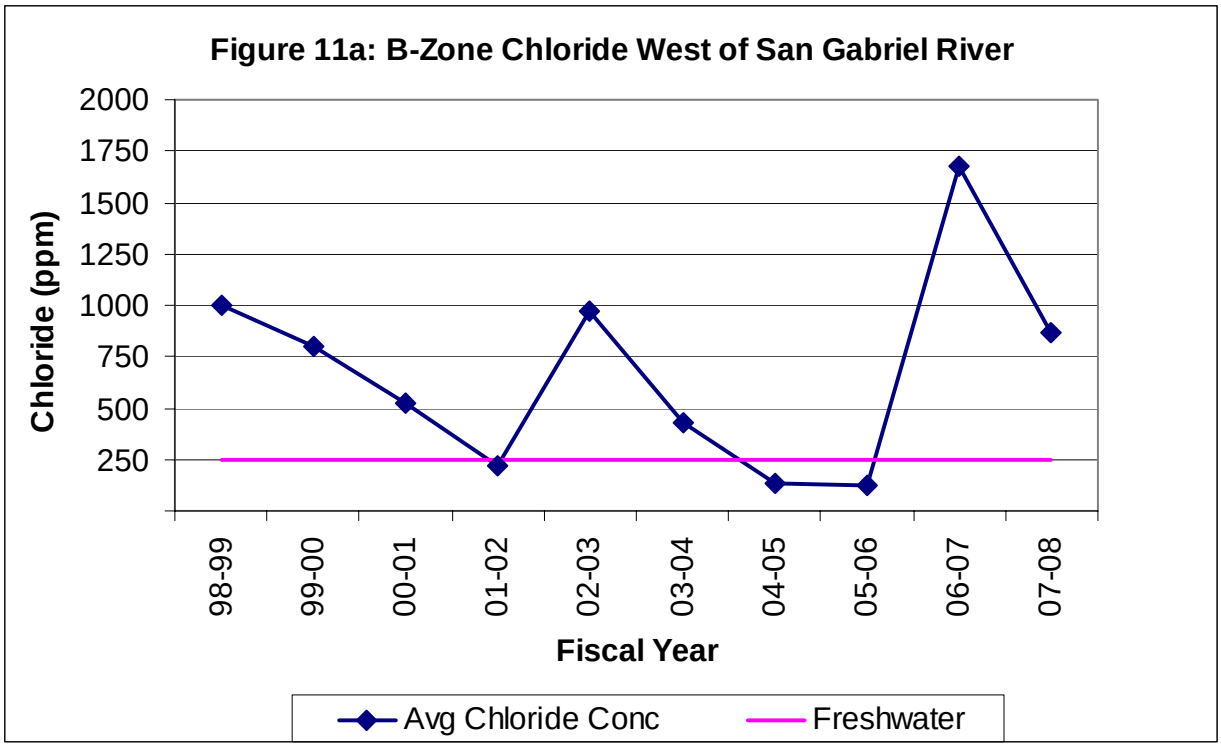


Figure 11a: B-Zone Chloride West of San Gabriel River
Chloride (ppm)
2000
1750
1500
1250
1000
750
500
250
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

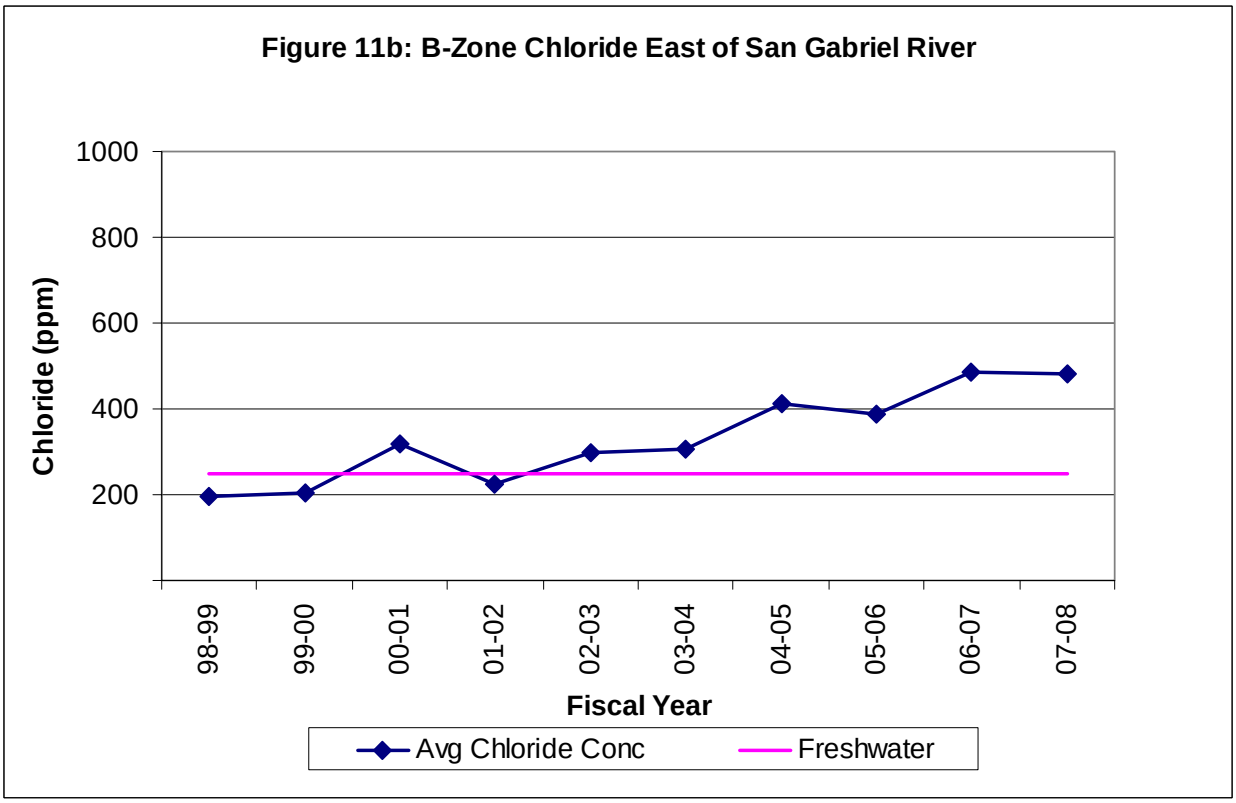


Figure 11b: B-Zone Chloride East of San Gabriel River
Chloride (ppm)
1000
800
600
400
200
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

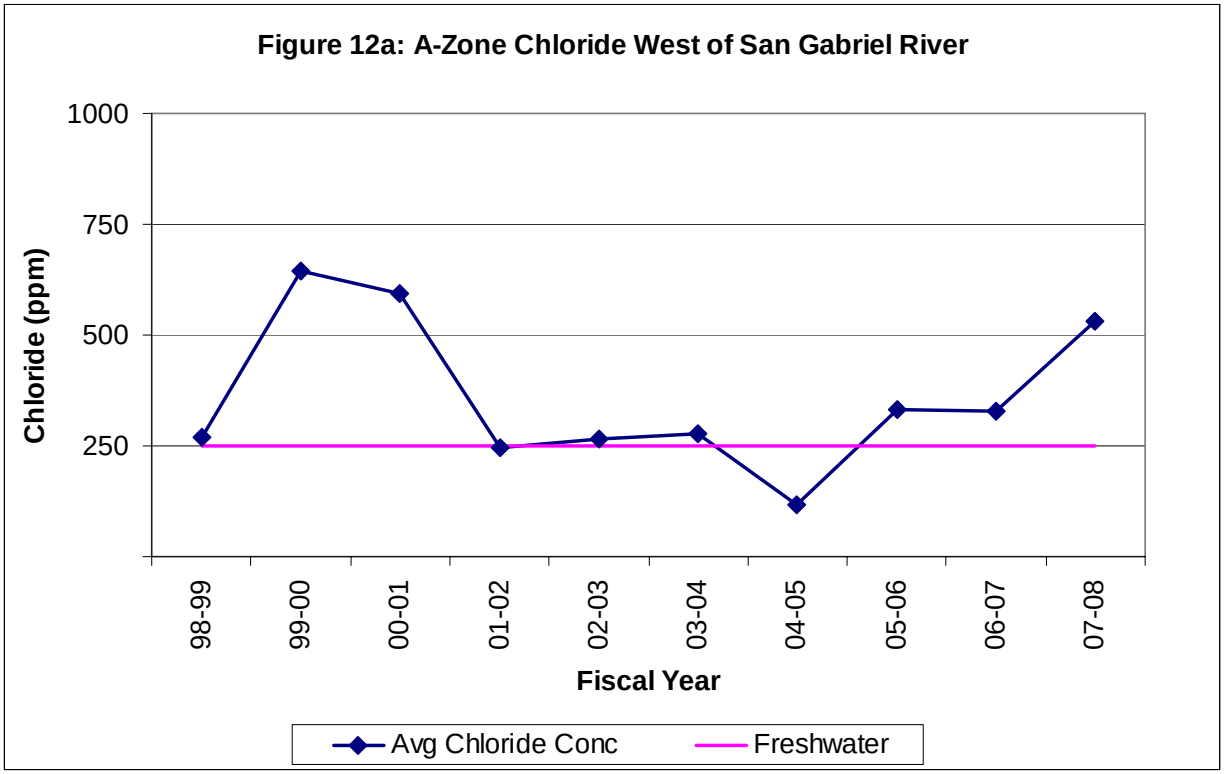


Figure 12a: A-Zone Chloride West of San Gabriel River
1000
750
500
250
Chloride (ppm)
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

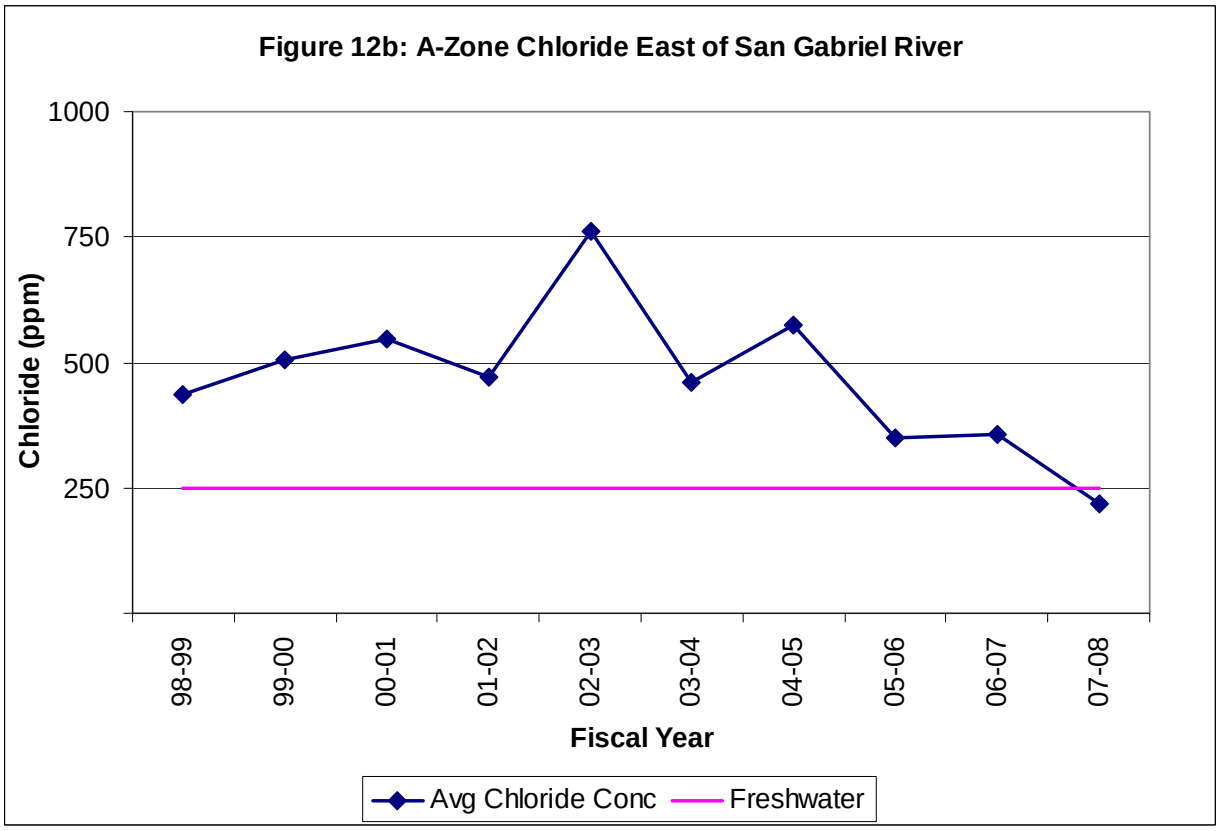


Figure 12b: A-Zone Chloride East of San Gabriel River
1000
750
500
250
Chloride (ppm)
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

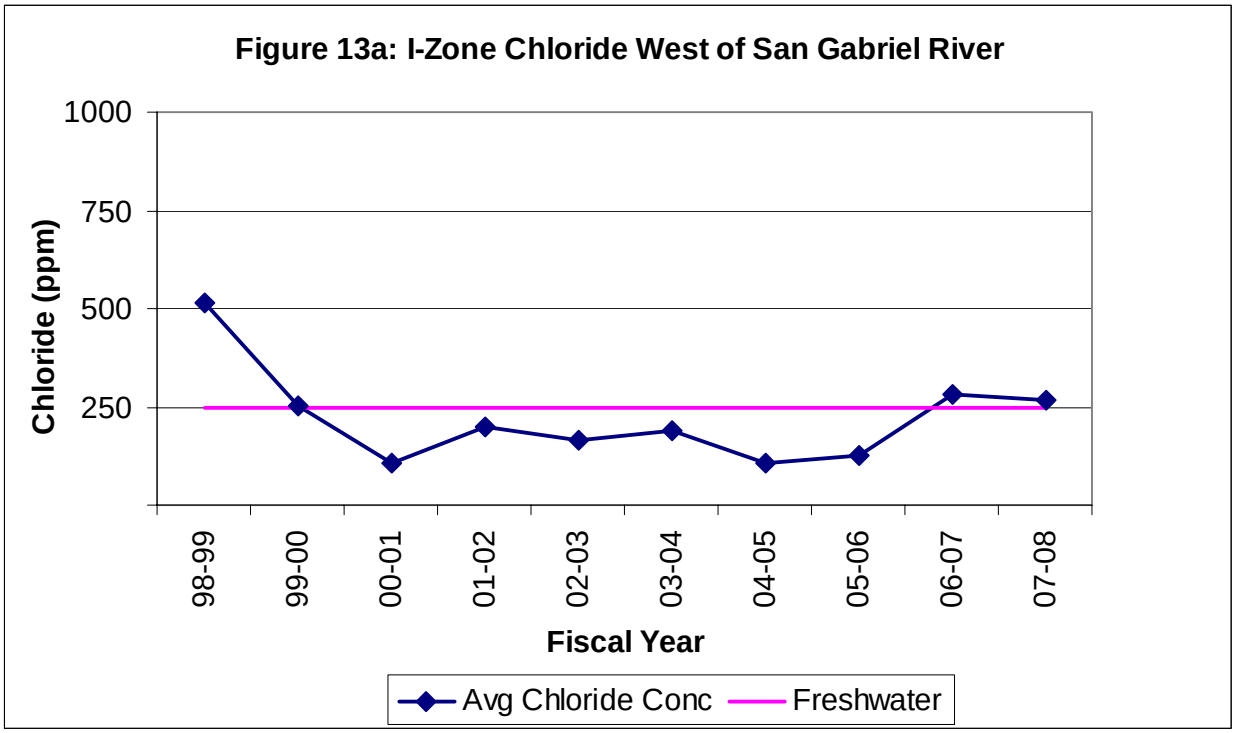


Figure 13a: I-Zone Chloride West of San Gabriel River
1000
750
500
250
Chloride (ppm)
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

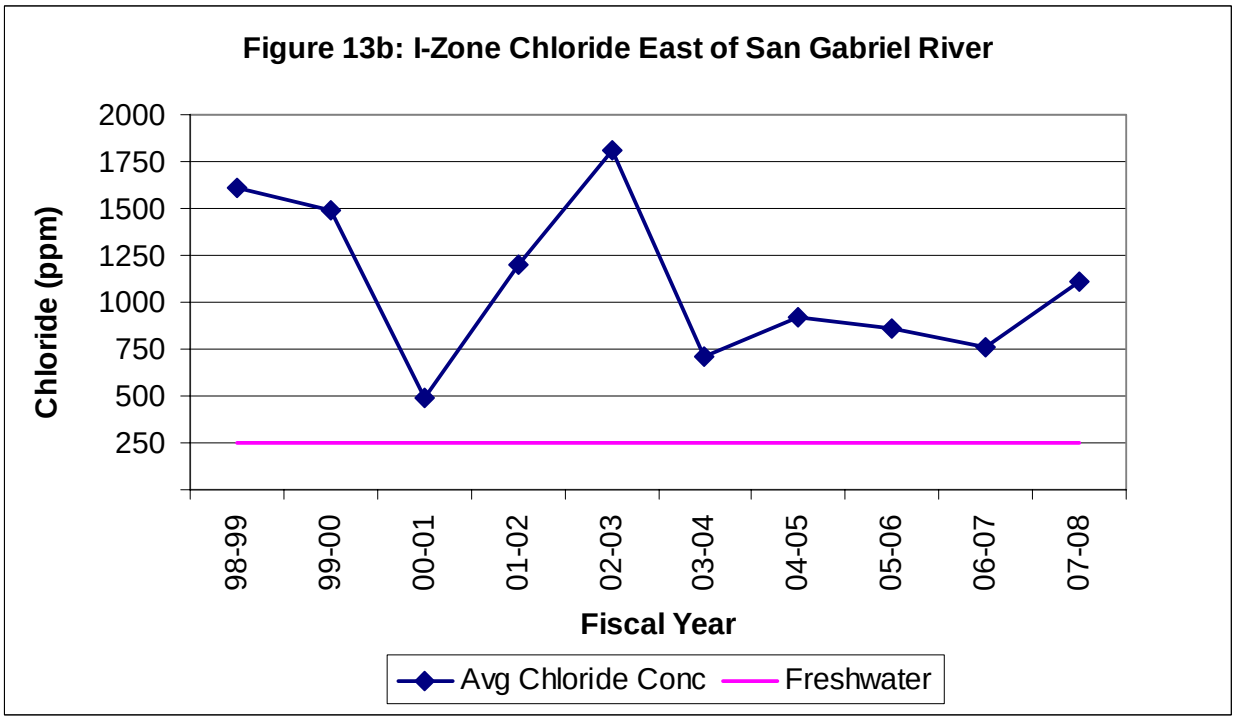


Figure 13b: I-Zone Chloride East of San Gabriel River
2000
1750
1500
1250
1000
750
500
250
Chloride (ppm)
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
Fiscal Year
Avg Chloride Conc
Freshwater

FINANCING AND COSTS

This section of the report is divided into three parts: Water Costs, Services and Supplies Costs (operation and maintenance), and Fixed Assets Costs (capital outlay). Under the terms of the Cooperative Agreement, fixed assets are divided into facilities paid for by the LACFCD, facilities paid for by the OCWD, and joint facilities paid for by both agencies. Under the same agreement, water costs are divided between the Water Replenishment District (on behalf of the LACFCD) and the OCWD.

WATER COSTS

During the 2007-08 fiscal year, 5,971.1 acre-feet of water were injected at a total cost of $3,018,740. The monthly water rates (dollars per AF) from July 2007 to June 2008 varied periodically as shown earlier in Table 1. The monthly quantity of water injected and the total water costs paid by the respective agencies are shown below in Table 4.

TABLE 4. QUANTITY OF WATER INJECTED AND COSTS

MONTH	AMT BY WRD (AF)	AMT BY OCWD (AF)	TOTAL AMT (AF)
Jul-07	228.8	36.9	265.7
Aug-07	439.9	106.3	546.2
Sep-07	419.8	95.3	515.1
Oct-07	284.9	111.2	396.1
Nov-07	383.6	97.7	481.3
Dec-07	246.6	169.3	415.9
Jan-08	386.7	120.6	507.3
Feb-08	310.2	127.9	438.1
Mar-08	410.6	184.4	595.0
Apr-08	424.0	133.8	557.8
May-08	465.7	168.2	633.9
Jun-08	466.2	152.5	618.7
TOTAL INJECTED	4,467.0	1,504.1	5,971.1
TOTAL COST ($) [From Tbl. 1]	**$2,256,461**	**$762,279**	**$3,018,740**

SERVICES AND SUPPLIES COSTS

A total of $3,518,181 was expended on services and supplies during the 2007-08 fiscal year (not including liability insurance and water costs). Of this total, $4,224 was charged to extraction well maintenance. Pursuant to the Cooperative Agreement, the Orange County Water District pays a percentage of the services and supplies costs for injection operations proportional to the percentage of the total amount of injection water paid for by the District. The distribution of FY 2007-08 services and supplies costs is summarized in Table 5:

TABLE 5. DISTRIBUTION OF SERVICES AND SUPPLIES COSTS FOR INJECTION AND EXTRACTION ACTIVITIES

ITEM	LOS ANGELES COUNTY	ORANGE COUNTY	TOTAL
Operation and Maintenance of Injection Facilities (including Observation Wells)	$2,612,861	$869,482	$3,482,343
Operation and Maintenance of Extraction Facilities	$4,224	$0	$4,224
Special Programs	$31,614	$0	$31,614
SUBTOTAL	**$2,648,699**	**$869,482**	**$3,518,181**
Liability Insurance	$15,068	$15,068	$30,136
TOTAL	**$2,663,767**	**$884,550**	**$3,548,317**

The yearly costs of the services and supplies for the last 20 years of injection operations, excluding water costs, are shown in Table 6.

TABLE 6. COSTS OF SERVICES AND SUPPLIES FOR INJECTION

Fiscal Year	Volume of Water Injected (Ac-Ft)	Total Cost	Cost Per Ac-Ft Injected
1988-89	5,599.3	$723,965	$129.30
1989-90	5,755.8	$515,964	$89.64
1990-91	6,167.7	$464,584	$75.33
1991-92	5,757.5	$865,016	$150.24
1992-93	5,240.8	$692,864	$132.21
1993-94	4,144.8	$584,975	$141.13
1994-95	3,495.7	$651,845	$186.47
1995-96	5,269.0	$509,377	$96.67
1996-97	5,739.4	$408,064	$71.10
1997-98	5,335.8	$923,342	$173.05
1998-99	5,330.4	$795,044	$149.15
1999-00	6,077.9	$589,168	$96.94
2000-01	5,398.8	$961,649	$178.12
2001-02	6,061.7	$713,299	$117.67
2002-03	5,012.3	$1,555,921	$310.42
2003-04	5,879.7	$730,652	$124.27
2004-05	5,066.1	$918,020	$181.21
2005-06[1]	3,457.8	$1,605,456	$464.30
2006-07[1]	1,265.1	$2,309,300	$1,825.39
2007-08[1]	5,971.1	$3,513,957	$588.49

[1] The higher costs per Ac-Ft injected in FY05-06 through FY07-08 are because these years included multiple repairs and/or improvement projects (PRV Replacement, Telemetry Implementation, and Cathodic Protection) whereas not all other years did. The cost is especially high in FY06-07 because the improvement projects, observation well cleanouts, costs related to the reclaimed water program, and various fixed costs were still incurred despite reduced injections due to the extended shutdowns for repairs.

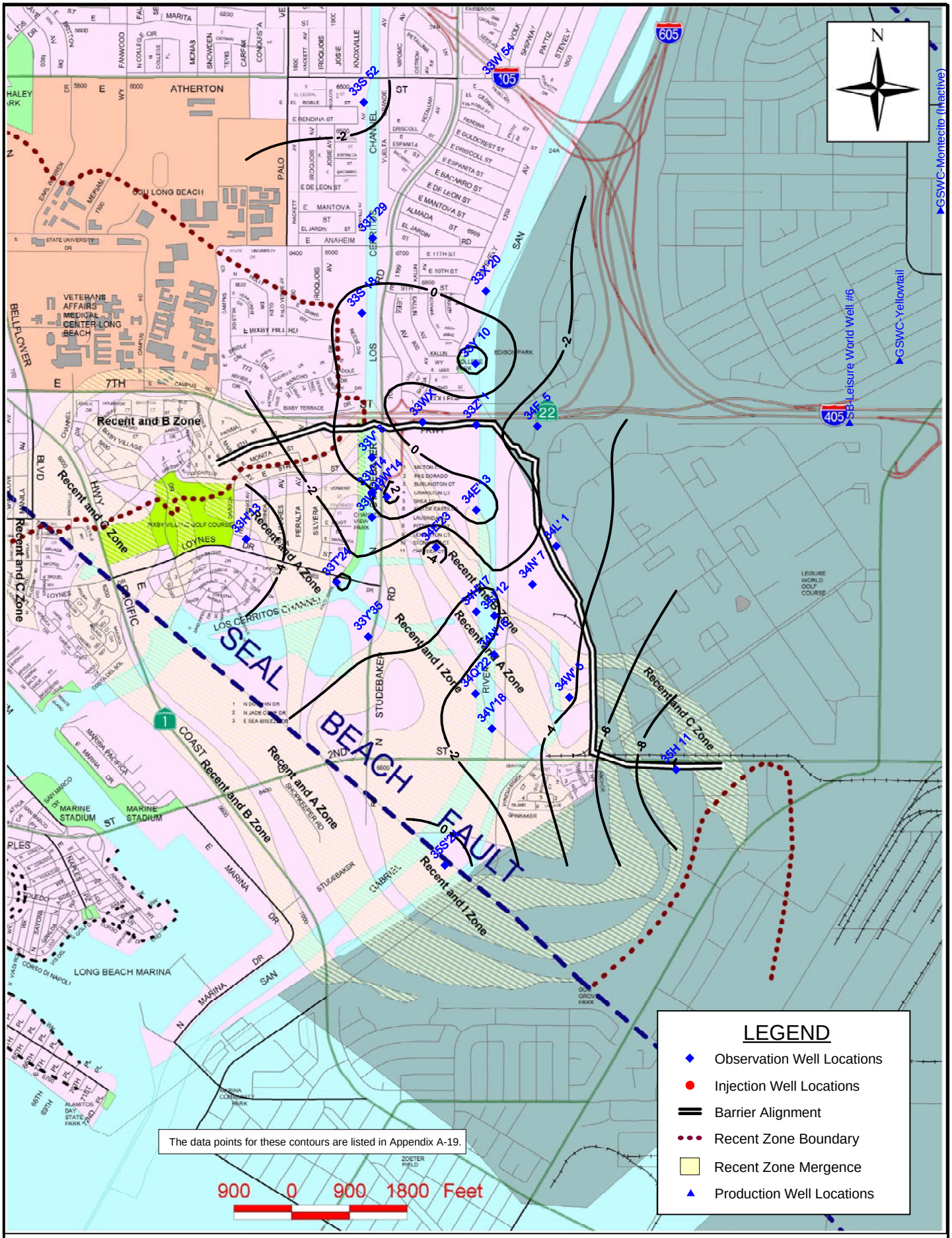
The costs of the services and supplies for extraction operations for the past 20 years, including electrical costs, are shown in Table 7.

TABLE 7. COSTS OF SERVICES AND SUPPLIES FOR EXTRACTION

Fiscal Year	Volume of Water Extracted (Ac-Ft)	Total Cost	Cost Per Ac-Ft Extracted
1988-89	1,522.4	$99,315	$65.24
1989-90	1,544.8	$66,717	$43.19
1990-91	1,278.0	$172,230	$134.77
1991-92	1,378.4	$151,520	$109.92
1992-93	1,136.1	$99,099	$87.23
1993-94	992.0	$169,621	$170.99
1994-95	940.7	$148,122	$157.46
1995-96	998.4	$130,901	$131.11
1996-97	1,200.9	$51,077	$42.53
1997-98	883.5	$64,774	$73.32
1998-99	775.6	$52,043	$67.10
1999-00	679.9	$41,320	$60.77
2000-01	404.8	$49,769	$122.95
2001-02	495.0	$53,153	$107.38
2002-03	262.7	$63,165	$240.45
2003-04	0.0	$6,068	N/A
2004-05	0.0	$3,043	N/A
2005-06	0.0	$2,857	N/A
2006-07	0.0	$3,224	N/A
2007-08	0.0	$4,224	N/A

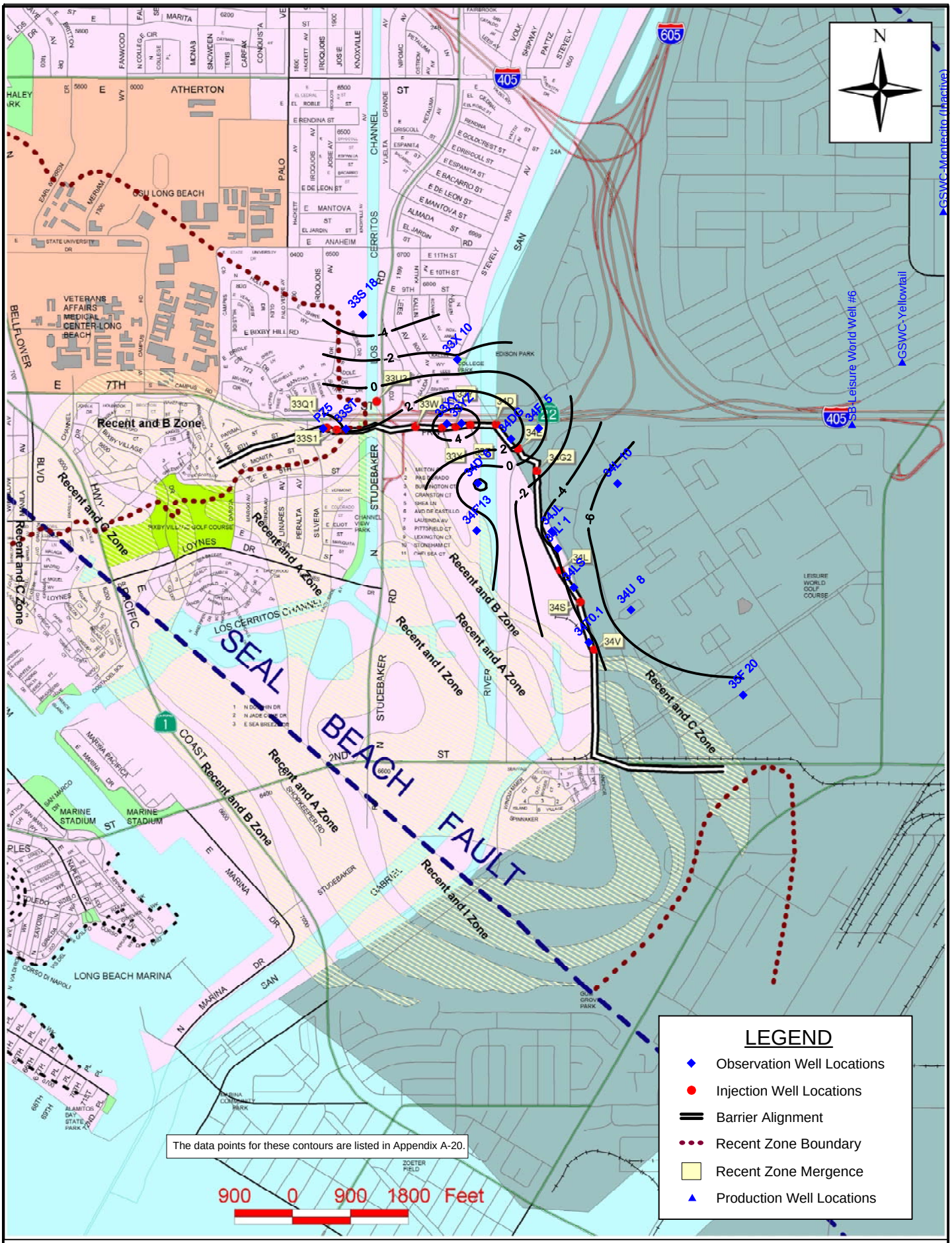
FIXED ASSETS COSTS

During this 2007-08 Fiscal Year, about $1.9M was spent by Public Works on the replacement of the PRV, the construction of the telemetry system (two phases), and the implementation of cathodic protection along the supply line (two phases). As agreed at the two previous annual JMC meetings, these costs were incorporated into the operation and maintenance costs (i.e., services and supplies) so that OCWD covered a portion of these costs in accordance with the distribution of water delivered (in this case, about $490,000 or 25%).



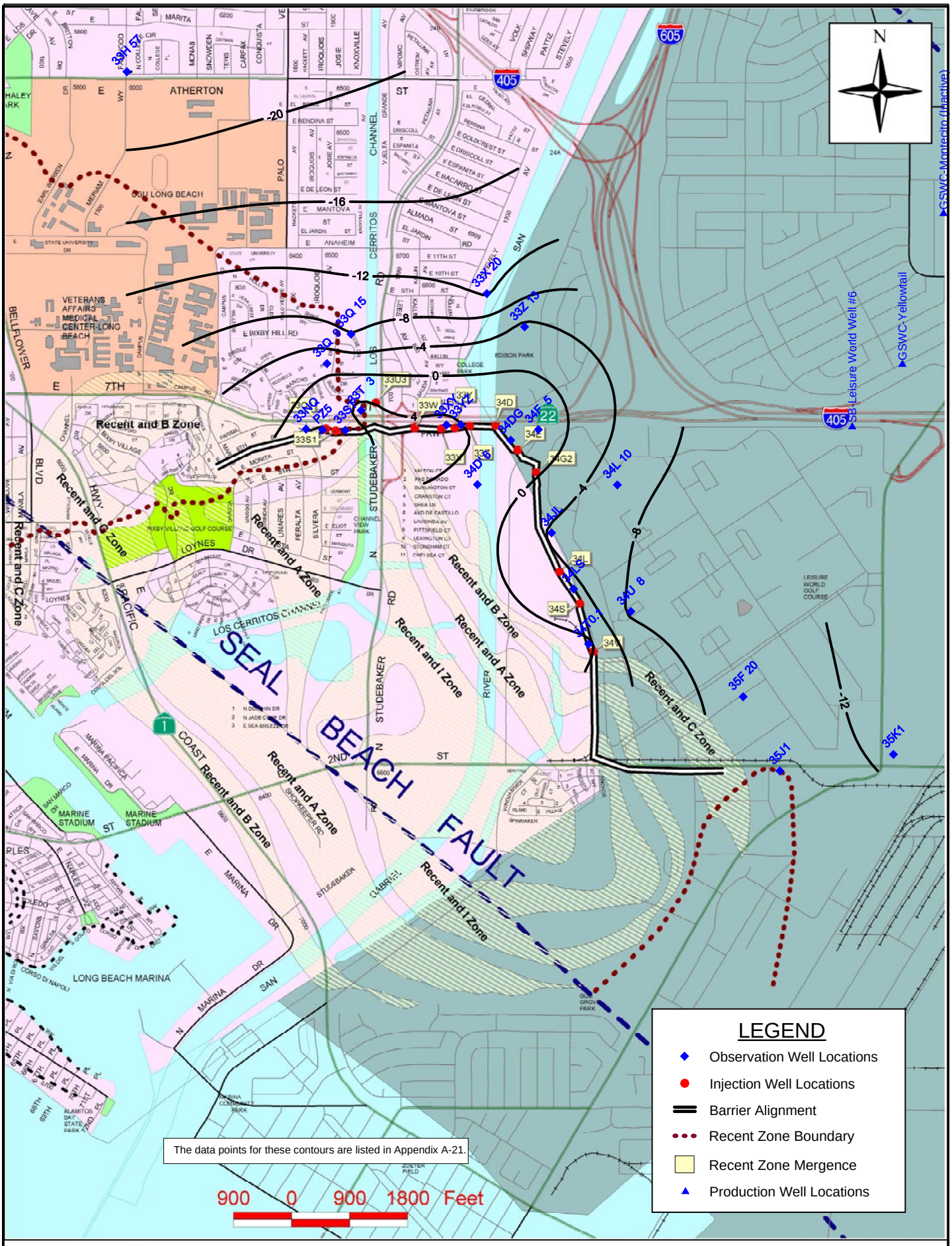
Alamitos Barrier Project
R Zone Groundwater Elevation (ft) Contours - March 2008

R zone GW.srf



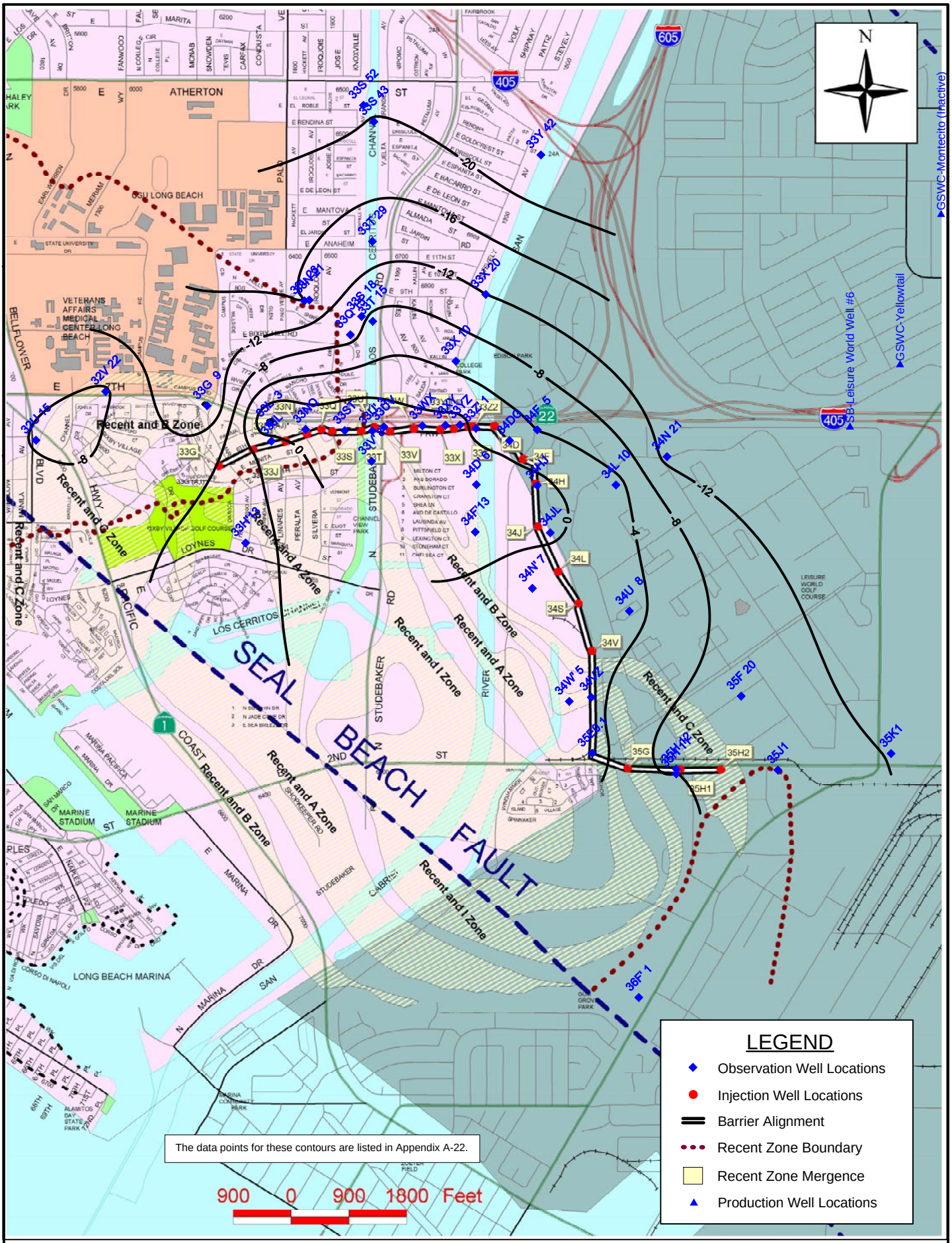
Alamitos Barrier Project
C Zone Groundwater Elevation (ft) Contours - March 2008

C zone GW.srf



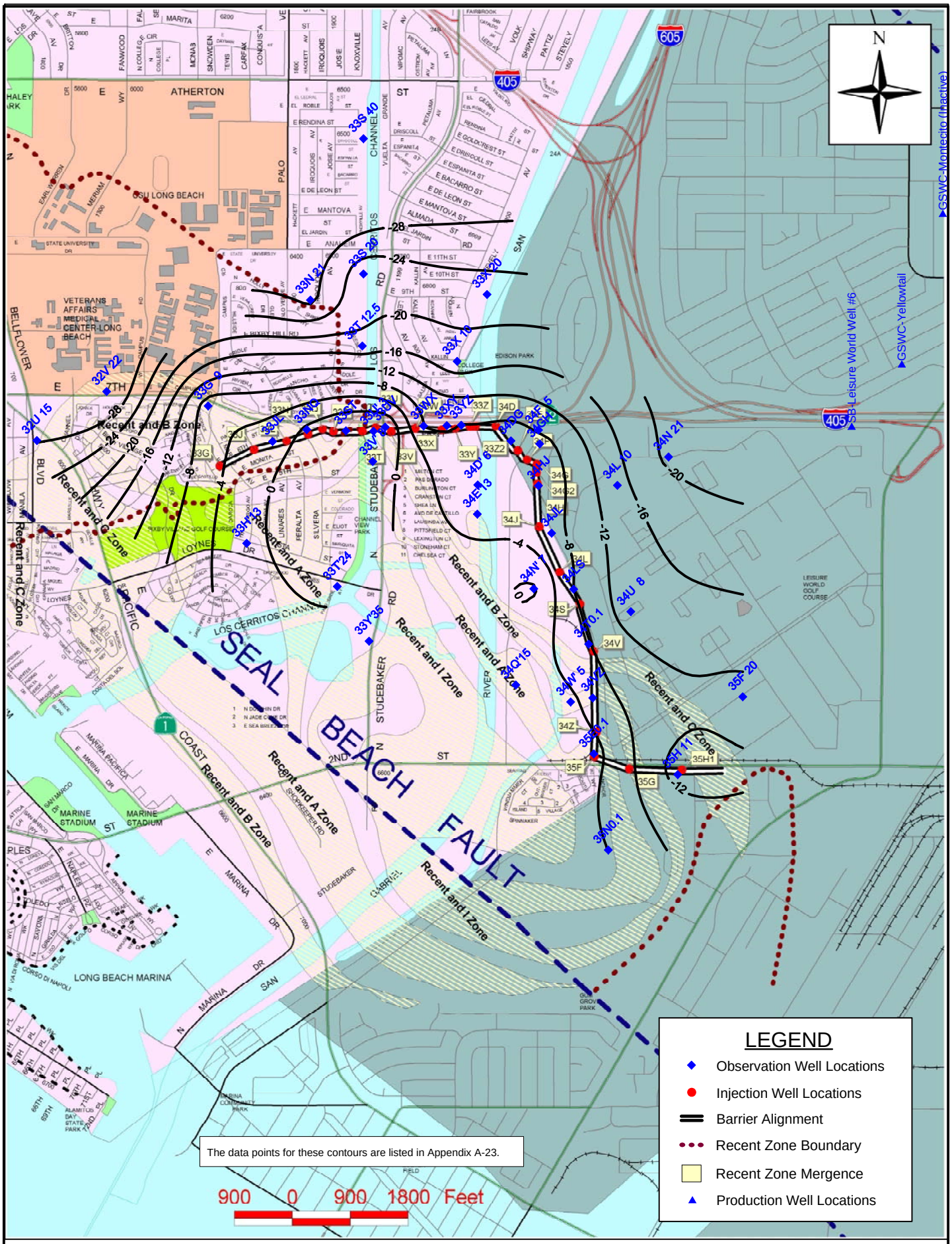
Alamitos Barrier Project
B Zone Groundwater Elevation (ft) Contours - March 2008

B zone GW.sif



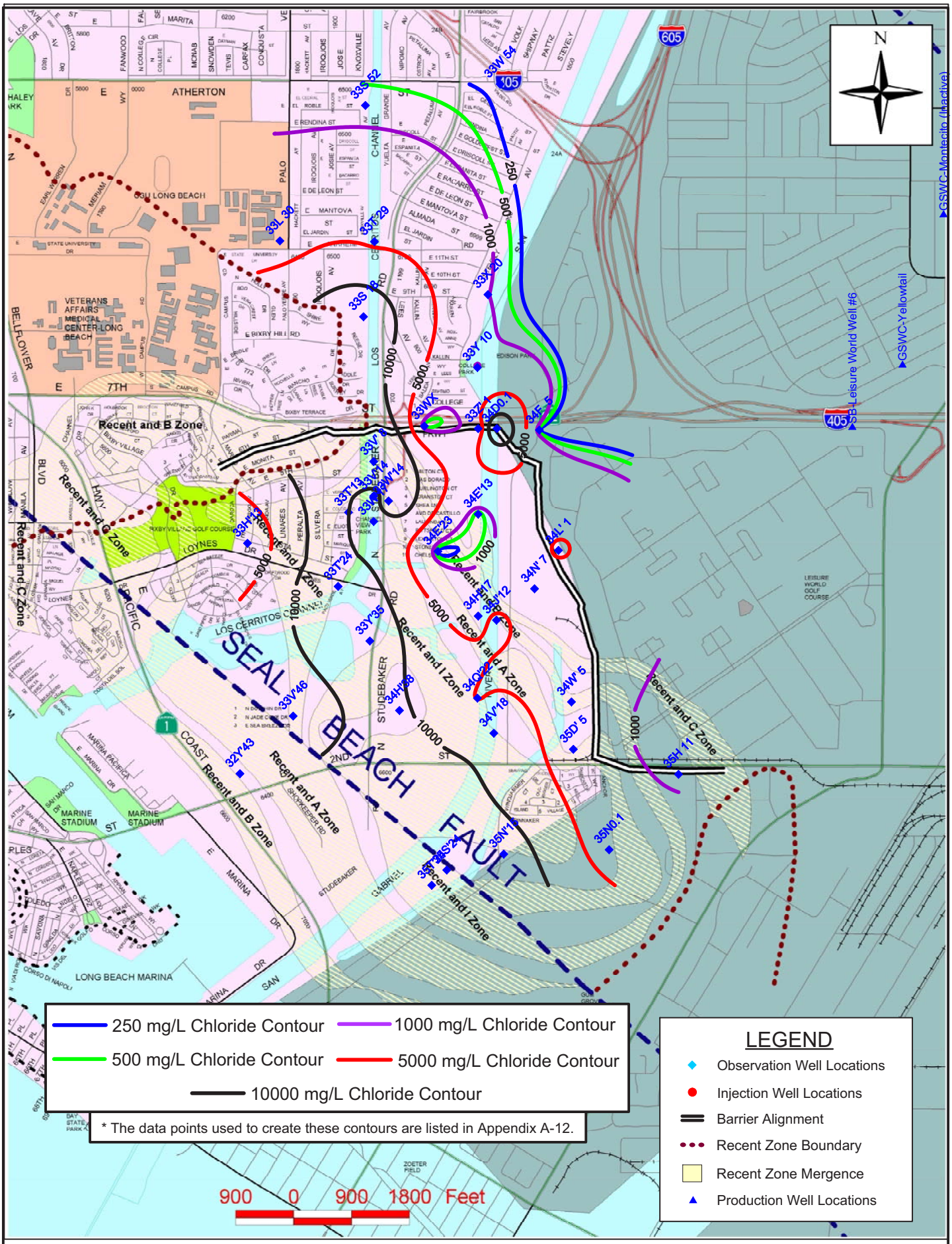
Alamitos Barrier Project
A Zone Groundwater Elevation (ft) Contours - March 2008

A zone GW.srf



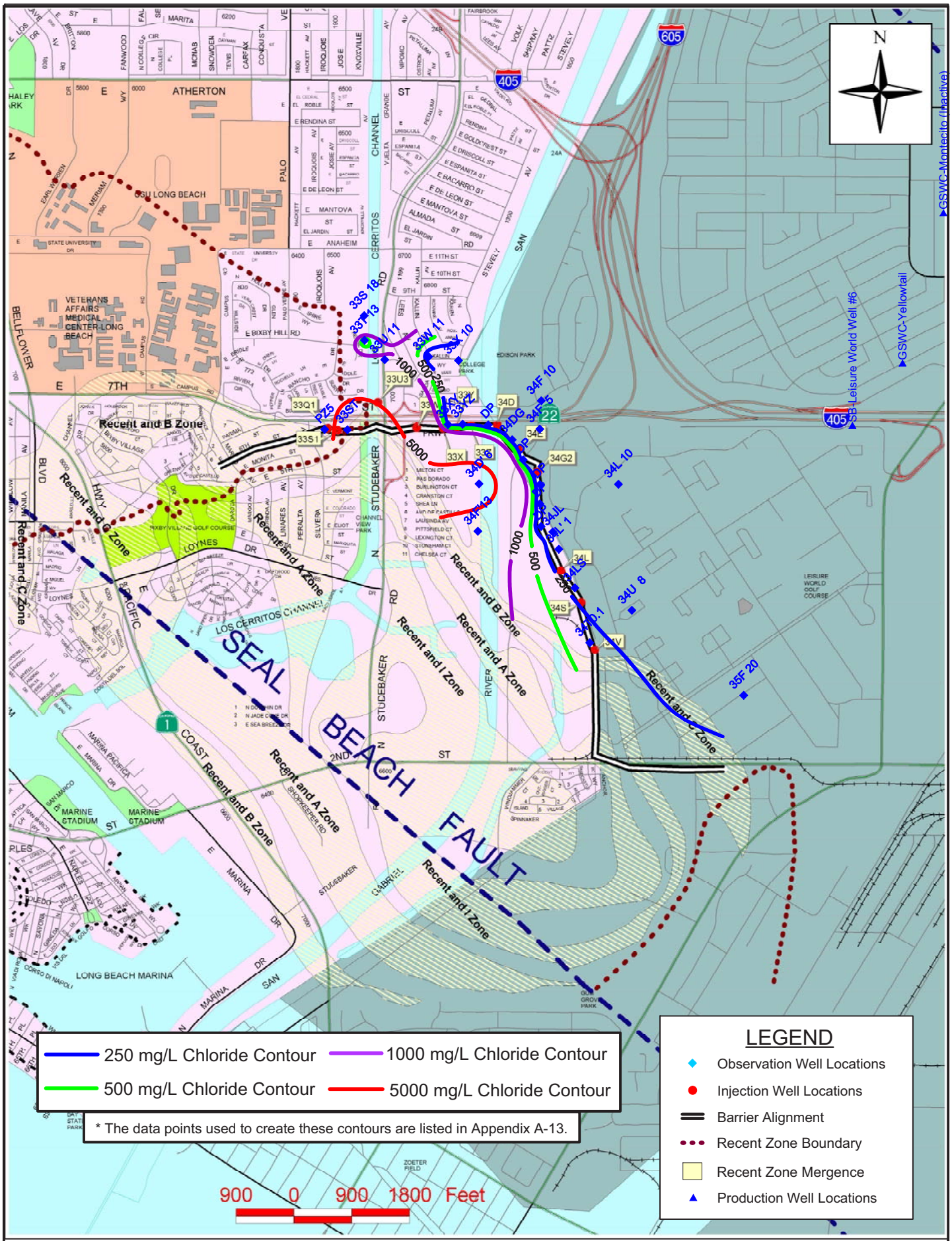
Alamitos Barrier Project
I Zone Groundwater Elevation (ft) Contours - March 2008

I zone GW.srf



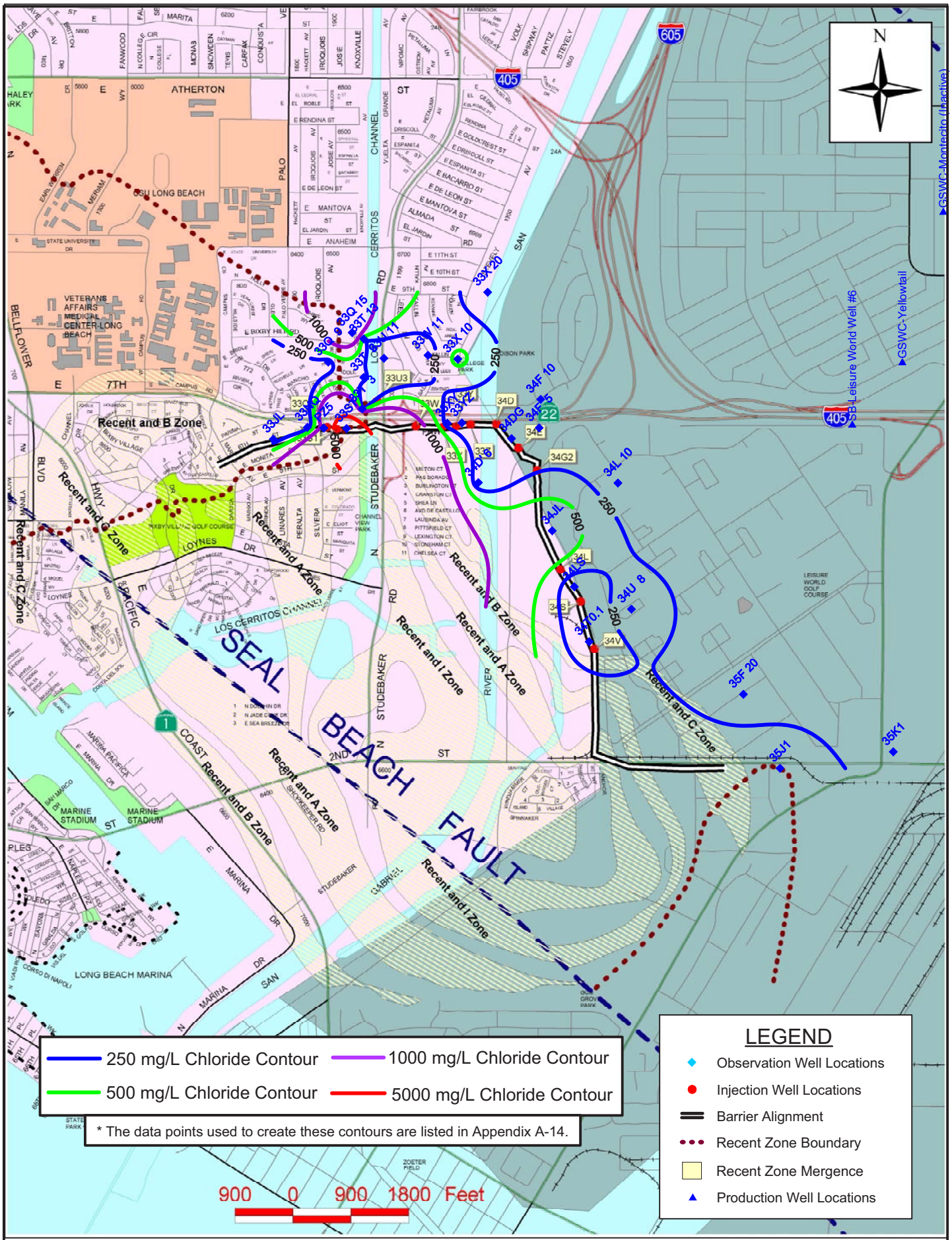
Alamitos Barrier Project
R Zone Chloride Concentration (mg/L) Contours: Spring 2008

R zone CL.sff



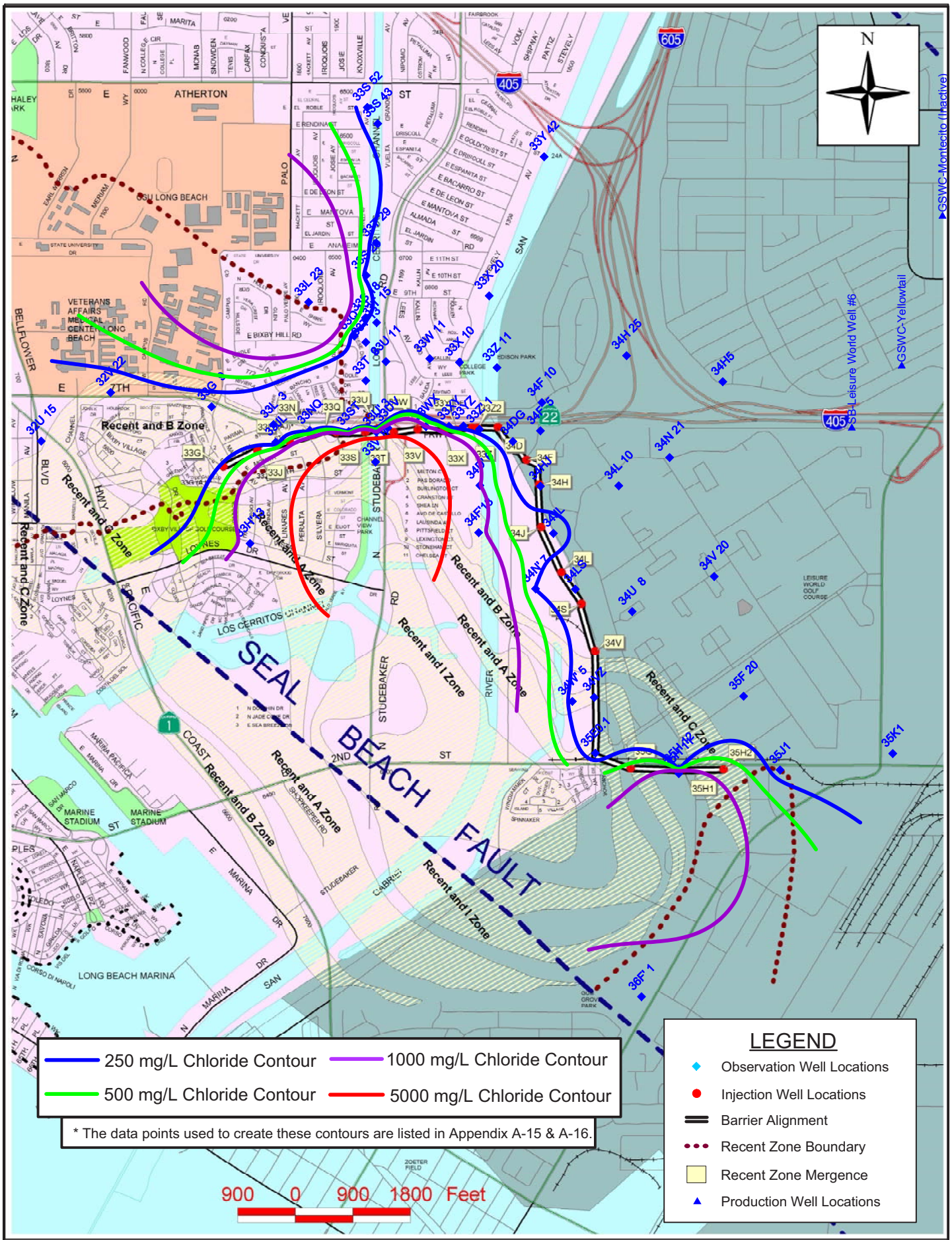
Alamitos Barrier Project
C Zone Chloride Concentration (mg/L) Contours: Spring 2008

C zone CL.srf



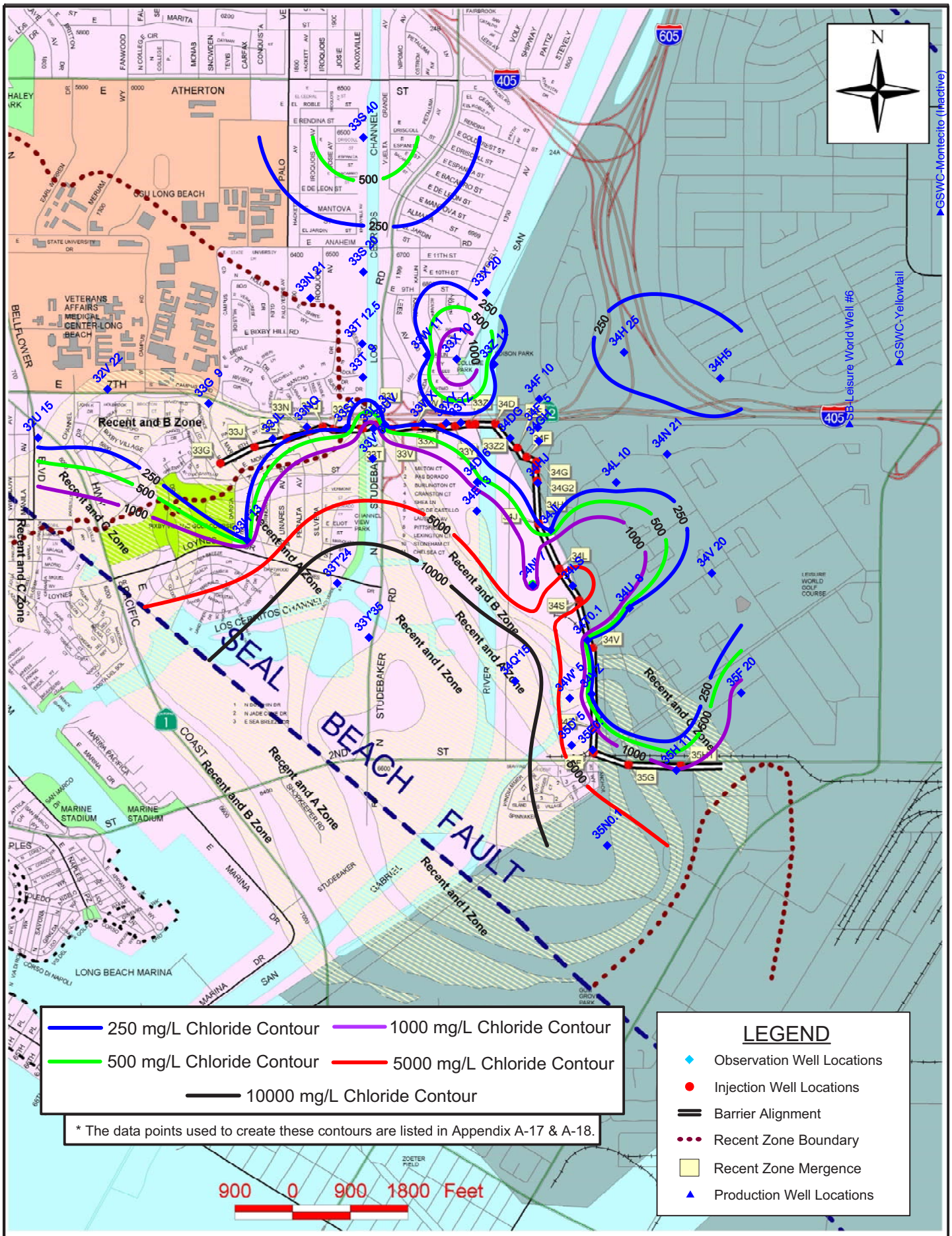
Alamitos Barrier Project
B Zone Chloride Concentration (mg/L) Contours: Spring 2008

B zone CL.srf



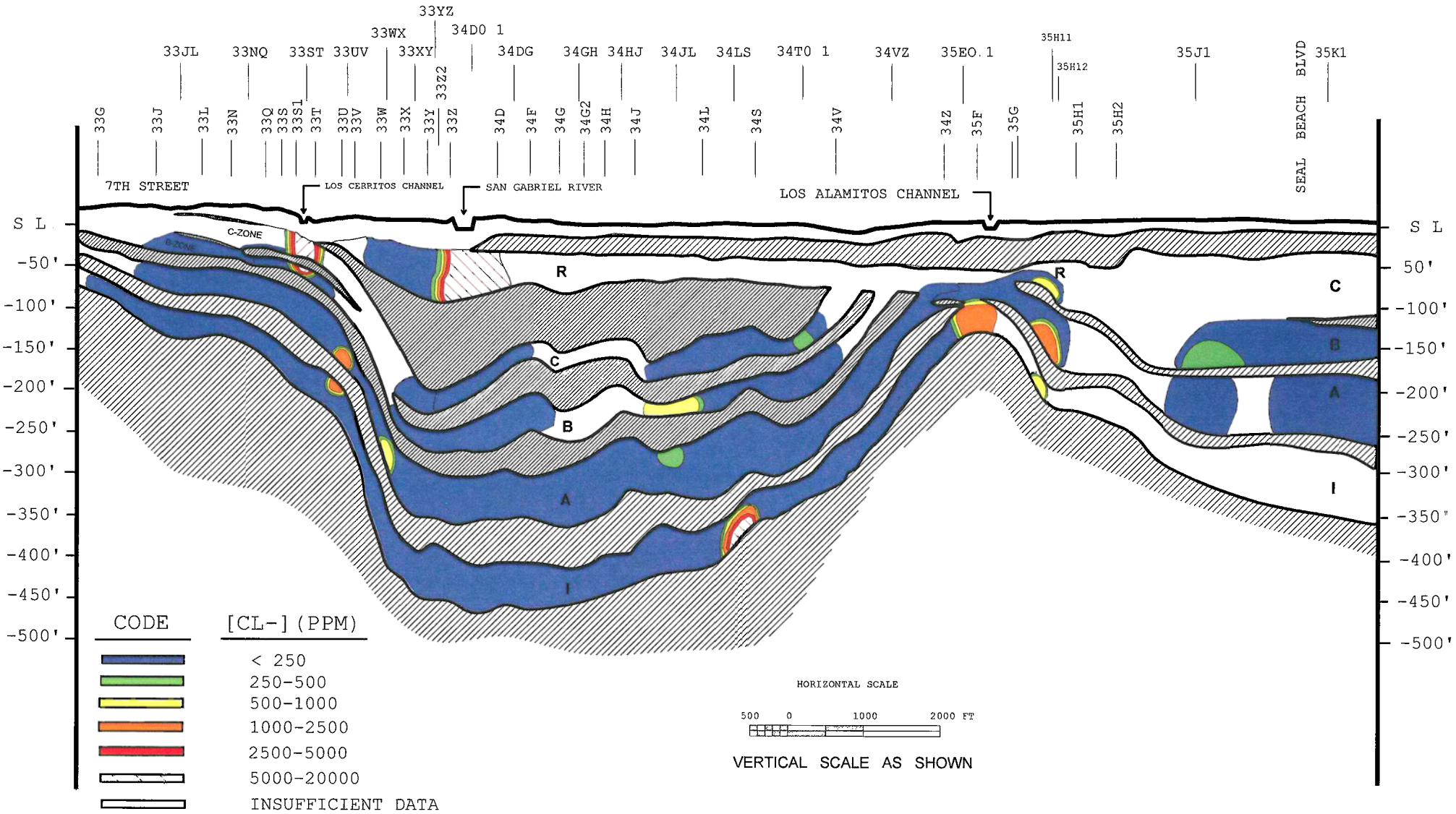
Alamitos Barrier Project
A Zone Chloride Concentration (mg/L) Contours: Spring 2008

A zone CL.srf



Alamitos Barrier Project
I Zone Chloride Concentration (mg/L) Contours: Spring 2008

I zone CL.sf



CHLORIDE SECTION ALONG THE BARRIER

Spring 2008

NOTE: The data points used to create this cross section are listed in the Appendix A-12 through A-18.

ALAMITOS BARRIER PROJECT
RECENT-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	**CHL 1 (mg/L)**	**ELEV 2 (ft)**	**CHL 2 (mg/L)**	**ELEV 3 (ft)**	**CHL 3 (mg/L)**	**MAX CHLORIDE**
1	32Y'43	493WW	20080401	4.10	R	-43	9,600					9,600
2	33H'13	493YY	20080312	9.20	(R,A)	-18	825	-38	925	-58	1,250	1,250
3	33L 30	491G	20080402	10.00	R	-50	2,650					2,650
4	33S 18	492AH	20080324	10.80	R	-67	14,700					14,700
5	33S 52	491J	20080319	12.50	R	-54	725					725
6	33T 29	491D	20080319	10.70	R	-56	4,400					4,400
7	33T'13	492AU	20080313	10.00	R	-41	1,550	-51	10,200			10,200
8	33T'24	493SS	20080312	8.00	R	-29	15,600					15,600
9	33V' 8	492BY	20080317	10.00	(R,A)	-24	21,200	-54	22,200			22,200
10	33V'14	492JJ	20080317	9.60	R	-71	5,900					5,900
11	33V'46	493UU	20080401	5.40	R	-61	6,600					6,600
12	33W 54	501C	20080324	13.50	R	-33	103	-53	145			145
13	33W'14	492AT	20080317	15.70	R	-46	2,650	-66	16,000			16,000
14	33W'17	493PP	20080313	9.30	R	-41	2,475	-51	5,300			5,300
15	**33WX**	**502AZ**	**20080515**	**10.00**	**R**	**-45**	**250**					**250**
16	33X 20	502L	20080522	23.40	R	-62	1,050					1,050
17	33Y 10	502BA	20080327	23.00	R	-58	450	-87	900			900
18	33Y'35	493AB	20080312	12.50	R	-36	13,400					13,400
19	33Z' 1	502AU	20080521	20.90	R	-46	1,450	-56	1,775			1,775
20	**34D0.1**	**502AX**	**20080521**	**21.00**	**R**	**-57**	**16,550**					**16,550**
21	34E'13	503AU	20080325	21.00	R	-19	250	-57	230			250
22	34E'23	503X	20080325	10.10	R	-43	34					34
23	34F 5	502BT	20080522	9.10	R	-136	80	-146	110	-156	110	110
24	34H'17	503Y	20080327	19.60	R	-46	3,250					3,250
25	34H'38	493QQ	20080401	9.40	R	-33	10,550					10,550
26	34J'12	503U	20080326	19.80	R	-28	5,450	-36	6,100			6,100
27	34L' 1	503P	20080528	10.10	R	-62	5,700					5,350
28	34N' 7	503AE	20080331	7.00	R	-51	1,150	-61	1,250	-71	1,400	1,400
29	34Q'22	503T	20080327	18.30	R	-42	140	-57	4,800			4,800
30	34V'18	503V	20080326	18.30	R	-48	9,150					9,150
31	34W' 5	503AH	20080331	13.60	R	-51	2,500					2,500
32	35D' 5	503AL	20080402	13.20	R	-57	2,250					2,250
33	**35H 11**	**514F**	**20080603**	**7.00**	**R**	**-42**	**750**	**-65**	**700**			**750**
34	*35N0.1*	*504M*	*20070306*	*7.30*	*R*	*-38*	*600*	*-68*	*2,750*			*2,750*
35	*35N'15*	*504P*	*20070313*	*7.40*	*R*	*-33*	*1,800*	*-58*	*12,900*			*12,900*
36	*35S'24*	*504K*	*20040127*	*7.30*	*R*	*-55*	*11,650*	*0*		*0*		*11,650*
37	35T'24	504A	20080402	7.9	(R,M)	-67	20,800	-134	20,100	-201	23,100	23,100

Italicized purple wells are old values, but included because they're reasonably recent and their historical values are consistantly in this range

ALAMITOS BARRIER PROJECT
C-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHLORIDE
1	33S 18	492AG	20080324	10.60	C	-225	4,250					4,250
2	**33ST**	**492BK**	**20080514**	**14.90**	**(C,B)**	**-25**	**10,200**					**10,200**
3	33T 13	492AC	20080514	11.40	C	-199	180					180
4	33U 11	492AL	20080520	13.30	C	-186	1,150					1,150
5	33W 11	502R	20080602	8.90	C	-183	110	-216	60			110
6	33X 10	502BB	20080327	10.00	C	-190	110	-215	120			120
7	**33XY**	**502BL**	**20080520**	**10.00**	**C**	**-195**	**150**	**-210**	**150**			**150**
8	**33YZ**	**502AB**	**20080520**	**10.60**	**C**	**-195**	**90**	**-210**	**130**			**130**
9	34D' 6	502BF	20080325	20.30	C	-125	8,300					8,300
10	DP											250
11	**34DG**	**502X**	**20080527**	**8.00**	**C**	**-190**	**100**	**-205**	**110**			**110**
12	DP											250
13	34F 5	502BU	20080522	9.30	C	-191	100	-201	100	-211	100	100
14	34F 10	502AP	20080519	8.8	C	-211	110					110
15	DP											250
16	DP											250
17	34F'13	503R	20080325	21.00	C	-79	2,200					2,200
18	**34JL**	**503AR**	**20080528**	**7.20**	**C**	**-161**	**250**					**250**
19	34L' 1	503N	20080528	10.30	C	-162	80					80
20	34L 10	502AK	20080326	5.60	C	-169	85					85
21	DP											250
22	**34LS**	**503BF**	**20080528**	**7.00**	**C**	**-133**	**190**	**-151**	**80**	**-163**	**160**	**190**
23	**34T0.1**	**503AB**	**20080529**	**6.10**	**C**	**-134**	**325**					**325**
24	34U 8	513D	20080604	5.40	C	-150	140	-165	110			140
25	35F 20	513L	20080604	6.50	C	-70	80	-78	65	-85	80	80
26	PZ5	492CH	20080313	16.3	(C,B)	-25	1,300					1,300

DP = Dummy point with an assumed chloride concentration of 250 mg/L

ALAMITOS BARRIER PROJECT
B-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHLORIDE
1	**33JL**	**492BQ**	**20080519**	**16.00**	**B**	**3**		**-7**	**125**			**125**
2	**33NQ**	**492BN**	**20080513**	**18.40**	**B**	**-4**	**88**	**-15**	**100**			**100**
3	33Q 9	492CM	20080318	35.00	B	-85	108	-95	115	-105	160	160
4	33Q 15	492AN	20080320	10.00	B	-268	2,175					2,175
5	**33ST**	**492BK**	**20080514**	**14.90**	**(C,B)**	**-25**	**10,200**					**10,200**
6	33T 3	492CL	20080317	10.00	B	-40	85	-57	105	-75	100	105
7	33T 9	492YY	20080514	11.20	B	-168	320					320
8	33T 13	492AB	20080514	11.10	B	-267	290					290
9	33U 11	492AK	20080520	12.60	B	-260	85					85
10	33W 11	502S	20080602	8.90	B	-241	130	-271	110			130
11	33X 10	502BC	20080327	10.00	B	-275	600					600
12	33X 20	502K	20080522	23.50	B	-277	80					80
13	**33XY**	**502BM**	**20080520**	**10.00**	**B**	**-245**	**150**					**150**
14	**33YZ**	**502AC**	**20080520**	**10.60**	**B**	**-214**	**140**	**-264**	**130**			**140**
15	34D' 6	502BG	20080325	20.30	B	-180	88	-200	98			98
16	**34DG**	**502Y**	**20080527**	**8.00**	**B**	**-232**	**100**	**-257**	**100**			**100**
17	34F 5	502BS	20080527	9.30	B	-231	110	-271	110			110
18	34F 10	502AQ	20080519	8.80	B	-271	110					110
19	**34JL**	**503AQ**	**20080528**	**7.20**	**B**	**-196**	**900**	**-211**	**825**			**900**
20	34L 10	502AL	20080326	5.60	B	-224	90	-249	85			90
21	**34LS**	**503BE**	**20080528**	**7.00**	**B**	**-188**	**83**					**83**
22	**34T0.1**	**503AC**	**20080529**	**6.10**	**B**	**-174**	**110**	**-207**	**100**	**-239**	**100**	**110**
23	34U 8	513E	20080604	5.40	B	-225	400					400
24	35F 20	513K	20080605	6.50	B	-115	110					110
25	**35J1**	**514M**	**20080603**	**7.42**	**B**	**-128**	**250**	**-143**	**390**	**-148**	**460**	**460**
26	**35K1**	**523A**	**20080605**	**7.96**	**B**	**-127**	**80**	**-142**	**80**	**-157**	**90**	**90**
27	PZ5	492CH	20080313	16.30	(C,B)	-25	1,300					1,300

ALAMITOS BARRIER PROJECT
A-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	**CHL 1 (mg/L)**	**ELEV 2 (ft)**	**CHL 2 (mg/L)**	**ELEV 3 (ft)**	**CHL 3 (mg/L)**	**MAX CHLORIDE**
1	32U 15	482M	20080312	51.00	A	-17	88					88
2	32V 22	482P	20080312	73.70	A	-11	95					95
3	33G 9	482F	20080311	57.20	A			-23	85			85
4	33H'13	493YY	20080312	9.20	(R,A)	-18	825	-38	925	-58	1,250	1,250
5	**33JL**	**492BW**	**20080519**	**16.00**	**(A,I)**	**-41**	**85**	**-79**	**88**	**-116**	**93**	**93**
6	33L 3	492	20080320	25.20	A	-60	80					80
7	33L 23	492RR	20080318	9.40	A	-344	3,950					3,950
8	**33NQ**	**492BP**	**20080513**	**18.40**	**(A,I)**	**-49**	**108**	**-93**	**128**	**-137**	**135**	**135**
9	33Q 15	492AM	20080320	10.90	A	-340	113					113
10	33S 18	492AE	20080324	11.10	A	-351	280					280
11	33S 20	492BR	20080324	8.90	A	-317	145	-336	93	-355	120	145
12	33S 43	491E	20080319	13.00	A	-333	145	-344	105			145
13	33S 52	491H	20080319	12.50	A	-284	165	-309	170			170
14	**33ST**	**492BL**	**20080513**	**14.90**	**A**	**-65**	**93**	**-86**	**85**	**-100**	**85**	**93**
15	33T 9	492TT	20080514	10.50	A	-262	108					108
16	33T 13	492ZZ	20071205	10.60	A	-330	160					160
17	33T 15	492SS	20080320	11.20	A	-334	190					190
18	33T 29	491C	20080319	12.20	A	-350	100					100
19	33U 11	492AJ	20080520	13.60	A	-348	95					95
20	33U' 3	492WW	20080317	10.90	A	-89	800					800
21	**33UV**	**492BH**	**20080602**	**10.80**	**A**	**-106**	**900**	**-131**	**1,550**	**-155**	**1,100**	**1,550**
22	33V' 8	492BY	20080317	10.00	(R,A)	-24	21,200	-54	22,200			22,200
23	33W 11	502T	20080515	8.90	A	-321	70	-349	90	-376	120	120
24	**33WX**	**502AF**	**20080515**	**10.40**	**A**	**-258**	**470**	**-281**	**950**	**-303**	**950**	**950**
25	33X 10	502BD	20080327	10.00	A	-320	260	-340	190	-360	230	260
26	33X 20	502J	20080522	23.20	A	-359	60					60
27	**33XY**	**502BN**	**20080520**	**10.00**	**A**	**-279**	**120**	**-296**	**130**	**-314**	**120**	**130**
28	33Y 42	501A	20080324	24.90	A	-342	84					84
29	**33YZ**	**502AD**	**20080520**	**10.60**	**A**	**-296**	**100**	**-318**	**110**			**110**
30	33Z' 1	502G	20080521	20.00	A	-320	130					130
31	33Z 11	502V	20080521	23.10	A	-321	70	-351	73			73
32	34D' 6	502BH	20080325	20.30	A	-270	190	-303	1,025	-335	950	1,025
33	**34DG**	**502Z**	**20080527**	**8.00**	**A**	**-292**	**150**	**-327**	**120**			**150**
34	34F 5	502BR	20080522	9.50	A	-297	100	-322	110	-347	150	150
35	34F 10	502AR	20080519	8.80	A	-311	80	-326	80			80
36	34F'13	503Q	20080325	21.20	A	-177	1,250					1,250
37	34H 25	502AH	20080521	8.20	A	-297	125	-312	120	-332	120	125
38	34H5	512E	20080527	7.21	A	-298	130	-313	150	-328	100	150
39	**34HJ**	**502BX**	**20080529**	**9.40**	**A**	**-301**	**210**	**-321**	**75**	**-331**	**165**	**210**
40	**34JL**	**503AP**	**20080528**	**7.20**	**A**	**-263**	**350**	**-288**	**375**	**-308**	**120**	**375**

ALAMITOS BARRIER PROJECT
A-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	**CHL 1 (mg/L)**	**ELEV 2 (ft)**	**CHL 2 (mg/L)**	**ELEV 3 (ft)**	**CHL 3 (mg/L)**	**MAX CHLORIDE**
41	34L 10	502AM	20080326	5.60	A	-310	60	-330	60	-354	65	65
42	**34LS**	**503BD**	**20080528**	**7.00**	**A**	**-238**	**140**	**-283**	**130**			**140**
43	34N 21	512B	20080326	6.80	A	-328	90	-354	95			95
44	34N' 7	503AF	20080331	7.00	A	-106	160	-144	240	-181	210	240
45	34U 8	513F	20080604	5.40	A	-280	140	-310	120			140
46	34V 20	513B	20080604	6.30	A	-234	110	-265	120	-292	100	120
47	**34VZ**	**503BH**	**20080602**	**6.20**	**A**	**-146**	**55**	**-156**	**60**			**60**
48	34W' 5	503AJ	20080331	13.60	A	-81	140	-101	200	-119	110	200
49	**35E0.1**	**503BK**	**20080602**	**6.50**	**A**	**-74**	**120**					**120**
50	35F 20	513J	20080604	6.50	A	-129		-158	130			130
51	**35H 11**	**514G**	**20080603**	**7.00**	**A**	**-123**	**450**	**-146**	**2,200**			**2,200**
52	**35H 12**	**514D**	**20080603**	**6.50**	**A**	**-137**	**80**					**80**
53	**35J1**	**514L**	**20080603**	**7.42**	**A**	**-193**	**80**	**-208**	**90**	**-228**	**130**	**130**
54	**35K1**	**523B**	**20080605**	**7.96**	**A**	**-197**	**23**	**-212**	**20**	**-227**	**22**	**23**
55	36F' 1	505D	20080331	35.65	A	-103	750					750

ALAMITOS BARRIER PROJECT
I-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHLORIDE
1	32U 15	482L	20080312	51.00	I	-74	90					90
2	32V 22	482N	20080312	73.70	I	-51	100					100
3	33G 9	482G	20080311	57.20	I	-34	90	-68	83	-78	63	90
4	33H'13	493XX	20080312	9.20	I	-89	220					220
5	**33JL**	**492BW**	**20080519**	**16.00**	**(A,I)**	**-41**	**85**	**-79**	**88**	**-116**	**93**	**93**
6	33N 21	492BV	20080318	9.00	I	-457	75	-471	78			78
7	**33NQ**	**492BP**	**20080513**	**18.40**	**(A,I)**	**-49**	**108**	**-93**	**128**	**-137**	**135**	**135**
8	33S 20	492BS	20080324	8.90	I	-472	40					40
9	33S 40	491F	20080319	11.80	I	-470	800					800
10	**33ST**	**492BM**	**20080514**	**14.90**	**I**	**-130**	**123**	**-148**	**103**	**-165**	**155**	**155**
11	33T 9	492XX	20080514	10.50	I	-364	190					190
12	33T 12.5	492BT	20080320	9.50	I	-423	130	-438	120	-452	130	130
13	33T'24	493RR	20080312	8.10	I	-60	15,800	-75				15,800
14	33U' 3	492QQ	20080317	9.80	I	-147	1,600					1,600
15	**33UV**	**492BJ**	**20080602**	**10.80**	**I**	**-209**	**70**	**-228**	**65**	**-246**	**65**	**70**
16	33V' 8	492BX	20080317	10.00	I	-109	1,700	-139	1,550			1,700
17	33W 11	502U	20080515	8.90	I	-423	90	-446	70	-468	90	90
18	**33WX**	**502AG**	**20080514**	**10.40**	**I**	**-374**	**200**	**-391**	**225**	**-408**	**225**	**225**
19	33X 10	502BE	20080327	10.00	I	-420	1,550	-440	2,450	-460	1,700	2,450
20	33X 20	502H	20080521	23.10	I	-465	65					65
21	**33XY**	**502BP**	**20080520**	**10.00**	**I**	**-404**	**140**	**-420**	**130**	**-422**	**150**	**150**
22	33Y'35	493ZZ	20080312	12.50	I	-67	20,800					20,800
23	**33YZ**	**502AE**	**20080520**	**10.60**	**I**	**-402**	**150**	**-435**	**130**			**150**
24	33Z 11	502W	20080521	23.10	I	-417	83	-437	75	-457	68	83
25	34D' 6	502BI	20080325	20.30	I	-400	613	-410	400	-420	463	613
26	**34DG**	**502AA**	**20080527**	**8.00**	**I**	**-402**	**140**	**-432**	**150**			**150**
27	34E'13	503AT	20080325	21.00	I	-289	2,050	-309	2,150			2,150
28	34F 5	502BQ	20080522	9.20	I	-411	90	-426	100	-441	90	100
29	34F 10	502AS	20080519	8.80	I	-416	60	-446	70			70
30	**34GH**	**502BV**	**20080527**	**8.30**	**I**	**-412**	**130**	**-427**	**150**	**-435**	**100**	**150**
31	34H 25	502AJ	20080521	8.30	I	-407	450	-427	300	-445		450
32	34H5	512D	20080527	7.21	I	-408	350	-423	360	-443	380	380
33	**34HJ**	**502BW**	**20080529**	**9.50**	**I**	**-407**	**60**	**-417**	**60**	**-427**	**100**	**100**
34	**34JL**	**503AN**	**20080528**	**7.20**	**I**	**-383**	**140**	**-402**	**225**			**225**
35	34L 10	502AN	20080326	5.60	I	-404	70	-439	75			75
36	**34LS**	**503BC**	**20080528**	**6.80**	**I**	**-338**	**510**	**-368**	**8,300**			**8,300**
37	34N 21	512C	20080326	6.80	I	-423	90	-453	145			145

ALAMITOS BARRIER PROJECT
I-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	DATE	REF PT EL.	AQUIFER	For Cross-Section **(Internodal Wells in Bold)**						For Contours
						ELEV 1 (ft)	**CHL 1 (mg/L)**	**ELEV 2 (ft)**	**CHL 2 (mg/L)**	**ELEV 3 (ft)**	**CHL 3 (mg/L)**	**MAX CHLORIDE**
38	34N' 7	503AG	20080331	7.00	I	-221	100	-254	120	-286	170	170
39	34Q'15	503H	20080331	8.30	I	-108	18,000					18,000
40	**34T0.1**	**503AD**	**20080529**	**6.10**	**I**	**-289**	**130**	**-312**	**130**	**-334**	**120**	**130**
41	34U 8	513G	20080604	5.40	I	-360	130	-375	115			130
42	34V 20	513C	20080604	6.30	I	-386	30					30
43	**34VZ**	**503BG**	**20080602**	**6.20**	**I**	**-214**	**200**	**-224**	**110**			**200**
44	34W' 5	503AK	20080331	13.60	I	-156	2,100					2,100
45	35D' 5	503AM	20080402	13.20	I	-89	3,550					3,550
46	**35E0.1**	**503BJ**	**20080602**	**6.50**	**I**	**-114**	**2,050**					**2,050**
47	35F 20	513H	20080604	6.50	I	-235	850	-245	1,300	-255	1,150	1,300
48	**35H 11**	**514H**	**20080603**	**7.00**	**I**	**-203**	**800**					**800**
49	*35N0.1*	*504N*	*20070306*	*7.3*	*I*	*-76*	*7,750*					*7,750*

Italicized purple wells are old values, but included because they're reasonably recent and their historical values are consistantly in this range

ALAMITOS BARRIER PROJECT
R-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	DATE	AQUIFER	ELEV	P.E.[1]	Δ[2]	
1	33H'13	493YY	20080312	R,A	-5.9			
2	33S 18	492AH	20080324	R	0.5			
3	33S 52	491J	20080319	R	-2.3			
4	33T 29	491D	20080319	R	-0.9			
5	33T'24	493SS	20080312	R	-1.9			
6	33V' 8	492BY	20080317	R,A	2.1			
7	33V'14	492JJ	20080317	R	-0.5			
8	33W 54	501C	20080324	R	-0.9			
9	33W'14	492AT	20080317	R	3.0			MAX
10	33W'17	493PP	20080313	R	-0.8			
11	33WX	502AZ	20080311	R	-2.1	2.0	-4.1	
12	33X 20	502L	20080311	R	-1.2			
13	33Y 10	502BA	20080327	R	3.0			MAX
14	33Y'35	493AB	20080312	R	-2.1			
15	33Z' 1	502AU	20080311	R	-1.6			
16	34E'13	503AU	20080311	R	1.3			
17	34E'23	503X	20080325	R	-5.0			
18	34F 5	502BT	20080313	R	-3.7			
19	34H'17	503Y	20080311	R	-1.3			
20	34J'12	503U	20080326	R	-1.9			
21	34L' 1	503P	20080312	R	-2.6			
22	34N' 7	503AE	20080326	R	-2.8			
23	34N'16	503W	20080325	R	-2.2			
24	34Q'22	503T	20080311	R	-2.2			
25	34V'18	503V	20080326	R	-3.5			
26	34W' 5	503AH	20080331	R	-3.7			
27	35H 11	514F	20080311	R	-10.2	2.0	-12.2	MIN
28	35S'24	504K	20080313	R	1.2			
				AVG=	-1.7			

[1] P.E. represents the protective elevations calcuated for internodal wells.

[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
C-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	DATE	AQUIFER	ELEV	P.E.[1]	Δ[2]	
1	33S 18	492AG	20080324	C	-5.8			
2	33ST	492BK	20080311	C,B	1.9	0.9	1.0	
3	33X 10	502BB	20080311	C	-1.8			
4	33XY	502BL	20080311	C	5.0	5.4	-0.4	
5	33YZ	502AB	20080311	C	5.3	5.4	-0.1	MAX
6	34D' 6	502BF	20080311	C	-2.6			
7	34DG	502X	20080313	C	3.1	5.4	-2.3	
8	34F 5	502BU	20080313	C	0.7			
9	34F'13	503R	20080325	C	1.9			
10	34JL	503AR	20080312	C	-5.0	4.2	-9.2	
11	34L' 1	503N	20080312	C	-4.1			
12	34L 10	502AK	20080311	C	-7.0			
13	34LS	503BF	20080312	C	-4.4	4.5	-8.9	
14	34T0.1	503AB	20080312	C	-3.5	3.6	-7.1	
15	34U 8	513D	20080311	C	-7.8			MIN
16	35F 20	513L	20080311	C	-5.6			
17	PZ5	492CH	20080313	C,B	3.1			
				AVG=	-1.6			

[1] P.E. represents the protective elevations calcuated for internodal wells.

[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
B-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	DATE	AQUIFER	G.W. ELEV	P.E.[1]	Δ[2]	
1	33H 57	481	20080324	B	-24.1			MIN
2	33NQ	492BN	20080311	B	1.2	0.7	0.5	
3	33Q 9	492CM	20080311	B	-1.1			
4	33Q 15	492AN	20080320	B	-8.1			
5	33ST	492BK	20080311	C,B	1.9	0.9	1.0	
6	33T 3	492CL	20080311	B	5.2			MAX
7	33X 20	502K	20080311	B	-12.5			
8	33XY	502BM	20080311	B	4.8	6.3	-1.5	
9	33YZ	502AC	20080311	B	4.0	7.1	-3.1	
10	33Z 13	502E	20080325	B	-3.0			
11	34D' 6	502BG	20080311	B	2.5			
12	34DG	502Y	20080313	B	3.2	6.6	-3.4	
13	34F 5	502BS	20080313	B	3.2			
14	34JL	503AQ	20080312	B	-4.6	5.3	-9.9	
15	34L 10	502AL	20080311	B	-6.4			
16	34LS	503BE	20080312	B	-3.1	5.4	-8.5	
17	34T0.1	503AC	20080326	B	0.8	6.1	-5.3	
18	34U 8	513E	20080311	B	-8.8			
19	35F 20	513K	20080311	B	-9.7			
20	35J1	514M	20080311	B	-10.8	5.8	-16.6	
21	35K1	523A	20080311	B	-12.3	5.8	-18.1	
22	PZ5	492CH	20080313	C,B	3.1			
				AVG=	-3.4			

[1] P.E. represents the protective elevations calcuated for internodal wells.

[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
A-Zone
Groundwater Elevation Data for Contours and Tables

PROJ	FCD	DATE	AQUIFER	G.W. ELEV	P.E.[1]	Δ[2]	
32L' 8	472A	20080324	A ZONE	-15.4			
32U 15	482M	20080312	A ZONE	-7.0			
32V 22	482P	20080312	A ZONE	-7.6			
33G 9	482F	20080311	A ZONE	-16.3			
33H'13	493YY	20080312	(R,A)	-5.9			
33JL	492BW	20080311	(A,I)	-2.2	3.1	-5.3	
33L 3	492	20080320	A ZONE	5.1			MAX
33L 23	492RR	20080318	A ZONE	-16.2			
33N 21	492BU	20080318	A ZONE	-13.8			
33NQ	492BP	20080311	(A,I)	0.7	3.6	-2.9	
33Q 15	492AM	20080320	A ZONE	-9.4			
33S 18	492AE	20080324	A ZONE	-9.3			
33S 43	491E	20080319	A ZONE	-18.8			
33S 52	491H	20080319	A ZONE	-23.8			
33ST	492BL	20080311	A ZONE	2.6	2.8	-0.2	
33T 15	492SS	20080320	A ZONE	-6.3			
33T 29	491C	20080319	A ZONE	-13.6			
33U' 3	492WW	20080317	A ZONE	3.8			
33U170	1008L	20080325	A ZONE	-73.8			MIN
33UV	492BH	20080311	A ZONE	1.8	4.0	-2.2	
33V' 8	492BY	20080317	(R,A)	2.1			
33W110	1009K	20080325	A ZONE	-48.2			
33WX	502AF	20080311	A ZONE	0.9	7.6	-6.7	
33X 10	502BD	20080311	A ZONE	-5.2			
33X 20	502J	20080311	A ZONE	-12.0			
33XY	502BN	20080311	A ZONE	0.8	8.0	-7.2	
33Y 42	501A	20080324	A ZONE	-23.8			
33YZ	502AD	20080311	A ZONE	1.3	8.7	-7.4	
33Z' 1	502G	20080311	A ZONE	-1.1			
34D' 6	502BH	20080325	A ZONE	1.1			
34DG	502Z	20080313	A ZONE	-0.9	8.5	-9.4	
34F 5	502BR	20080313	A ZONE	-4.1			
34F'13	503Q	20080311	A ZONE	1.4			
34HJ	502BX	20080313	A ZONE	0.9	8.6	-7.7	
34JL	503AP	20080312	A ZONE	0.5	7.8	-7.3	
34L 10	502AM	20080311	A ZONE	-2.5			
34N 21	512B	20080326	A ZONE	-13.1			
34N' 7	503AF	20080326	A ZONE	-2.5			
34U 8	513F	20080311	A ZONE	-2.8			
34VZ	503BH	20080313	A ZONE	-3.4	4.4	-7.8	
34W' 5	503AJ	20080331	A ZONE	-3.4			
35E0.1	503BK	20080313	A ZONE	-2.7	2.4	-5.1	
35F 20	513J	20080311	A ZONE	-10.0			
35H 11	514G	20080311	A ZONE	-7.2	3.8	-11.0	
35H 12	514D	20080311	A ZONE	-11.2	3.8	-15.0	
35J1	514L	20080311	A ZONE	-10.6	6.2	-16.8	
35K1	523B	20080311	A ZONE	-12.1	5.8	-17.9	
36F' 1	505D	20080331	A ZONE	-8.4			
			AVG=	-8.4			

[1] P.E. represents the protective elevations calcuated for internodal wells.

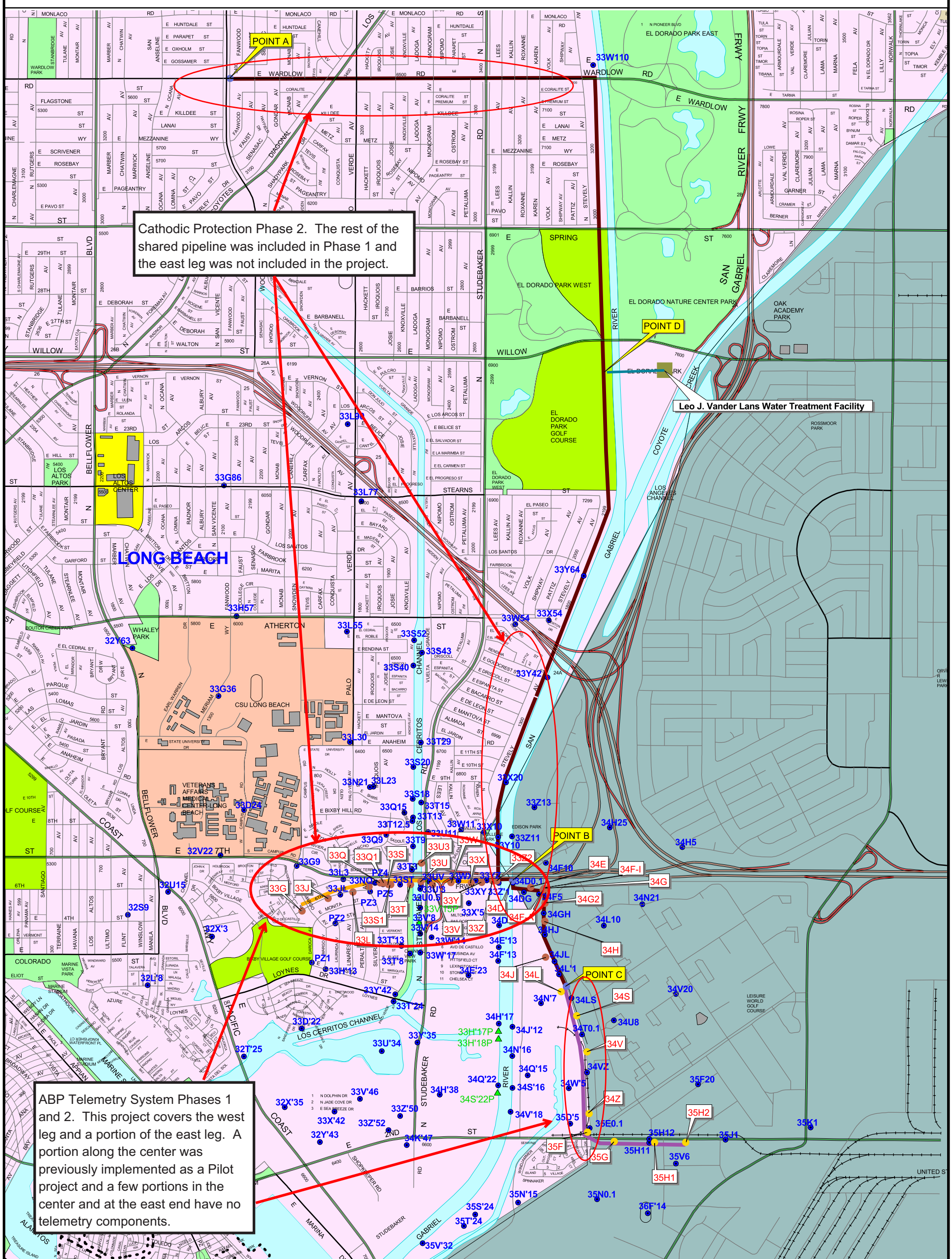
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
I-Zone
Groundwater Elevation Data for Contours and Tables

PROJ	FCD	DATE	AQUIFER	G.W. ELEV	P.E.[1]	Δ[2]	
32U 15	482L	20080312	I	-28.2			
32V 22	482N	20080312	I	-33.9			
33G 9	482G	20080311	I	-5.7			
33H'13	493XX	20080312	I	-1.1			
33JL	492BW	20080311	A,I	-2.2	3.1	-5.3	
33N 21	492BV	20080318	I	-29.0			
33NQ	492BP	20080311	A,I	0.7	3.6	-2.9	
33S 20	492BS	20080324	I	-21.2			
33S 40	491F	20080319	I	-39.9			MIN
33ST	492BM	20080311	I	3.8	4.2	-0.4	
33T 12.5	492BT	20080320	I	-18.2			
33T'24	493RR	20080312	I	1.0			
33U' 3	492QQ	20080317	I	3.2			
33UV	492BJ	20080311	I	4.1	6.1	-2.0	MAX
33V' 8	492BX	20080317	I	2.2			
33WX	502AG	20080311	I	-8.2	10.4	-18.6	
33X 10	502BE	20080311	I	-18.2			
33X 20	502H	20080311	I	-22.1			
33XY	502BP	20080311	I	-8.7	11.0	-19.7	
33Y'35	493ZZ	20080312	I	-2.1			
33YZ	502AE	20080311	I	-7.8	11.1	-18.9	
34D' 6	502BI	20080311	I	-7.5			
34DG	502AA	20080313	I	-4.7	11.1	-15.8	
34E'13	503AT	20080311	I	-6.6			
34F 5	502BQ	20080313	I	-8.7			
34GH	502BV	20080313	I	-5.9	11.3	-17.2	
34HJ	502BW	20080313	I	-4.9	11.0	-15.9	
34JL	503AN	20080312	I	-6.8	10.5	-17.3	
34L 10	502AN	20080311	I	-14.7			
34LS	503BC	20080312	I	-8.2	9.5	-17.7	
34N 21	512C	20080326	I	-20.8			
34N' 7	503AG	20080326	I	0.7			
34Q'15	503H	20080331	I	-2.5			
34T0.1	503AD	20080312	I	-7.8	8.4	-16.2	
34U 8	513G	20080311	I	-13.8			
34VZ	503BG	20080313	I	-6.1	5.9	-12.0	
34W' 5	503AK	20080331	I	-2.9			
35E0.1	503BJ	20080313	I	-2.7	3.0	-5.7	
35F 20	513H	20080311	I	-10.6			
35H 11	514H	20080311	I	-13.6	5.5	-19.1	
35N0.1	504N	20070326	I	-4.0			
			AVG=	-9.4			

[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
Overview Map



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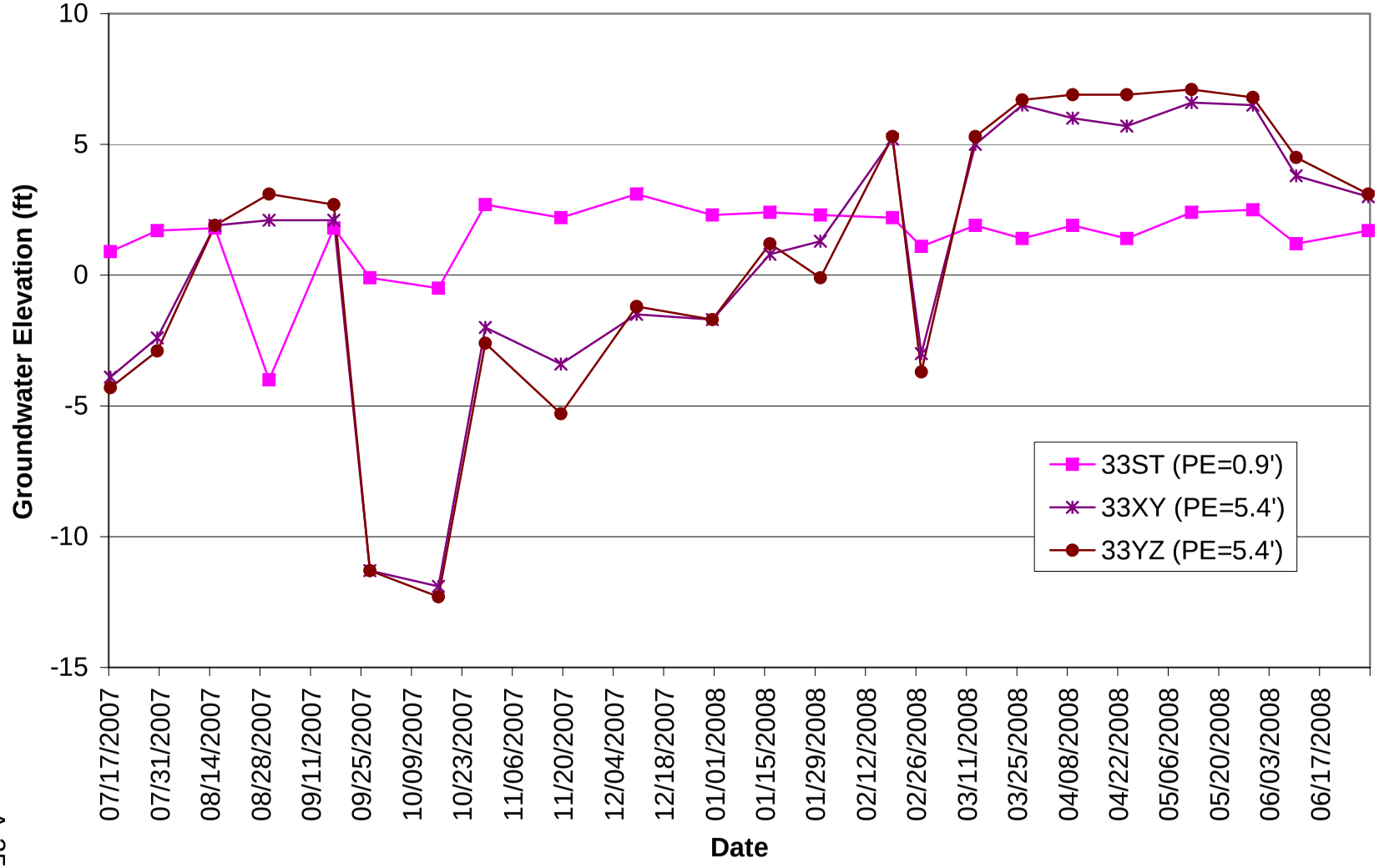
900 0 900 1800 Feet

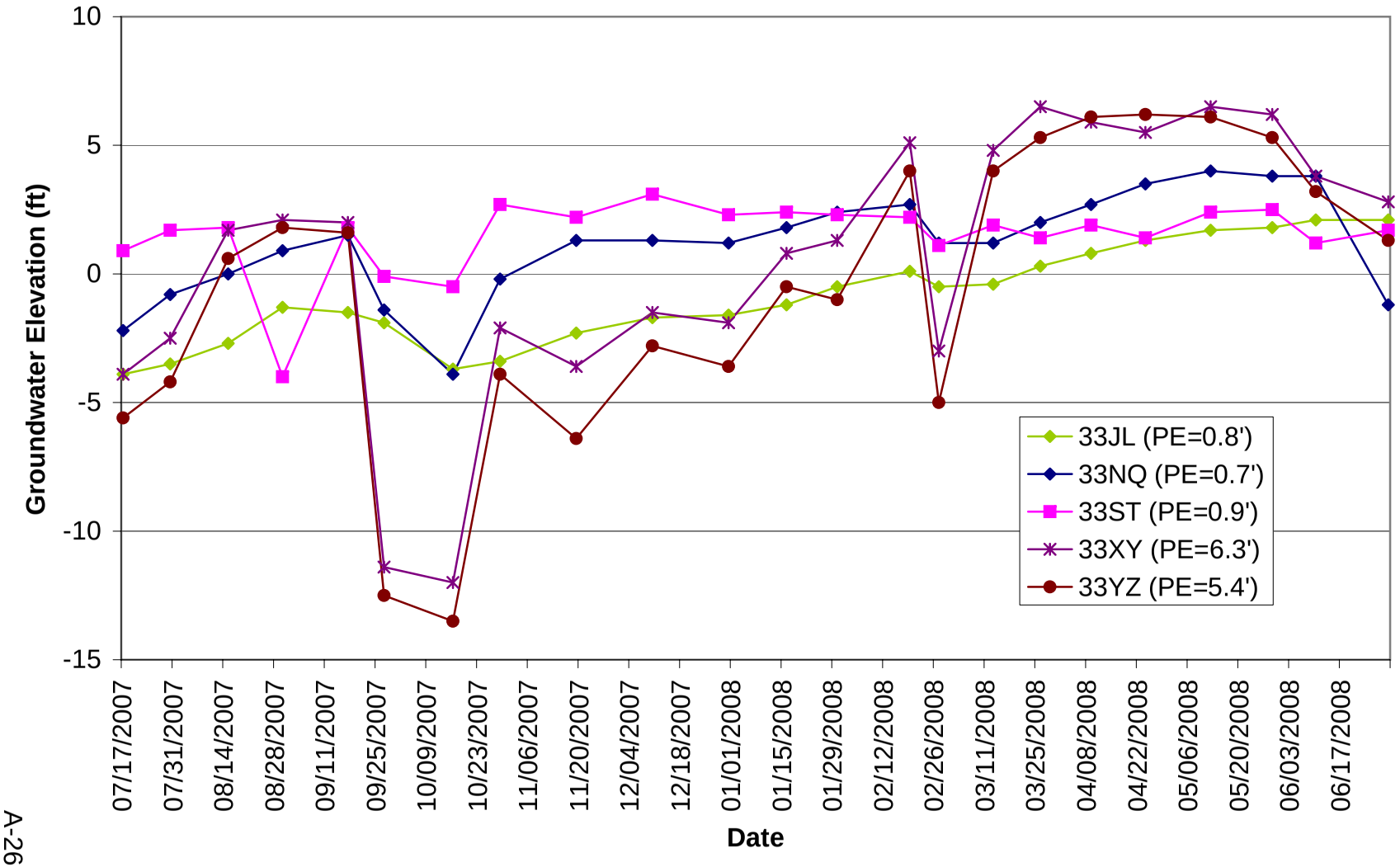
LEGEND

- Extraction Well
- Observation Well
- LACFCD Injection Well
- OCWD Injection Well
- ABP Water Supply Line (owner: LACFCD/OCWD)
- ABP Water Supply Line (owner: LACFCD)
- ABP Water Supply Line (owner: OCWD)
- Reclaimed Water Delivery Line (owner: WRD)

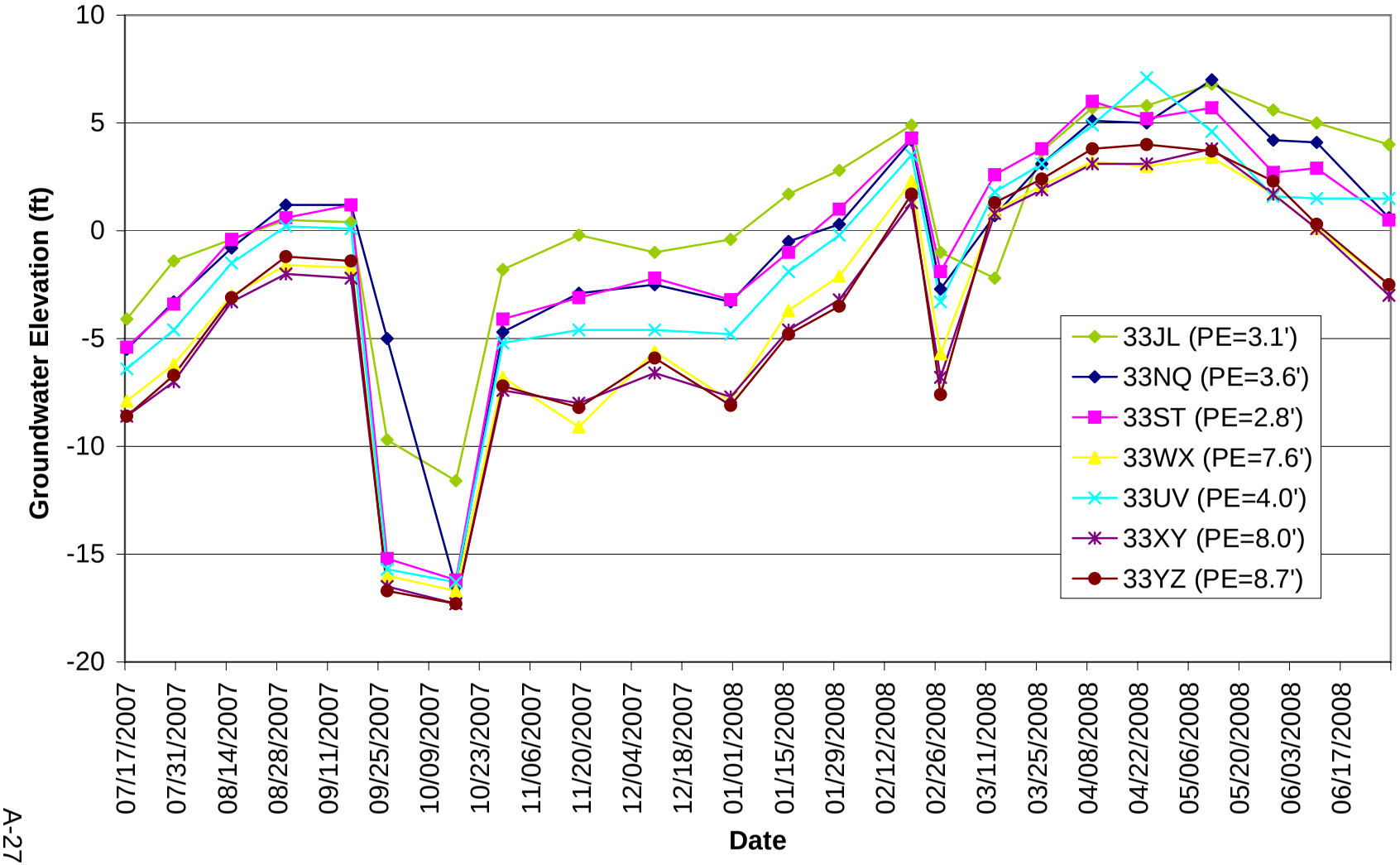
ABP West Leg Groundwater Elevations - C Zone



ABP West Leg Groundwater Elevations - B Zone



ABP West Leg Groundwater Elevations - A Zone



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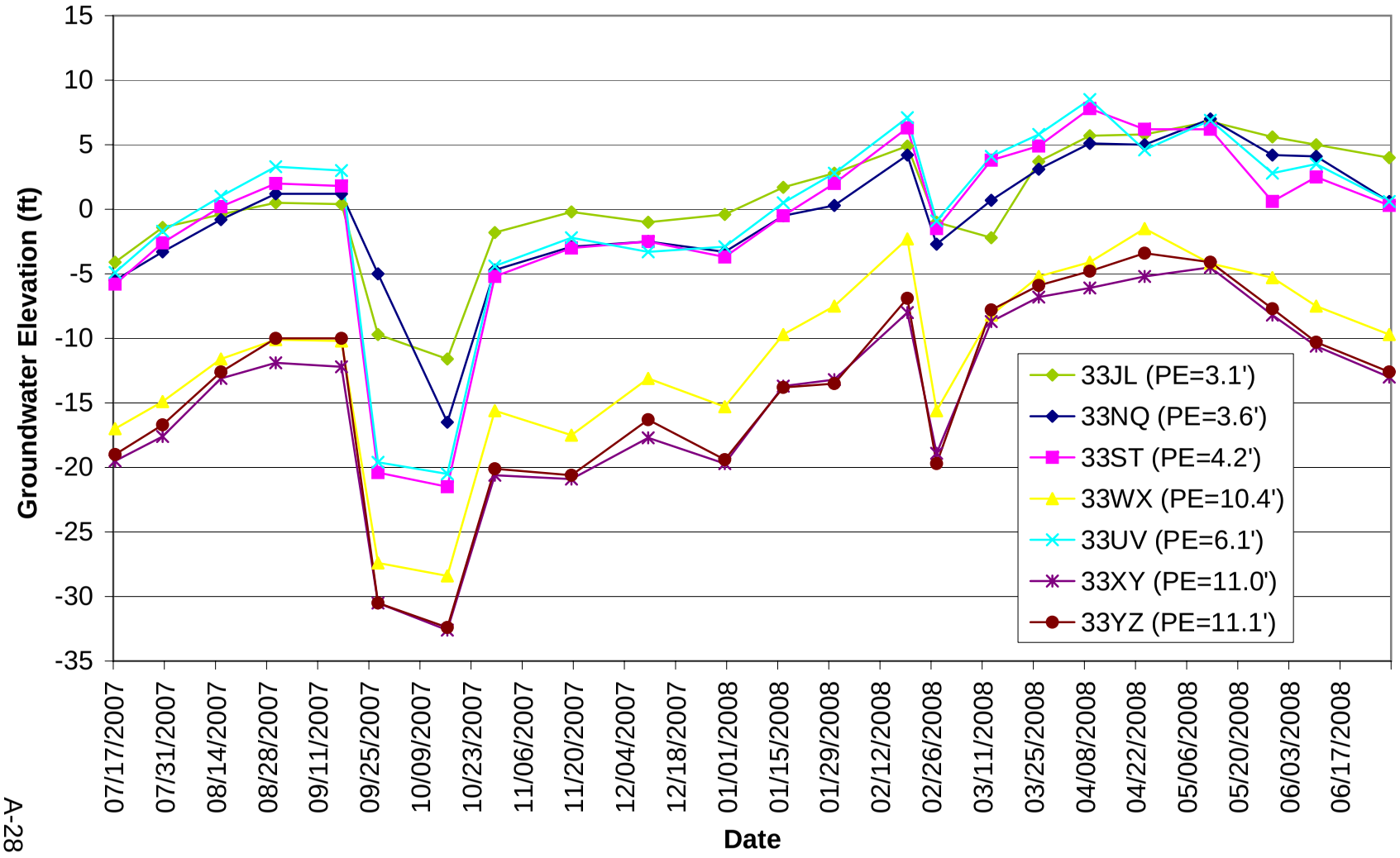
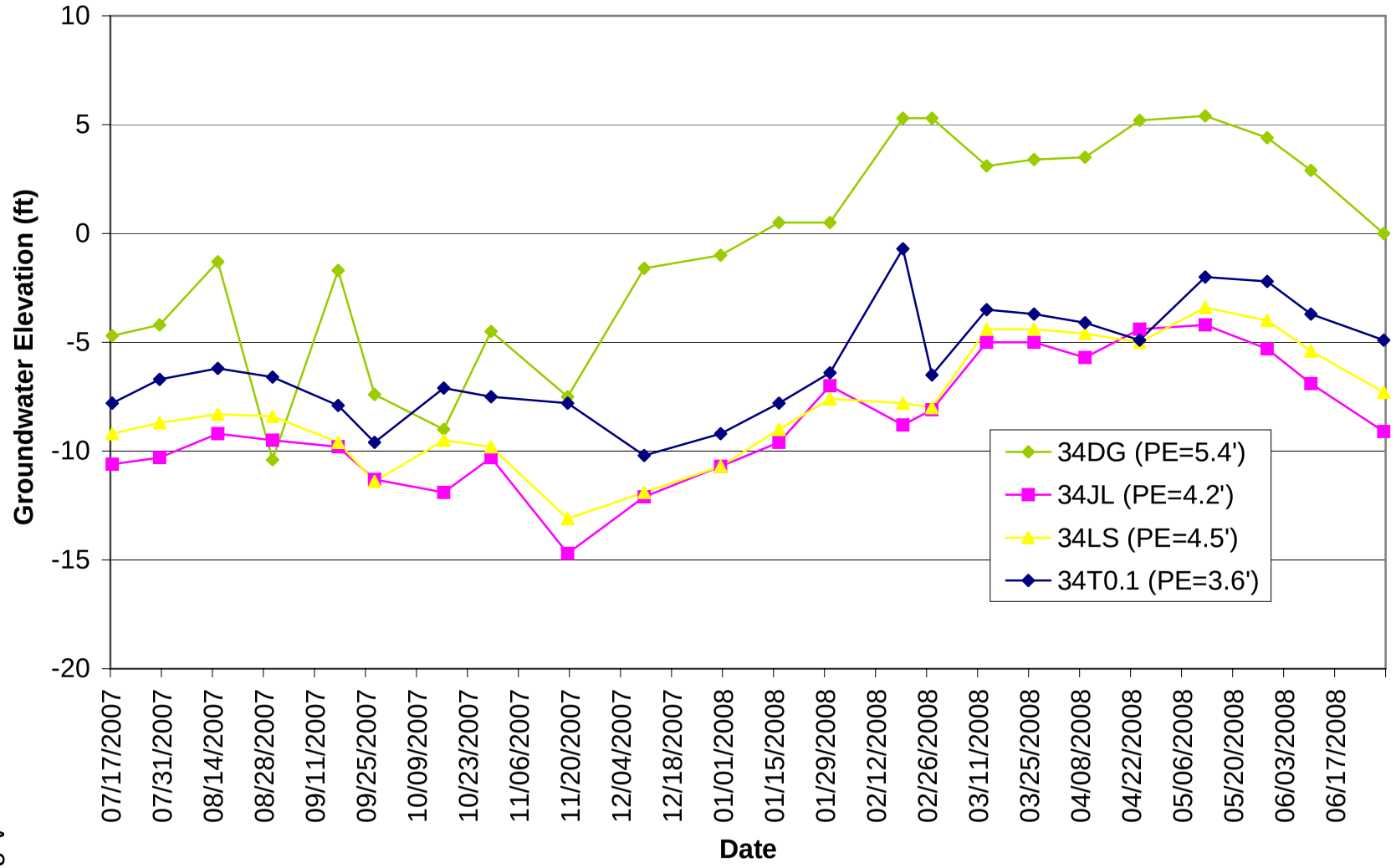
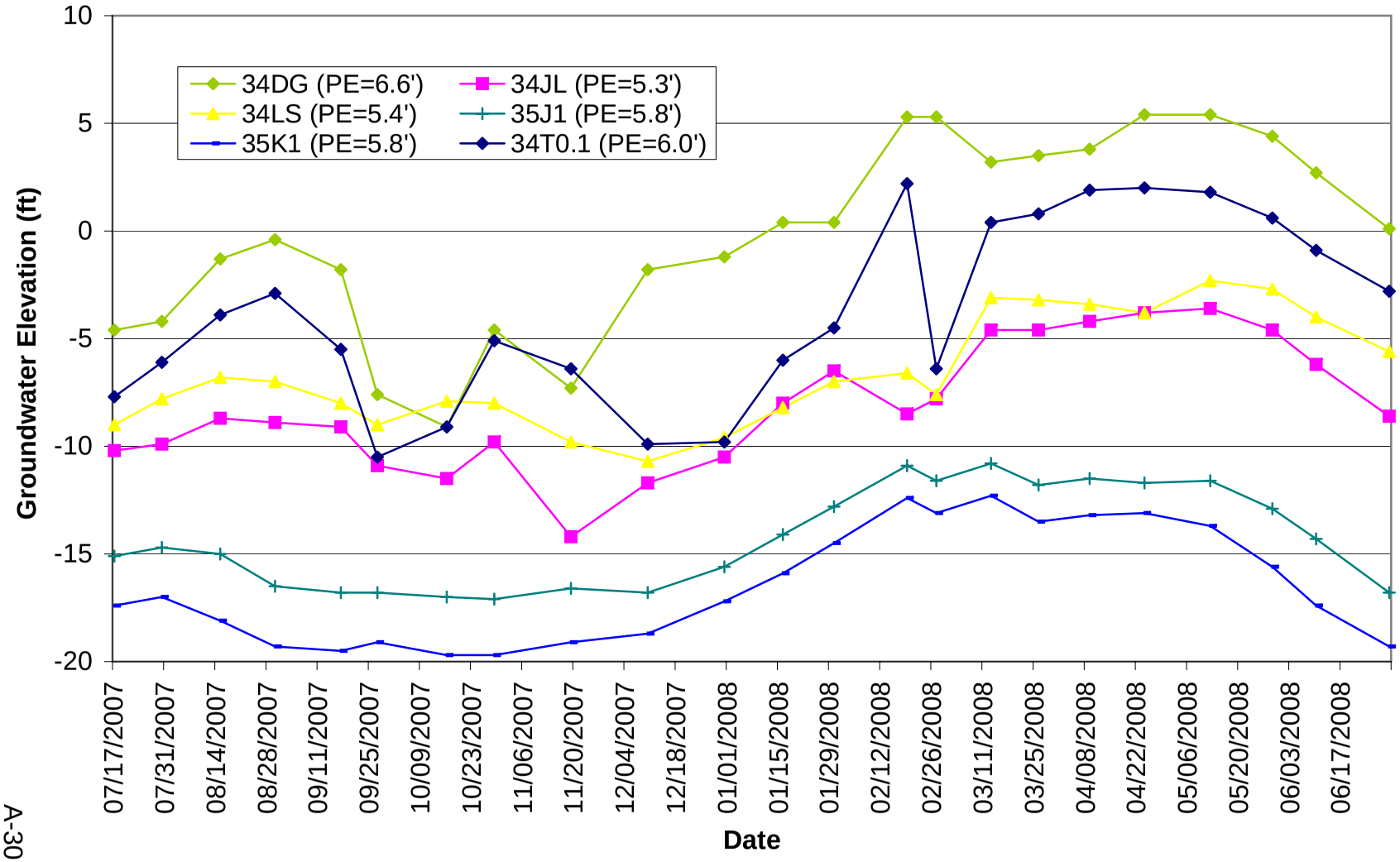


ABP East Leg Groundwater Elevations - C Zone



ABP East Leg Groundwater Elevations - B Zone



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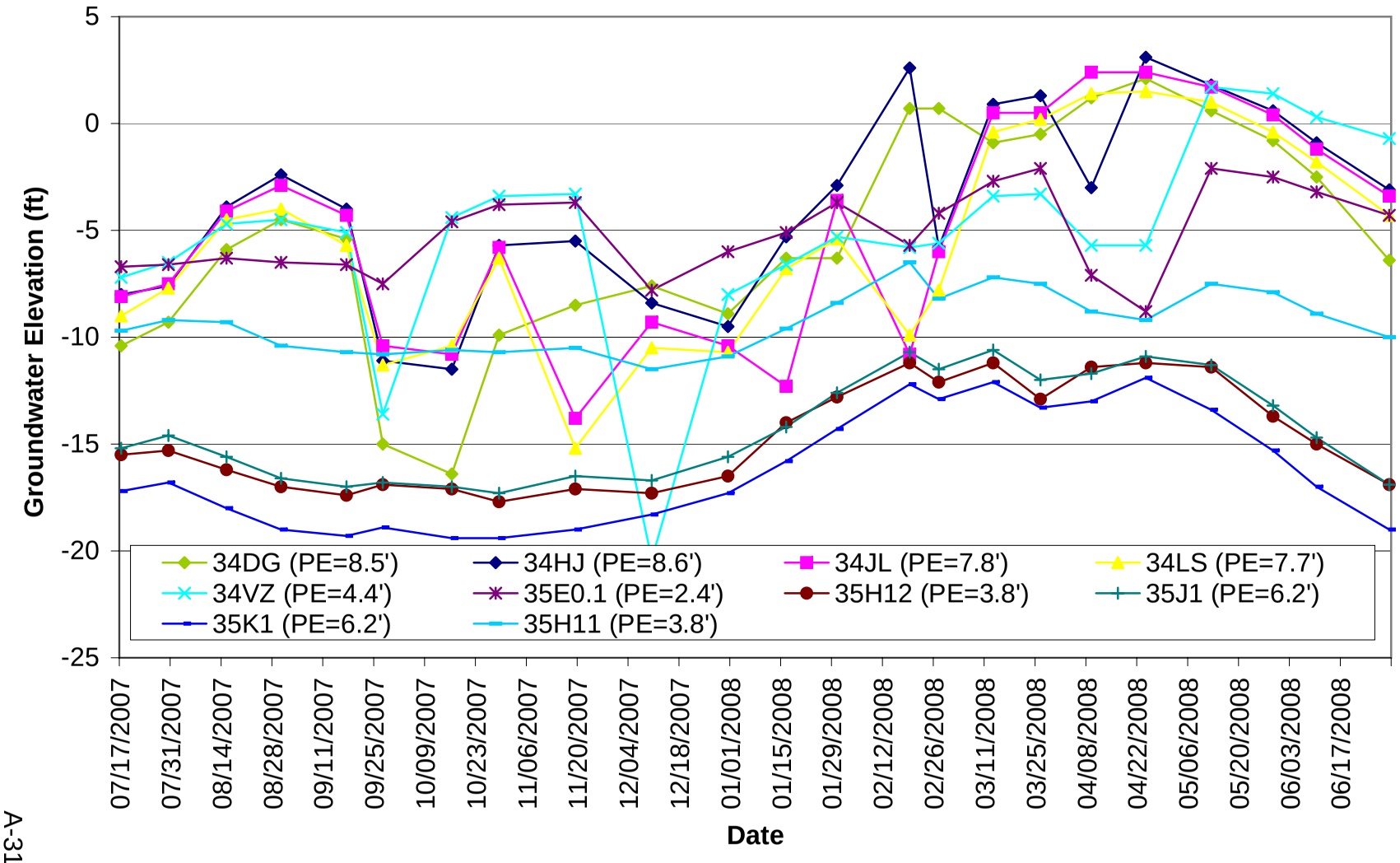


ABP East Leg Groundwater Elevations - I Zone

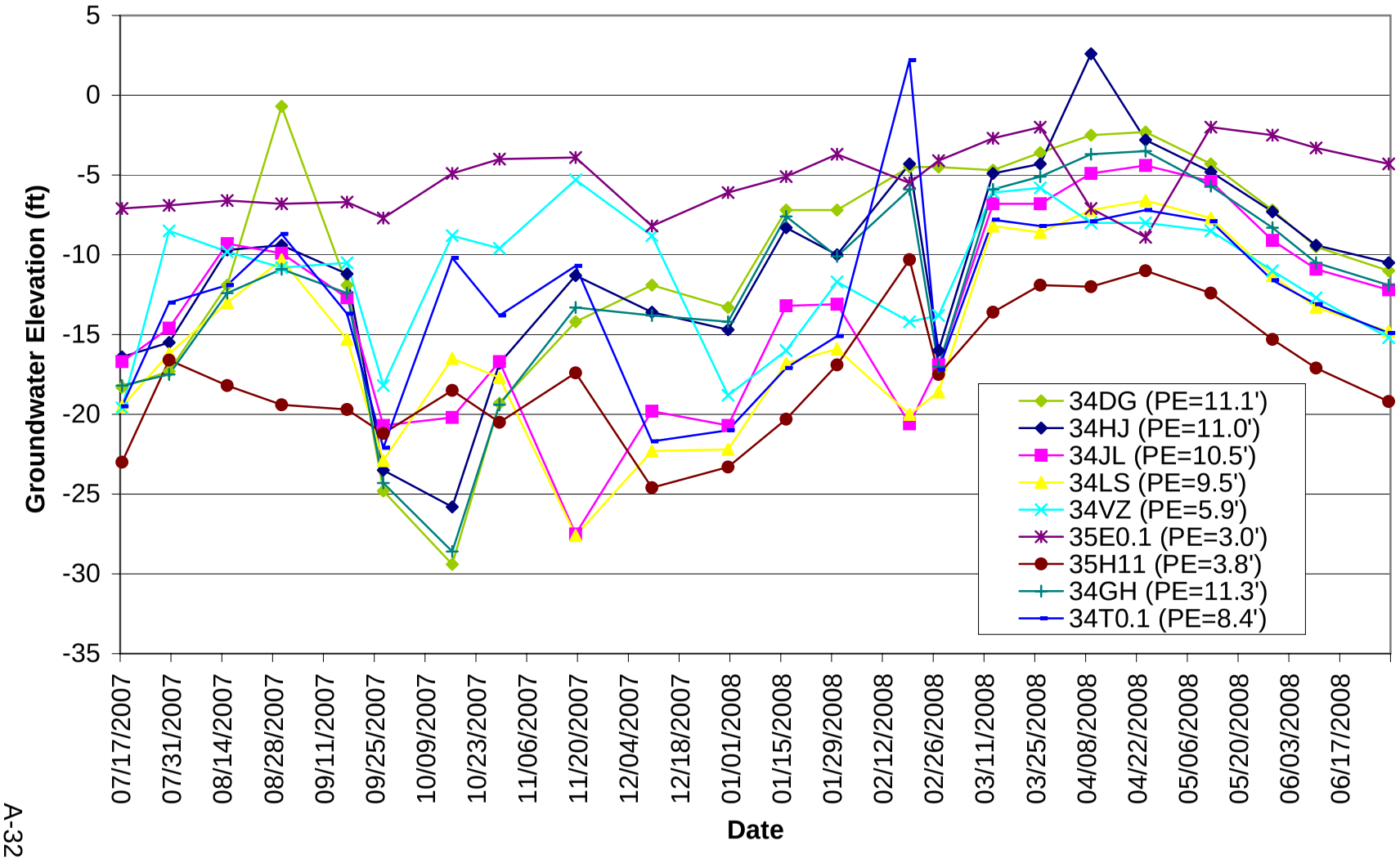


Table A-33: Current Capital Improvement Projects and Contracts (FY 2007-08)

Board Award Date	Project Title	Description	Contractor	Final Contract Amount	Field Acceptance
06/19/2007	Barrier Water Supply Facilities Improvements ("Cathodic Protection") Phase 1	Corrosion protection on portions of ABP supply pipeline	Mike Prlich & Sons, Inc.	$ 649,399.00	12/05/2007
08/27/2007 by WBMWD	Recycled Water Quality Standards Study [incl. all 3 barriers]	WBMWD managed contract with LACDPW, LADPW, and WRD to evaluate appropriateness and adequacy of current standards.	Carollo Engineers	$75,000.00 ($18,750 per agency)	June 2008 Final Report
09/24/2007	ABP Telemetry System Phase 2	IT component for remote monitoring of injection wells and various internodal observation wells	Leed Electric Inc. (with Soffa Electric, Inc.)	$ 374,242.29	05/13/08
December 2008 (Estimated)	Barrier Water Supply Facilities Improvements ("Cathodic Protection") Phase 2 - ABP	Corrosion protection on portions of ABP supply pipeline	TBD	$1.1M (Estimated ABP portion)	June 2009 (Estimated)

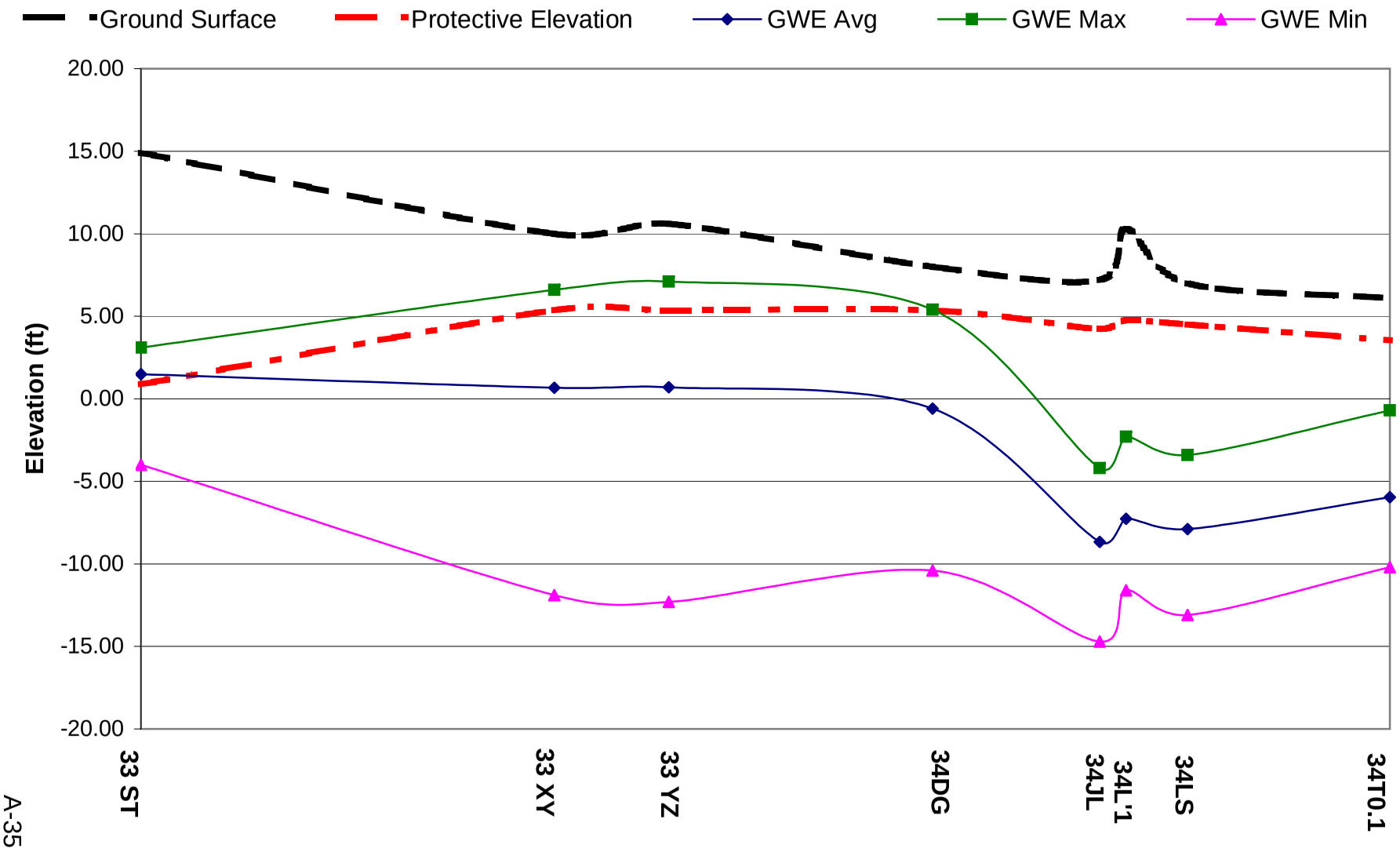
Note: For a full history of improvement projects and contracts on record, please contact LACDPW.

Table A-34: Summary of the Alamitos Barrier Project Shutdowns (FY 2007-08)

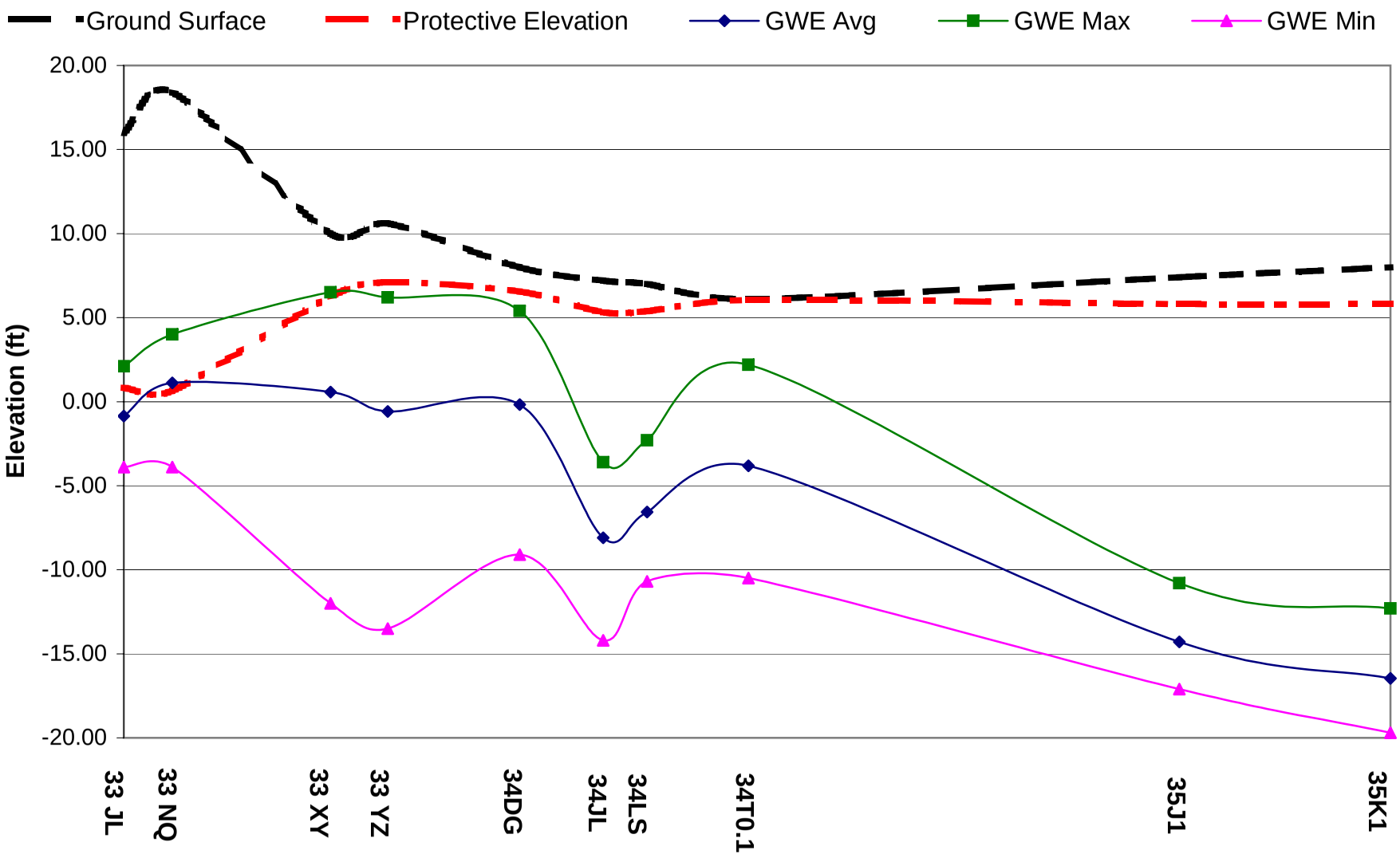
Shutdown	Startup	Duration (days)	Impacted Portion of ABP	Reason	Addressed By	Means of Repair/Remediation
06/27/2007	07/06/2007	9	14 wells	The start-up process after valve replacement was extra conservative and gradual	LACDPW	Normal operational routines.
06/04/2007	09/19/2007	107	Injection Well 33W	9' x 9' sinkhole next to well	LACDPW	Filled & compacted sinkhole, then tested.
08/22/2007	08/23/2007	1	Entire Barrier	Leak at Station 3+45 air valve	LACDPW	Isolated, then repaired valve seating.
09/24/2007	10/11/2007	17	West Leg	Video inspection for cathodic protection joint identification	LACDPW	N/A (prep for capital improvement proj)
11/19/2007	11/21/2007	2	East Leg	Southern California Gas Company (SCGC) broke supply line near 34E during their nearby excavation.	Southern California Gas Co.	Installed temporary 8' segment of C900 pipe with mechanical couplings connecting to surrounding asbestos cement pipe.
11/28/2007	12/02/2007	4	East Leg	SCGC needed barrier back off to permanently fix the supply line near 34E	Southern California Gas Co.	Installed permanent 170' concrete lined-and-coated steel pipe with mechanical couplings connecting to surrounding asbestos cement pipe.
02/18/2008	02/25/2008	7	Entire Barrier	(1) SCGC broke the supply line near 34E for a second time while compacting nearby. (2) City of Long Beach reported leak along Los Cerritos Channel (Station 234+80, north of T-vault).	LACDPW	(1) Installed clamp on the transite pipe and then encased in concrete. (2) Welded a 2'x1' steel patch over 3 holes in the SCCP and then recoated with cement.
02/25/2008	06/30/2008	126	Injection Well 35G	Frozen Q-valve, excavation required to access isolation valve, and delay in new parts.	LACDPW	Isolated lateral pipeline, ordered parts, and installed.
03/14/2008	05/01/2008	48	Injection Wells 34V(A) and 34V(C,B)	Issues installing the sensors for ABP Telemetry Phase 2	LACDPW	Adjusted risers and base plates to house sensors.
03/14/2008	06/30/2008	108	Injection Well 34V(I)	Issues installing the sensors for ABP Telemetry Phase 2, then issues reconstructing the base plate, the pre-screening for redevelopment.	LACDPW	Adjusted risers and base plates to house sensors, then modfied base plate assembly and conductor pipes.

Notes:
* Routine and/or minor shutdowns of individual wells are not listed here but are included in Figure 3 of Annual JMC Report.
* For a full history of shutdowns on record, please contact LACDPW.

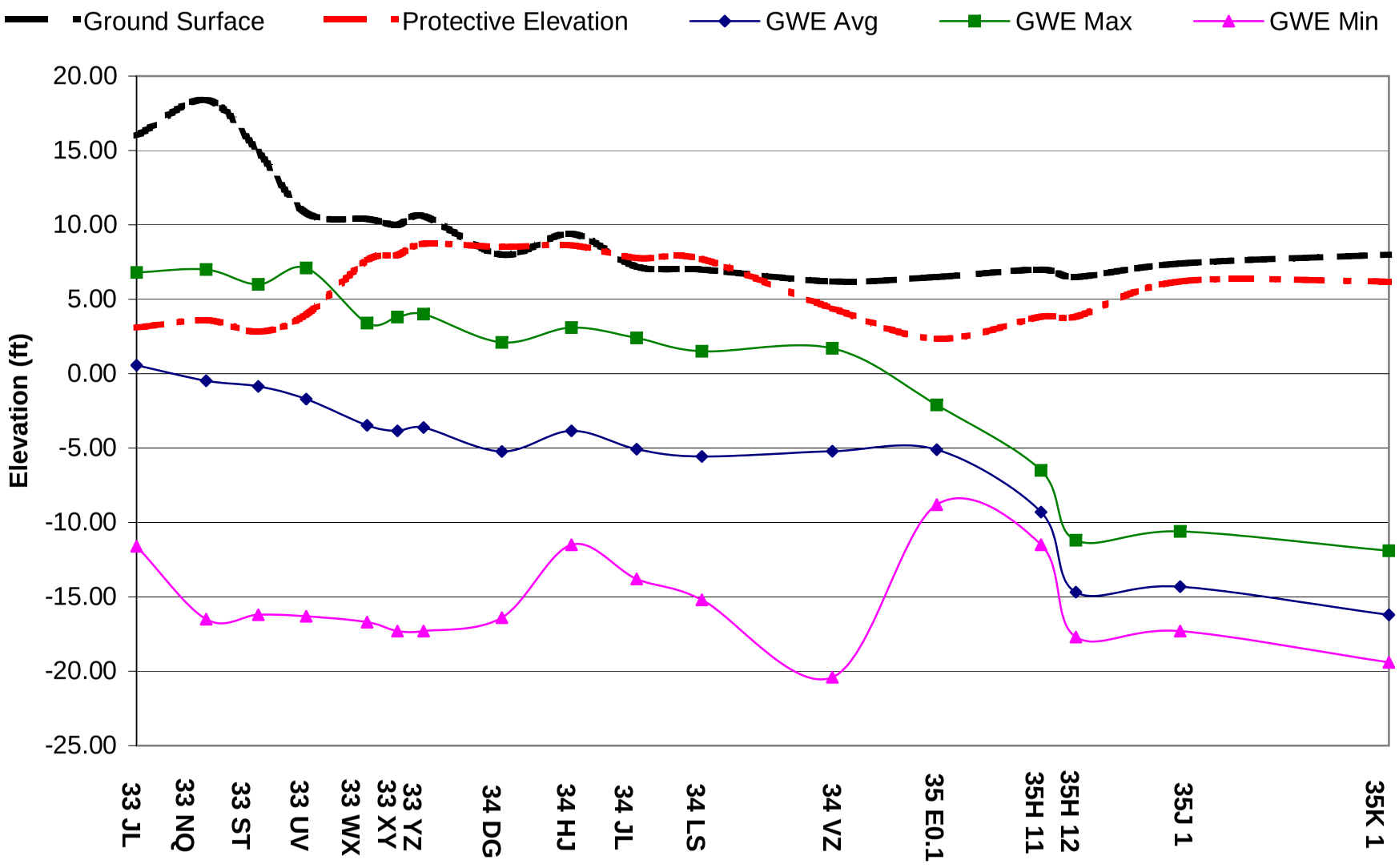
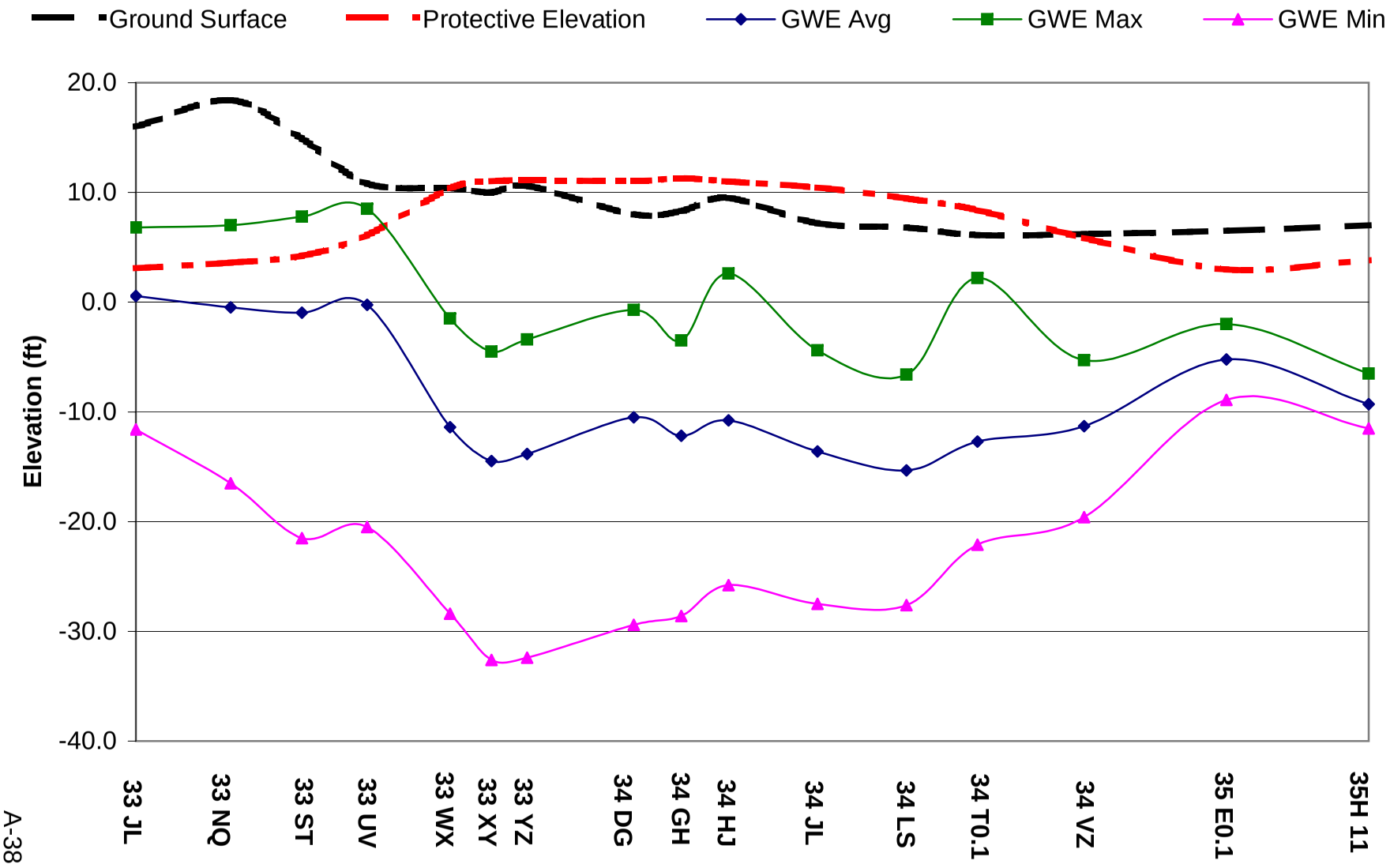
C Zone - Groundwater Elevation (GWE) Along the ABP in FY07-08



B Zone - Groundwater Elevation (GWE) Along the ABP in FY07-08



A Zone - Groundwater Elevation (GWE) Along the ABP in FY07-08



I Zone - Groundwater Elevation (GWE) Along the ABP in FY07-08