

**APPENDIX E**

**Storm Drain Investigation Letter Memorandum**

2701 Prospect Park Drive  
Sacramento, California 95670

Tel: (916) 444-0123  
Fax: (916) 635-8805

www.browncaldwell.com

7 December 2004

BROWN AND  
CALDWELL

Ms. Meegan Nagy  
US Army Corps of Engineers  
Sacramento District  
1325 J Street  
Sacramento, California 95814

1017/124785-005

Subject: Storm Drain Investigation Letter Memorandum, Former Benicia  
Arsenal, Benicia, California

Dear Ms. Nagy:

This letter memorandum presents Brown and Caldwell's results from the sampling and preliminary investigation of shallow storm water catch basins located in the industrial area at the former Benicia Arsenal (Arsenal). The data indicate that the storm water drain system intercepts shallow groundwater in the industrial area, and contaminated groundwater is infiltrating into the storm drain system.

This letter memorandum begins with an introduction. The introduction includes a description of the events that lead to investigating the storm water drain system in the industrial area and includes the purpose of the investigation. After the introduction, each investigative purpose stated in the introduction is discussed. A summary of the investigation with conclusions is included at the end of this letter memorandum.

## INTRODUCTION

Analysis of the Expanded Site Investigation (SI<sup>1</sup>) results indicated that shallow (<15 feet below ground surface [bgs]) groundwater contamination does not extend past a line just south of the 50 Series Complex and Building 165 (Figure 1). On 9 August, 2004, Brown and Caldwell conducted a preliminary inspection of storm drain catch basins nearest to existing piezometers in the area. Based on this inspection, it appears that the storm water drain system may be in communication with the shallow groundwater table. These findings were presented to the US Army Corps of Engineers, Sacramento District (USACE) on 13 August, 2004.

<sup>1</sup> Brown and Caldwell. 2004. Expanded Site Inspection, Former Benicia Arsenal, Benicia, California. Prepared for the U.S. Army Corps of Engineers. Preliminary Draft.

P:\US Army Corps\Benicia Arsenal\Reports\Expanded SI\Storm Drain Memo\Storm Drain memo.doc

*Environmental Engineers & Consultants*

Ms. Meegan Nagy  
December 7, 2004  
Page 2

As a result of these findings, USACE requested Brown and Caldwell to sample selected storm drain catch basins and piezometers to determine if contaminated groundwater was infiltrating into the storm water drain system. A letter workplan<sup>2</sup> was submitted to and approved by the USACE on 19 August, 2004. The first round of water samples were collected on 17 September, 2004. Based on the results from the first sampling event, a follow-up investigation was planned to collect additional water samples and information<sup>3</sup>. The second round of water samples were collected from storm drain catch basins on 28 October, 2004.

The purpose of these investigations was to collect data for the following reasons:

- to evaluate the route of storm water discharge from the Arsenal industrial area;
- to locate and perform a quick inspection of storm drain catch basins in the Arsenal industrial area;
- to review the City of Benicia's National Pollutant Discharge Elimination System (NPDES) permit for the discharge of storm water;
- to collect and evaluate water level measurements in selected piezometers and the catch basins;
- to sample these piezometers and the storm water catch basins that are upstream, within, and downstream from the Arsenal industrial area; and
- to evaluate if storm water upstream, within, and downstream of the Arsenal industrial area is contaminated.

### **STORM WATER ROUTE OF DISCHARGE FROM THE ARSENAL INDUSTRIAL AREA**

The catch basins for the storm drains were first mapped on the USACE General Storm Drainage Map, dated 1958. After the decommissioning of the Arsenal in 1964, the new landowner of the storm water drain system, the City of Benicia, adopted this map. In the Industrial area, the Army storm water drain system

---

<sup>2</sup> Brown and Caldwell. 2004. Storm Drain Investigation Letter Workplan. Prepared for the U.S. Army Corps of Engineers. August 19

<sup>3</sup> Brown and Caldwell. 2004. Addendum to Storm Drain Investigation Letter Workplan, Former Benicia Arsenal, Benicia, California. Prepared for the U.S. Army Corps of Engineers. October 20

included a series of concrete catch basins connected with corrugated steel pipe and then drained into the Carquinez Strait through two tide gates. These tide gates are labeled "TIDEGATE01" and "TIDEGATE02" on Figure 1. The City of Benicia changed the original system by abandoning a line in 1980 that once connected to TIDEGATE02. A new line was installed with a sump labeled as "SUMP01" and the outfall is labeled "SSP01OUTFALL" on Figure 1.

The catch basins and piezometers discussed in this memorandum are organized into four groups (Table 1) based on similar routes of storm water discharge. The associated piezometers in the group are the closest groundwater sampling points to the storm water drain lines. Each group is named after the closest building to the system (e.g., B165SD01 is near Building 165). The four groups of catch basins, from west to east as shown on Figure 1 are the following:

1. Building 165 Group – with associated piezometer PZ-2 and located within the Lowlands or former marshland. Water in the lowlands is typically brackish to saline.
2. Building 91/161 Group – no piezometers were sampled associated with this group. These catch basins are located within north of the Lowland boundary or in the Highlands where water is typically fresh.
3. Building 116 Group – no piezometers were sampled associated with this group. This group of catch basins is within the Lowlands and water is typically brackish to saline.
4. Building 56A/89 Group – with associated piezometers B057AHP005 and B057AHP006 (sampled in 1999) near Building 56A (part of the 50 Series Complex), and piezometer PZ-5 associated with the storm water drain system near Building 89. These catch basins are straddled along the Lowland and Highland boundary. Therefore, water in this area could be fresh to brackish.

Arrows on the storm drain lines indicate the direction of water flow (Figure 1). The Building 165 Group transmits water from the City of Benicia (labeled "dry ditch" on the figures) and from a residential area north of Building 165 (catch basins CITYSD02 and CITYSD03). The connection of the storm water drain lines from the residential area to the line that connects to the "dry ditch" is not clear. Army and City of Benicia maps indicate these two lines connect at catch basin B165SD19, but the line sizes observed in the catch basin do not match. Therefore, a question mark has been placed on the line segment next to

B165SD19. The Building 165 Group eventually joins the lower part of the Building 91/161 Group at storm drain B154ASD01. This water then flows into the Building 116 Group.

The Building 116 Group also receives water from the Bottle Hill (Figure 1). The storm water is collected and stored temporarily in SUMP01 before it is pumped out toward the Carquinez Strait.

The Building 56A/89 storm drain line transmits water solely from the 50 Series Complex, in which building 56A is the southernmost building. This storm drain line then flows toward Building 89 and turns south to flow out to TIDEGATE01 (Figure 1).

Based on the City of Benicia and the 1958 Army storm water drainage maps, TIDEGATE01 receives storm water from the east side of the industrial area including the 50 Series Complex, businesses along Jackson Street and Tyler Street, the hills north of these streets, and Building 48 (Figure 1) (Building 48 is not shown on the figures provided in this memorandum but is located approximately 300 feet east of Building 88.). The connection to TIDEGATE01 from storm water draining from the businesses along Jackson Street and Tyler Street, the hills north of these streets, and Building 48 could not be confirmed. Flow was observed on the east side of Building 89, but the water in the next downstream catch basin (B089SD01) was not flowing. As a result, a question mark has been placed along this segment of storm drain line east of catch basin B089SD01.

#### **LOCATE AND INSPECT STORM DRAIN CATCH BASINS IN THE INDUSTRIAL AREA**

Locations of the storm drain catch basins were then identified in the field, if possible, and are shown on Figure 1 in grey. Several measurements were collected from the catch basins: depth of the basin, the number of inlet/outlet pipes visible, depth to the pipes, and the general orientation of each pipe. These observations are summarized in Table 1. Although the storm water catch basins are shown on the figures as connecting, these connections are not certain. As stated above, there are some discrepancies between the City of Benicia's storm water drain map and the 1958 Army map; however, the information in this investigation is believed to be accurate based on field observations.

## **REVIEW OF THE CITY OF BENICIA'S NPDES PERMIT FOR THE DISCHARGE OF STORM WATER**

Phone calls were made to the Regional Water Quality Control Board San Francisco Bay Region regulatory agency for NPDES permits to determine the status of any permit. At the date of this letter, the City of Benicia is finalizing their draft version of the NPDES permit that will include Waste Discharge Requirements.

### **WATER LEVEL MEASUREMENTS IN PIEZOMETERS AND CATCH BASINS**

Table 1 summarizes the depth to water in the catch basins for both sampling events. The locations of piezometers sampled for this investigation were surveyed after their installation. The elevation and locations of the catch basins were estimated in the field based on the elevation of nearby wells and are accurate to within about 0.5 to 1 feet. Using the estimated elevations, it was observed that the elevation of the top of the water in all the catch basins was about 1 foot below the top of the water table that was measured in the associated piezometers. Therefore, groundwater could flow into the catch basins.

Water was observed in all of the catch basins during the first sampling event (August and September 2004) and water was flowing in catch basin B56ASD02. Since the catch basins were observed at the end of the dry season, the catch basins probably contain groundwater.

Between sampling events, up to 3.59 inches of rain fell in the area. Approximately 0.4 inches of rain was recorded during September 2004, and about 3.19 inches of rain was recorded during October 2004 (National Climatic Data Center, San Francisco Airport). As a result, the salinity of the water in the catch basins decreased after the precipitation.

The second monitoring event in October 2004 was expanded to measure the water levels and sample additional catch basins that were not sampled in September 2004. Most of the catch basins had water in them during the October 2004 sampling event, and water was flowing in catch basins B089SD02, B089SD03 and B089SD04. The ditch west of the industrial area was dry. Water was draining from the foothills above the industrial area in the storm drain north of Building 91 and was not draining from CITYSD02. The catch basins had water in them regardless of the amount of recent precipitation indicating that groundwater remained in the catch basins.

## **STORM WATER CATCH BASIN AND PIEZOMETER WATER SAMPLING**

There were two sampling events for this investigation as described below.

- The first sampling event was on 17 September, 2004. For this event, water levels and the number of inflow and outflow pipes were observed in eight storm drain catch basins. Water samples were collected and analyzed for general water chemistry (anions [nitrate, chloride, sulfate] and cations [calcium, magnesium, sodium and potassium]), volatile organic compounds (VOCs), total dissolved solids (TDS), and electrical conductivity (EC) (Attachment A) in six of the catch basins. Groundwater samples were also collected and analyzed from three local groundwater piezometers (Table 1). The methodology for collecting the samples is discussed in the Storm Water Investigation Letter Workplan<sup>2</sup>.
- The second sampling event was on 28 October, 2004. For this event, water levels and numbers of pipes were observed in 43 storm drain catch basins. Water samples were collected and analyzed for general water chemistry, TDS, EC, VOCs, and semi-volatile organic compounds (SVOCs) (Attachment B) in 12 catch basins. Piezometers were not sampled during the 28 October, 2004 sampling event. Catch basins B089SD01, B165SD01, and B165SD03 were sampled during both events.

Two changes were made from the Workplans<sup>2,3</sup>. Catch basin B056ASB02 was sampled instead of catch basin B053SD01, because catch basin B056ASB02 was closer to piezometer B057AHP005 than catch basin B053SD01. Piezometer B57AHP006 could not be sampled because right-of-entry permission was not granted, general mineral analyses of groundwater from 1999 was used to compare to the catch basin water samples.

## **EVALUATION OF THE STORM WATER CATCH BASIN DATA**

This section presents and evaluates the analytical results from the water samples collected from both sampling events for each catch basin group and then by analytical method (i.e. TDS, VOCs). This evaluation will conclude that the catch basins are intercepting groundwater and will identify where storm water is contaminated (upstream, within, or downstream of the Arsenal industrial area).

The analytical results for detected compounds from the catch basins and piezometers sampled in September 2004 are presented in Attachment A. The analytical results for detected compounds from the catch basins sampled in October 2004 are presented in Attachment B. The catch basin sampling results are combined in the discussions below, and a list of the catch basins in each group is presented in Table 1. As discussed earlier, the catch basins are grouped together based on their connections and named after the closest building.

### Analytical Results of the Building 165 Group

This section presents the results for TDS and VOCs for the Building 165 Group. The table below summarizes the highest TDS, cis-1,2-dichloroethene (cis-1,2-DCE) and trichloroethene (TCE) results from Building 165 Group of catch basin water samples. Further discussion is included below.

Analyte	Date	Direction of water flow (west to east) →				PZ-2
		B165SD05	B165SD01	B165SD02	B165SD03	
TDS (mg/L)	Sept 2004	Not sampled	7,930	Not sampled	Not sampled	8,750
	Oct 2004	1,270	564	Not sampled	1,210	Not sampled
Cis-1,2-DCE (µg/L)	Sept 2004	Not sampled	630	680	170	100
	Oct 2004	2.2	170	Not sampled	97	Not sampled
TCE (µg/L)	Sept 2004	Not sampled	97	6.2	20	0.71
	Oct 2004	2.6	860	Not sampled	410	Not sampled
TDS <1,000 mg/L = Fresh water TDS 1,000 mg/L to 10,000 mg/L = Brackish water						

**TDS.** During the September 2004 sampling event, the catch basin water samples and the nearby piezometer, PZ-2, collected from this group were all brackish to saline based on a concentration of TDS greater than 1,000 milligrams per liter (mg/L) (Figure 2 and table above). This coincides with historical groundwater sampling results. The catch basin water samples collected during the October 2004 sampling event were mostly fresh (<1,000 mg/L TDS) to brackish water (Figure 3). As shown in the table above, concentrations of TDS dropped between the two sampling events. The change from more saline in September 2004 to less saline or fresh in October 2004 can be attributed to the 3 inches of precipitation that occurred between the two sampling events.

**VOCs.** During the September 2004 sampling event, cis-1,2-DCE was the VOC with the highest concentration, in catch basins B165SD01 and B165SD02 (630 and 680 micrograms per liter [ $\mu\text{g}/\text{L}$ ], respectively) (Figure 4). However, in October 2004 the VOC with the highest concentrations was TCE, in catch basins B165SD01 and B165SD03 (860  $\mu\text{g}/\text{L}$  and 410  $\mu\text{g}/\text{L}$ , respectively) (Figure 5). Catch basin B165SD02 was not sampled in October 2004. During the October 2004 sampling event, the catch basin just up-gradient of B165SD01 was sampled (B165SD05) and concentrations were significantly lower than B165SD01 (see table above). Additionally, VOC concentrations in the storm drain catch basins decrease away from catch basin B165SD01 in the direction of flow (west to east).

The highest detection of cis-1,2-DCE and TCE in the catch basin water samples also coincide with the highest detection of cis-1,2-DCE and TCE identified in groundwater. This sample was collected during the Expanded SI<sup>1</sup> from B165HP001 at 6 feet bgs, concentrations of cis-1,2-DCE and TCE were 46,000  $\mu\text{g}/\text{L}$  and 32,000  $\mu\text{g}/\text{L}$ , respectively. This location is just up-gradient (north) of B165SD01 (Figure 4 and Figure 5). Therefore, it is possible that the storm drain catch basins are intercepting contaminated groundwater in the area of Building 165.

#### **Analytical Results of the Building 91/161 Group**

Catch basins B091SD02, B091SD04, and B161SD02 were sampled only during the October 2004 sampling event. The analytical results of the water samples from the three catch basins were similar (Figure 5).

**TDS.** TDS concentrations ranged from 910 mg/L to 986 mg/L. These concentrations indicate that the water is fresh (Figure 3).

**VOCs.** Cis-1,2-DCE concentrations ranged from not detected in B091SD04 to 9.1  $\mu\text{g}/\text{L}$  in B091SD02 (Figure 4) and TCE concentrations ranged from not detected in B091SD04 to 11  $\mu\text{g}/\text{L}$  in catch basins B091SD02 and B161SD02 (Figure 5).

The water sample from catch basin B161SD02 had tentatively identified compounds (TICs) of caffeine, ibuprofen, and hexadecanoic acid (a saturated fatty acid that is the major fat in meat and dairy products). These compounds are not commonly found in groundwater or storm drains but can be a common constituent in sewer water. The sewer system in this area may be leaking and the storm drain system may be collecting some of that leakage.

### **Analytical Results of the Building 116 Group**

This group of catch basins is connected to and downstream from both the Building 165 group and the Building 91/161 group. Catch basin B116SD01 and SUMP01 were sampled only during the October 2004 sampling event.

**TDS.** TDS concentrations were very low in catch basin B116SD01 (114 mg/L) compared with the other catch basin samples in the Building 165 and Building 91/116 groups, and could be reflective of fresh water draining off of the highlands of Bottle Hill (Figure 3).

**VOCs.** The concentrations of VOCs in the Building 116 group are more similar to the Building 91/116 group than to the Building 165 group. Cis-1,2-DCE concentrations were detected at a maximum concentration of 11 µg/L (Figure 4) and TCE concentrations up to 31 µg/L (Figure 5).

### **Analytical Results of the Building 56A/89 Group**

This group of catch basins has at least two branches. The first branch goes from Building 56A (B056ASD01 and B056ASD02) of the 50 Series Complex, east toward Building 89 (B089SD01). The second branch comes from east of Building 89 and flows south west toward B089SD01. It is uncertain if the second branch connects with the first branch at catch basin B089SD01. Storm water samples collected from the first branch of this group were fresh water in the upstream direction (catch basins B56ASD01 and B56ASD02) based on concentrations of TDS. These catch basins were only sampled in September 2004 (Figure 2).

**TDS.** TDS concentrations ranged from 240 mg/L to 6,050 mg/L. Groundwater samples from piezometers B057AHP005 and PZ-5 were brackish during the September 2004 sampling event. However, groundwater samples from nearby piezometer B057AHP006, sampled in 1999 for TDS, had fresh water (TDS concentrations = 395 mg/L) and in catch basins B56ASD01 and B56ASD02 in September 2004. Piezometer B057AHP006 could not be sampled in September 2004. The border between the fresh and brackish groundwater, or the Lowland/Highland boundary, is estimated to be just north of, or upgradient of catch basins B56ASD01 and B56ASD02 (Figure 2).

Catch basin B089SD01 had brackish water during the September 2004 sampling event (Figure 2). Catch basins B089SD01 and B089SD02 had fresh water during the October 2004 sampling event based on the concentration of TDS (Figure 3).

**VOCs.** VOC concentrations in all of the piezometers and catch basins for this group for both sampling events were below 25 µg/L. Concentrations of cis-1,2-DCE and TCE were consistent in B089SD01, at 7.9 µg/L and 4.9 µg/L in September 2004 and 7 µg/L and 5.4 µg/L in October 2004 (Figures 4 and 5).

## INVESTIGATION SUMMARY AND CONCLUSIONS

The main conclusion for this report is that the data indicate the storm water drain system intercepts shallow groundwater in the industrial area, and contaminated groundwater is infiltrating into the storm drain system. The following conclusions are based on the water levels measured in the catch basins and the analytical results from both sampling events.

- Water in the catch basins is at a level that was generally lower than the nearby piezometers.
- Water was present in most of the catch basins at the end of the dry season.
- Water in the catch basins changed from mostly brackish in September 2004, which was similar to the groundwater, to mostly fresh water in the October 2004 sampling event because of approximately 3 inches of rain that fell and drained into the storm water drain system between sampling events.
- VOCs were detected in all of the catch basins sampled within the Arsenal industrial area, and concentrations generally decreased in the direction of flow.
- The highest concentrations were identified in catch basins B165SD01 and B165SD02, which are down-gradient of an Expanded SI groundwater sample location had the highest concentrations of cis-1,2-DCE and TCE of 46,000 µg/L and 32,000 µg/L, respectively.

Ms. Meegan Nagy  
December 7, 2004  
Page 11

- The source of the VOCs was located in the Arsenal industrial area and not from an off-site source during both sampling events. Water was not present in the ditch west of the industrial area, and VOCs were not present in the water sample from catch basin CITYSD02 in the foothills above the industrial area.

If you have any questions, please call me at (916) 853-5325.

Sincerely,

BROWN AND CALDWELL



Wendy Linck, R.G.  
Project Manager

WL:sh  
Enclosures

**TABLES**

Table 1 Industrial Area - Storm Drain Catch Basin and Piezometer Measurements

Building 165 Group											
PZ-2	10-20	Not applicable			-	2.78	-	-	Yes	9/17/04	
Ditch, west of B165SD19		No storm drain catch basin, the inlet is a culvert fed by a drainage ditch. Ditch is dry 10/14/04.									
City SD02	3.48	N	12	0.18	-	-	2.95	-	Yes	10/28/04	Located on L Street, water not flowing
		W	12	0.18							
City SD03	5.45	N	12	4.5	-	-	dry	-	Dry	-	
		W/NW	12	4.5							
		E/SE	6	5							
B156SD01	1.7	N	2	2	-	-	dry	-	Dry	-	
		E	16	2							
B156SD02	4.26	Not visible			-	-	dry	-	Dry	-	
B156SD03	5.73	NW	16	4	-	-	5.38	-	Yes	-	Water not flowing in basin
		NE	8	0.5							
		S	12	4.5							
B165SD01	4.6	W	24	2.6	-	4.41	4.6	4.4	Yes <sup>b,d</sup>	9/17/04 10/28/04	Water flowing west to east <sup>c</sup> in basin
		E	24	2.6							
B165SD02	4.91	4 pipes		1.7	-	4.10	-	-	Yes	9/17/04	Water not flowing in basin
B165SD03	5.2 <sup>b</sup> , 4.7 <sup>d</sup>	Not visible due to grate			-	3.87	-	3.9	Yes <sup>a,d</sup>	9/17/04 10/28/04	Water not flowing in basin
B165SD04	4.65	2 pipes		2	3.85	-	-	-	Yes	-	Water not flowing in basin
B165SD05	4.65	E	24	2.5	-	-	-	4.6	Yes	10/28/04	Water flowing west to east in basin
		W	24	2.5							
B165SD06	5.25	NW	12	4.1	-	-	5.0	-	Yes	-	Water not flowing in basin
		SE	12	4.1							
B165SD07	4.85	NW	12	3.6	-	-	4.6	-	Yes	-	Water not flowing in basin
		SE	12	3.6							
		S	6	3.05							
B165SD08	4.3	NW	12	3	-	-	4.2	-	Yes	-	Water not flowing in basin
		SE	12	3							

Table 1 Industrial Area - Storm Drain Catch Basin and Piezometer Measurements

Storm Drain Number	Depth of Basin (feet)	Piezometer Catch Basin			Depth of Water (feet)				Piezometer (Water Dry)	Flow Direction	Notes
		Orientation	Depth of Water (feet)	Depth of Pipe (feet)	Avg	Sept	Oct	Nov			
B165SD09	3.55	N	8	1.5	-	-	3.5	-	Yes	-	Water not flowing in basin
		SE	12	2.8							
B165SD10	4.0	N	18	3	-	-	3.9	-	Yes	-	Water not flowing in basin
		S	18	3							
		E	12	3.2							
B165SD11	3.5	N	18	2.2	-	-	3.4	-	Yes	-	Water flowing in from surface
		E	Not visible								
		S	18	2.2							
B165SD12	3.3	W	12	2.4	-	-	dry	-	Dry	-	
B165SD13	4.85	N	-	Not visible	-	-	2.4	-	Yes	-	Water flowing north to south in basin
		S	-	12							
		S	-	18							
B165SD14	Not found - Location is under storage containers										
B165SD15	3.3	N	18	1.3	-	-	3.05	-	Yes	-	Water flowing in from surface, possible northern pipe
		W	18	1.3							
		S	6	1							
B165SD16	5.35	NW	12	2.9	-	-	5.02	-	Yes	-	Water flowing northeast to south in basin
		NE	15	3.1							
		S	12	NV							
		S	18	NV							
B165SD17	3.9	N/NE	12	2.5	-	-	3.55	-	Yes	-	Water not flowing in basin
		S	-	NV							
B165SD18	3.2	NW	12	2.25	-	-	3.1	-	Yes	-	Water not flowing in basin
		SE	12	2.0							
B165SD19	5.32	W	24	3.5	-	-	4.7	-	Yes	-	Water not flowing in

Table 1 Industrial Area - Storm Drain Catch Basin and Piezometer Measurements

Catch Basin ID	Elevation (ft)	Storm Drain Catch Basin			Piezometer (ft)				Flow	Date	Notes
		Direction	Number	Depth (ft)	Water Level (ft)	Water Level (ft)	Water Level (ft)	Water Level (ft)			
		E	24	3.5							basin
		W	6	1.5							
		E	6	1.5							
		N	6	3.8							
B165SD20	5.9	N	1 (clogged)	2.5	-	-	5.35	5.25	Yes	10/28/04	Water not flowing in basin
		N	12	3.5							
		W	18	4							
		S	24	4							
<b>Building 56A/89 Group</b>											
B057AHP006 (PZ)	3-13	Not applicable			2.95	-	-	-	Yes	-	
B057AHP005 (PZ)	2.5-12.5	Not applicable			-	5.31	-	-	Yes	9/17/04	
PZ-5	5-15	Not applicable			3.77	-	-	-	Yes	9/17/04	
B56ASD01	4.1	2 pipes		1.5	-	2.10	1.2	-	Yes <sup>b,c</sup>	9/17/04	pipes underwater <sup>c</sup>
B56ASD02	4.45	3 pipes		-	-	3.86	1.5	-	Yes	9/17/04	pipes underwater <sup>c</sup> , Significant, water is not flowing <sup>c</sup>
B053SD01	4.95	N	12	3.2	4.35	-	4.2	-	Yes	-	oily sheen <sup>c</sup> , dribble from northeast <sup>a</sup> , water flowing from north to south <sup>c</sup>
		S	12	3.2							
		W	12	2.7							
B053SD02	1.5	Full of soil, not visible			-	-	dry	-	Dry	-	
B071SD01	8.1	Under water, not visible			-	-	4.95	-	Yes	-	Water not flowing in basin
B088SD03	-	W	18	-	-	-	-	-	Yes	-	Water flowing west to south
		S	18	-							
		NW	-	-							

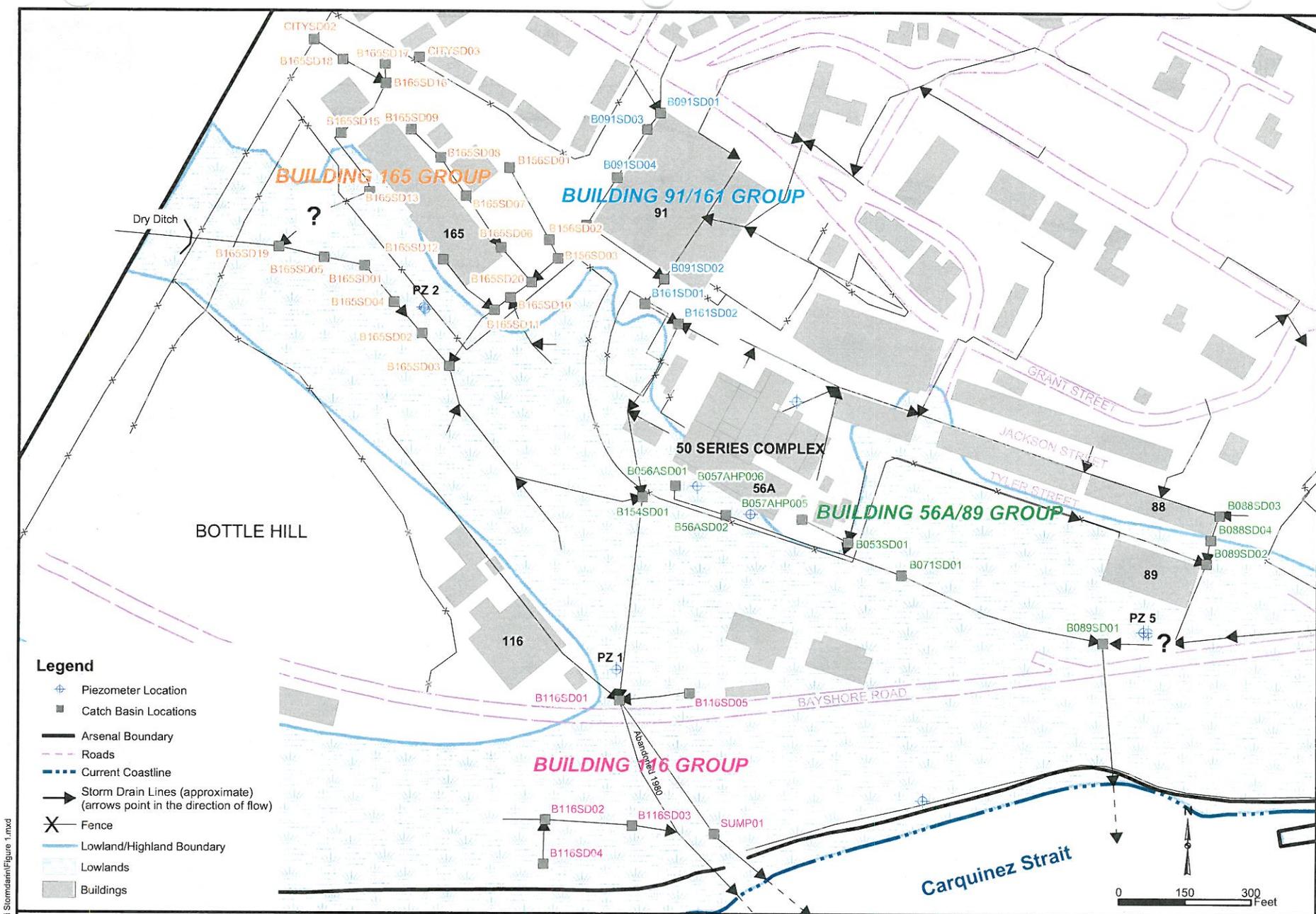
**Table 1 Industrial Area - Storm Drain Catch Basin and Piezometer Measurements**

Catchment Basin Name	Catchment Area (sq. ft.)	Flow in Catch Basin			Flow in Water from Basin				Flow in Water Visible	Date Visible	Notes
		Direction	Flow (gpm)	Flow (cfs)	Flow (gpm)	Flow (cfs)	Flow (gpm)	Flow (cfs)			
B088SD04		N	18	-	-	-	-	-	Yes	-	Water flowing north to south
		S	18	-							
B089SD01	8.05	N	-	3.6	4.14	2.69	2.4	2.98	Yes	9/17/04, 10/28/04	Pipes under water <sup>c</sup> , water is not flowing <sup>a,b,c,d</sup>
		S, E, W	-	-							
B089SD02	6.2	N	36	3.5	-	-	-	5.98	Yes	9/17/04	Water flowing north to south
		W	36	3.5							
		S	36	3.5							
		E	4	2.15							
TIDEGATE01		Abandoned outfall to the Carquinez Strait									
<b>Building 91/161 Group</b>											
B091SD01	Unknown	Not visible due to dirt in basin			-	-	-	0.6	Yes <sup>d</sup>	-	Water flowing from uphill <sup>d</sup>
B091SD02	5.6	N	36	-	-	-	5.36	5.35	Yes <sup>c,d</sup>	10/28/04	Water not flowing in basin
		S	36	-							
B091SD03	2.74	N	36	-	-	-	2.57	-	Yes	-	Water flowing north to southeast
		W	2	-							
B091SD04	3	N	12	-	-	-	-	2.75	Yes	10/28/04	Flowing slowly from north to south
		S	12	-							
B091SD05	3.65	N	-	3	-	-	3.41	-	Yes	-	Bad odor, water not flowing in basin
		E	-	3							
		SW	-	1.3							
		SE	-	3							
B161SD01	6.03	N	12	3	-	-	5.45	-	Yes	-	Water not flowing in basin
		E	12	3							
		SW	6	3							
B161SD02	6.1	W	36	2.85	-	-	5.93	5.92	Yes <sup>c,d</sup>	10/28/04	Water not flowing in basin
		NW	6	4.75							
		S	36	2.85							
		E	Not visible								
B154SD01	-	S	36	-	-	-	-	Yes	-	Water flowing from	

**Table 1 Industrial Area - Storm Drain Catch Basin and Piezometer Measurements**

Catch Basin ID	Elevation (ft)	Piezometer Data			Flow Data				Flow Direction		
		Direction	Depth (ft)	Flow (ft)	Flow (ft)	Flow (ft)	Flow (ft)				
		N	36	-						the northwest	
		W	27	-							
		NW	6	-							
<b>Building 116 Group</b>											
B116SD01	7.58	Underwater, not visible.			-	-	-	4.08	Yes	10/28/04	Water not flowing in basin
B116SD02	3.35	E	16	1.5	-	-	dry	-	Dry	-	Downhill of B116SD04 and B116SD03
		S	12	2							
		W	12	2							
B116SD03	2	E	12	1	-	-	dry	-	Dry	-	
		W	12	1							
		SW	2	1							
B116SD04	2.5	N	12	1	-	-	dry	-	Dry	-	
		NW	1	0.25							
B116SD05	2.3	Under water, not visible.			-	-	2.25	-	Yes	-	Scum and sheen on water, bubbles, water moves in no particular direction
SUMP01	12.6	Under water, not visible.			-	-	-	6.8	Yes	10/28/04	Sediment at bottom, water not flowing in basin
TIDEGATE02	Abandoned? outfall to the Carquinez Strait										
Notes:					Acronyms/Abbreviations:						
- = Not measured <sup>a</sup> = August 9, 2004 investigation event <sup>b</sup> = September 17, 2004 sampling event <sup>c</sup> = October 14 & 15, 2004 investigation event <sup>d</sup> = October 18, 2004 sampling event					bgs = below ground surface E = East N = North PZ = piezometer S = South W = West						

**FIGURES**



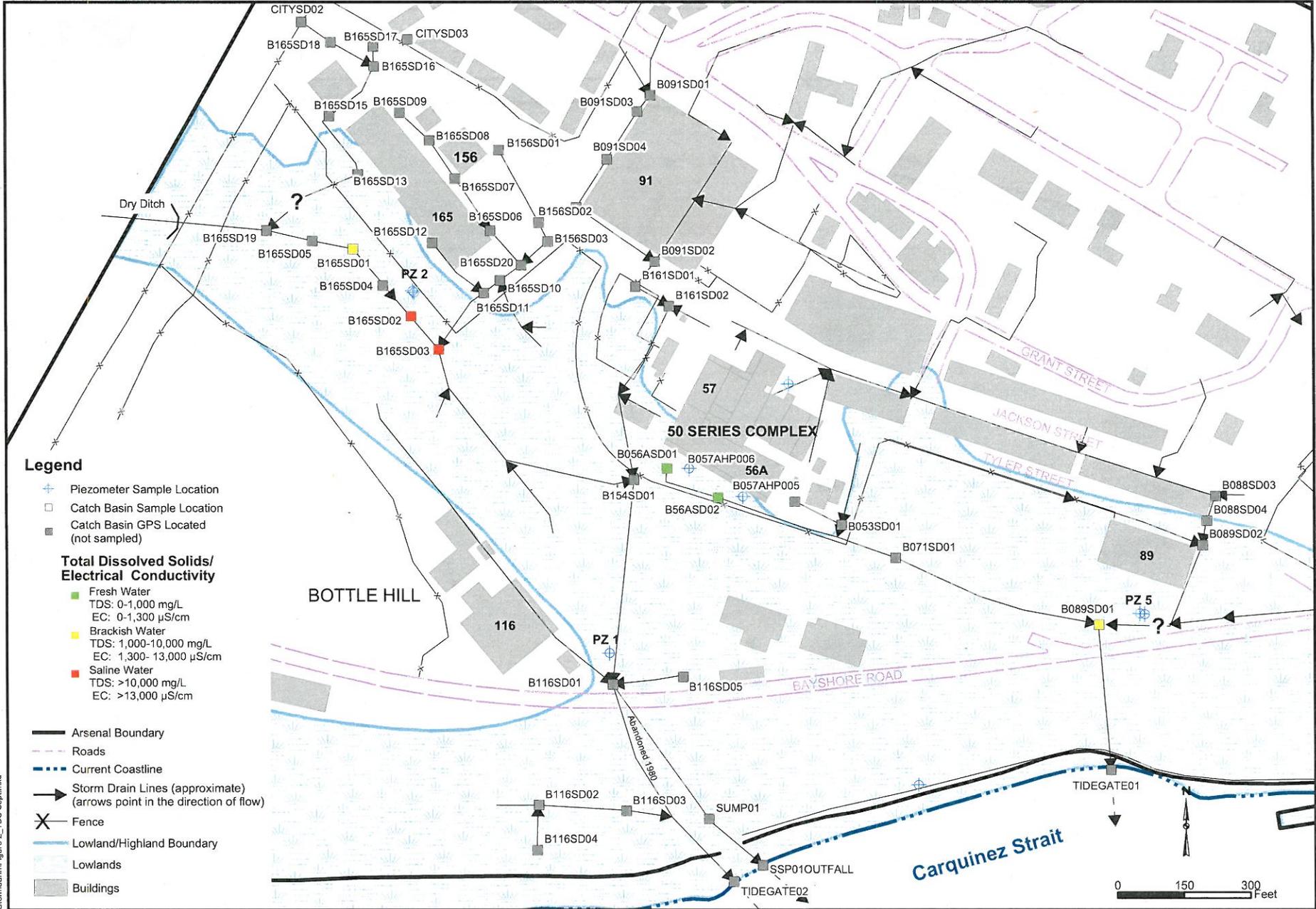
PATH: S:\Benicia Storm\dm\Figure 1.mxd



PROJECT: 124785-005  
DATE: 4/14/05

TITLE: Storm Water Drain System in the Industrial Area  
SITE: Benicia Arsenal, Benicia, California

Figure 1



**Legend**

- + Piezometer Sample Location
  - Catch Basin Sample Location
  - Catch Basin GPS Located (not sampled)
- Total Dissolved Solids/  
Electrical Conductivity**
- Fresh Water  
TDS: 0-1,000 mg/L  
EC: 0-1,300  $\mu$ S/cm
  - Brackish Water  
TDS: 1,000-10,000 mg/L  
EC: 1,300- 13,000  $\mu$ S/cm
  - Saline Water  
TDS: >10,000 mg/L  
EC: >13,000  $\mu$ S/cm
- Arsenal Boundary
  - Roads
  - Current Coastline
  - Storm Drain Lines (approximate)
  - (arrows point in the direction of flow)
  - X Fence
  - Lowland/Highland Boundary
  - Lowlands
  - Buildings

PATH: S:\Benicia Stormdrain\Figure 2\_TDS Sept.mxd

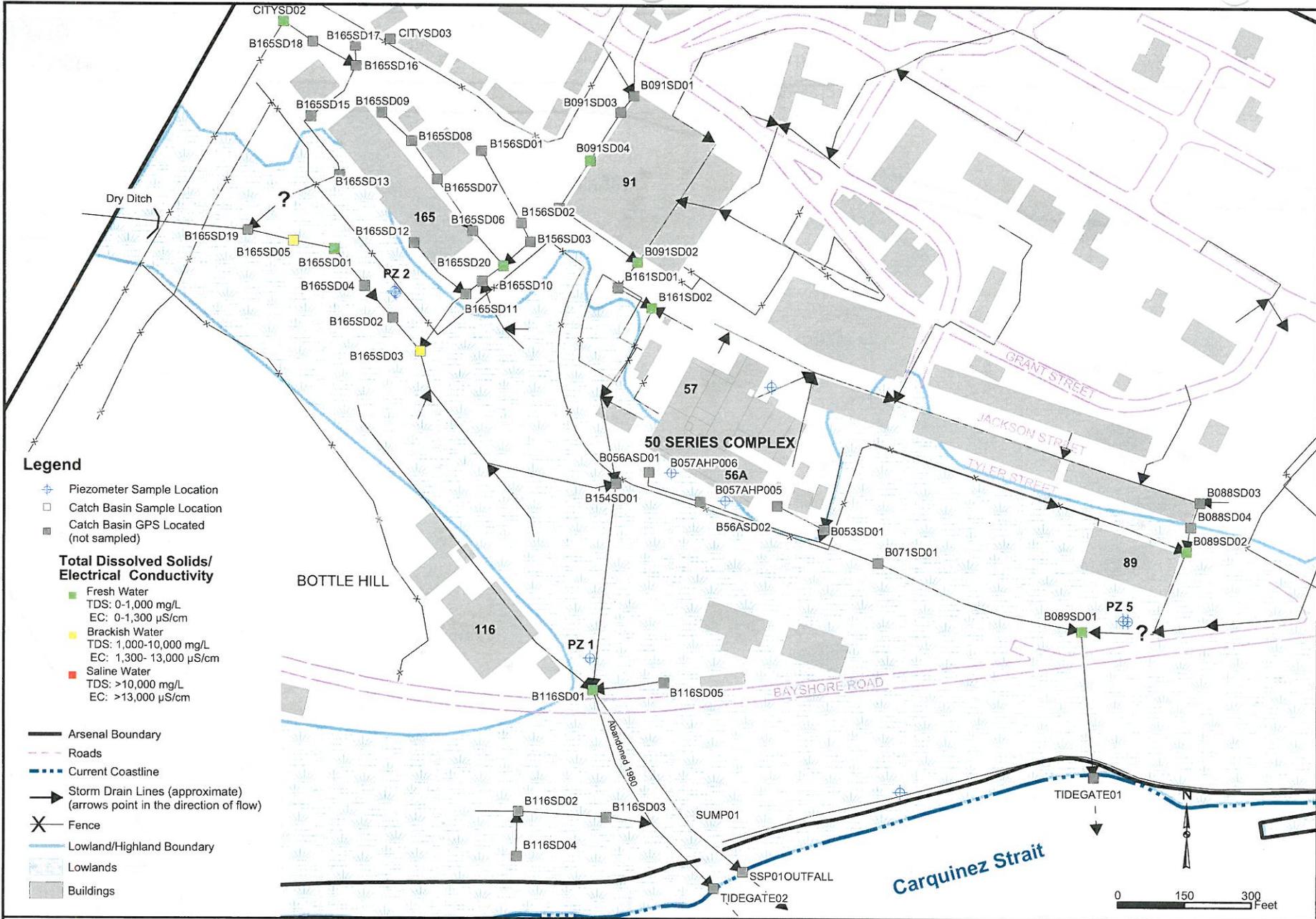


PROJECT: 124785-005  
DATE: 12/6/04

TITLE: September 2004 Stormwater Quality  
SITE: Benicia Arsenal, Benicia, California

**Figure 2**

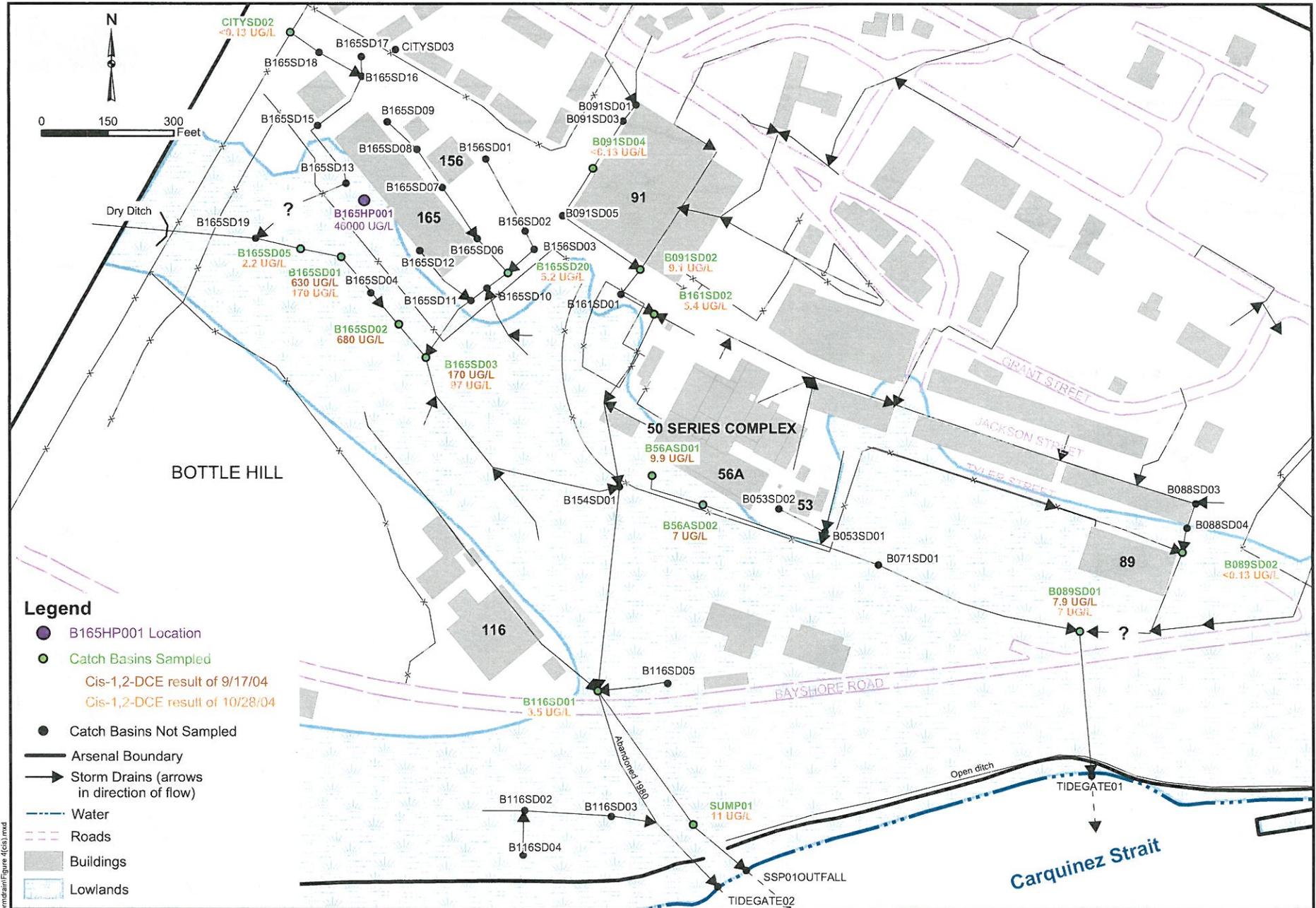
PATH: S:\Benicia Stormdrain\Figure 3\_TDS Oct.mxd



PROJECT: 124785-005  
DATE: 12/6/04

TITLE: October 2004 Stormwater Quality  
SITE: Benicia Arsenal, Benicia, California

Figure 3



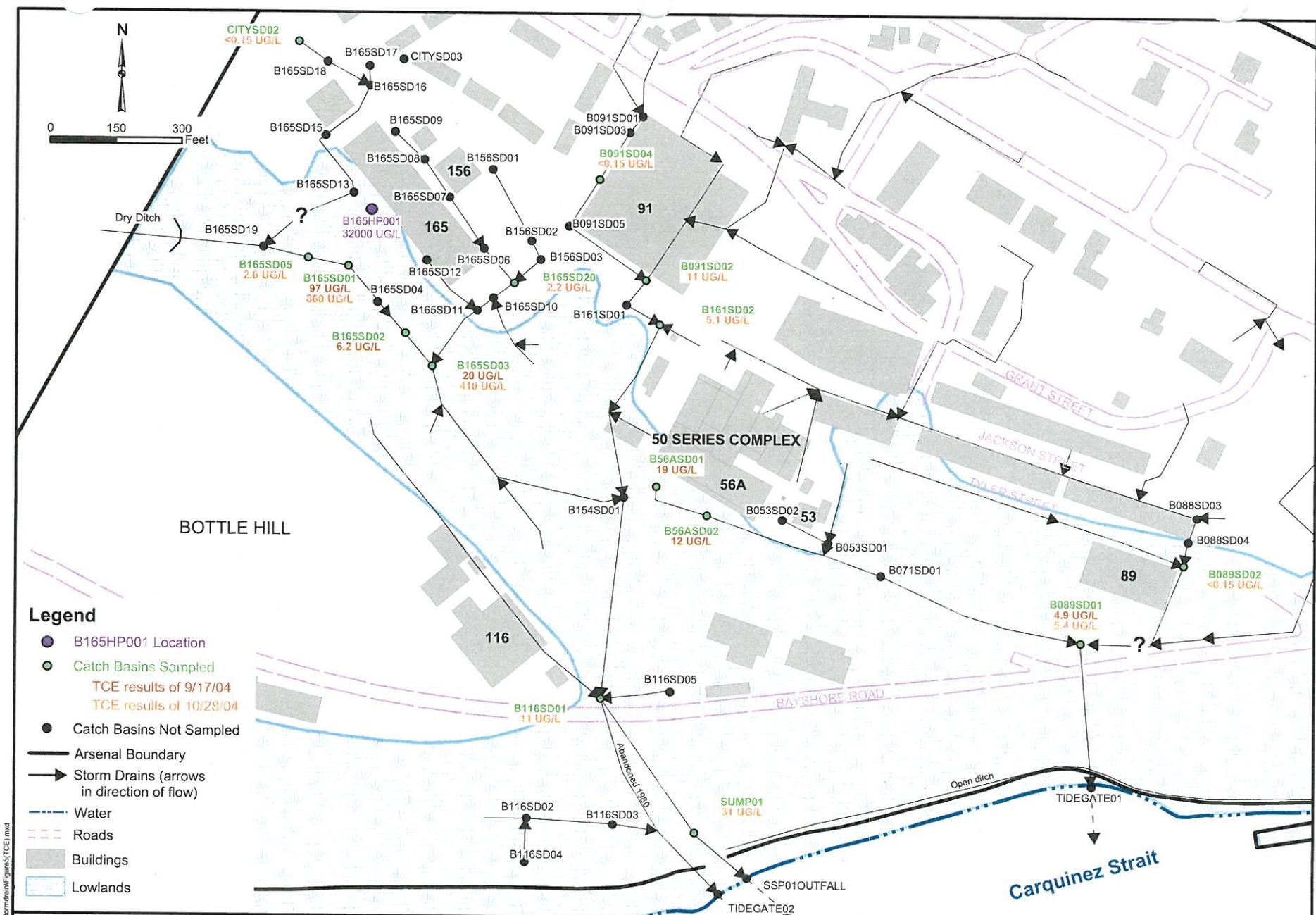
PATH: S:\Benicia Stormdrain\Figure\_4(cis).mxd

**BROWN AND CALDWELL**

PROJECT: 124785-005  
DATE: 12/6/04

TITLE: Cis-1,2-DCE Concentrations in Storm Drain Catch Basins (September/October 2004)  
SITE: Benicia Arsenal, Benicia, California

**Figure 4**



PATH: S:\Benicia Stormdrain\Figures\TCE.mxd



PROJECT: 124785-005  
DATE: 12/6/04

TITLE: TCE Concentrations in Storm Drain Catch Basins (September/October 2004)  
SITE: Benicia Arsenal, Benicia, California

Figure 5

**ATTACHMENT A**

**September 2004 Storm Drain Sampling**

**ATTACHMENT A**  
**September 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
<b>BUILDING 165 GROUP</b>								
PZ-2	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	8750	MG/L	5	10
PZ-2	17-Sep-04	E300	CL	CHLORIDE (AS CL)	3860	MG/L	100	500
PZ-2	17-Sep-04	E300	SO4	SULFATE (AS SO4)	17.7	MG/L	2	20
PZ-2	17-Sep-04	SW6010B	CA	CALCIUM	120	MG/L	0.1	1
PZ-2	17-Sep-04	SW6010B	K	POTASSIUM	59.1	MG/L	1	5
PZ-2	17-Sep-04	SW6010B	MG	MAGNESIUM	203	MG/L	0.1	1
PZ-2	17-Sep-04	SW6010B	NA	SODIUM	2800	MG/L	5	20
PZ-2	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	2.5	UG/L	0.13	1
PZ-2	17-Sep-04	SW8260B	DCA11	1,1-DICHLOROETHANE	0.14	UG/L	0.12	1
PZ-2	17-Sep-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.56	UG/L	0.15	1
PZ-2	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	100	UG/L	1.3	10
PZ-2	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	54	UG/L	1.5	10
PZ-2	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	0.71	UG/L	0.15	1
PZ-2	17-Sep-04	SW8260B	VC	VINYL CHLORIDE	0.81	UG/L	0.25	1
B165SD01	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	7930	MG/L	5	10
B165SD01	17-Sep-04	E300	CL	CHLORIDE (AS CL)	3430	MG/L	100	500
B165SD01	17-Sep-04	E300	SO4	SULFATE (AS SO4)	255	MG/L	20	200
B165SD01	17-Sep-04	SW6010B	CA	CALCIUM	259	MG/L	0.1	1
B165SD01	17-Sep-04	SW6010B	K	POTASSIUM	23.3	MG/L	1	5
B165SD01	17-Sep-04	SW6010B	MG	MAGNESIUM	282	MG/L	0.1	1
B165SD01	17-Sep-04	SW6010B	NA	SODIUM	2050	MG/L	5	20
B165SD01	17-Sep-04	SW8260B	ACE	ACETONE	4.1	UG/L	1.9	10
B165SD01	17-Sep-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.16	UG/L	0.15	1
B165SD01	17-Sep-04	SW8260B	BZME	TOLUENE	0.13	UG/L	0.12	1
B165SD01	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	0.15	UG/L	0.13	1
B165SD01	17-Sep-04	SW8260B	CLBZ	CHLOROBENZENE	0.13	UG/L	0.12	1
B165SD01	17-Sep-04	SW8260B	CLEA	CHLOROETHANE	0.24	UG/L	0.18	2
B165SD01	17-Sep-04	SW8260B	DCE11	1,1-DICHLOROETHENE	2.8	UG/L	0.15	1

**ATTACHMENT A**  
**September 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B165SD01	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	630	UG/L	3.3	25
B165SD01	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	130	UG/L	3.8	25
B165SD01	17-Sep-04	SW8260B	ISOPRE	ISOPROPYL ETHER	1.1	UG/L	0.13	5
B165SD01	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	97	UG/L	3.9	25
B165SD01	17-Sep-04	SW8260B	TCLME	CHLOROFORM	0.35	UG/L	0.12	1
B165SD01	17-Sep-04	SW8260B	VC	VINYL CHLORIDE	94	UG/L	6.3	25
B165SD02	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	14900	MG/L	5	10
B165SD02	17-Sep-04	E300	CL	CHLORIDE (AS CL)	6960	MG/L	100	500
B165SD02	17-Sep-04	E300	SO4	SULFATE (AS SO4)	522	MG/L	20	200
B165SD02	17-Sep-04	SW6010B	CA	CALCIUM	444	MG/L	0.1	1
B165SD02	17-Sep-04	SW6010B	K	POTASSIUM	57.5	MG/L	1	5
B165SD02	17-Sep-04	SW6010B	MG	MAGNESIUM	491	MG/L	0.1	1
B165SD02	17-Sep-04	SW6010B	NA	SODIUM	3810	MG/L	5	20
B165SD02	17-Sep-04	SW8260B	BZME	TOLUENE	0.3	UG/L	0.12	1
B165SD02	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	1.9	UG/L	0.13	1
B165SD02	17-Sep-04	SW8260B	CLBZ	CHLOROBENZENE	0.82	UG/L	0.12	1
B165SD02	17-Sep-04	SW8260B	CLEA	CHLOROETHANE	0.51	UG/L	0.18	2
B165SD02	17-Sep-04	SW8260B	DCBZ12	1,2-DICHLOROBENZENE	0.45	UG/L	0.16	1
B165SD02	17-Sep-04	SW8260B	DCBZ14	1,4-DICHLOROBENZENE	0.17	UG/L	0.14	1
B165SD02	17-Sep-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.76	UG/L	0.15	1
B165SD02	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	680	UG/L	3.3	25
B165SD02	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	38	UG/L	0.15	1
B165SD02	17-Sep-04	SW8260B	ISOPRE	ISOPROPYL ETHER	0.27	UG/L	0.13	5
B165SD02	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	6.2	UG/L	0.15	1
B165SD02	17-Sep-04	SW8260B	VC	VINYL CHLORIDE	340	UG/L	6.3	25
B165SD03	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	11200	MG/L	5	10
B165SD03	17-Sep-04	E300	CL	CHLORIDE (AS CL)	5030	MG/L	100	500
B165SD03	17-Sep-04	E300	SO4	SULFATE (AS SO4)	196	MG/L	20	200
B165SD03	17-Sep-04	SW6010B	CA	CALCIUM	310	MG/L	0.1	1

**ATTACHMENT A**  
**September 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B165SD03	17-Sep-04	SW6010B	K	POTASSIUM	42.1	MG/L	1	5
B165SD03	17-Sep-04	SW6010B	MG	MAGNESIUM	355	MG/L	0.1	1
B165SD03	17-Sep-04	SW6010B	NA	SODIUM	2930	MG/L	5	20
B165SD03	17-Sep-04	SW8260B	BZME	TOLUENE	1	UG/L	0.12	1
B165SD03	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	0.34	UG/L	0.13	1
B165SD03	17-Sep-04	SW8260B	CLBZ	CHLOROBENZENE	0.32	UG/L	0.12	1
B165SD03	17-Sep-04	SW8260B	DCBZ12	1,2-DICHLOROBENZENE	0.17	UG/L	0.16	1
B165SD03	17-Sep-04	SW8260B	DCBZ14	1,4-DICHLOROBENZENE	0.17	UG/L	0.14	1
B165SD03	17-Sep-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.57	UG/L	0.15	1
B165SD03	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	170	UG/L	1.3	10
B165SD03	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	26	UG/L	0.15	1
B165SD03	17-Sep-04	SW8260B	ISOPRE	ISOPROPYL ETHER	1.2	UG/L	0.13	5
B165SD03	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	20	UG/L	0.15	1
B165SD03	17-Sep-04	SW8260B	TCLME	CHLOROFORM	0.19	UG/L	0.12	1
B165SD03	17-Sep-04	SW8260B	VC	VINYL CHLORIDE	65	UG/L	2.5	10
<b>BUILDING 56A/89 Group</b>								
B56ASD01	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	240	MG/L	5	10
B56ASD01	17-Sep-04	E300	CL	CHLORIDE (AS CL)	61.6	MG/L	1	5
B56ASD01	17-Sep-04	E300	SO4	SULFATE (AS SO4)	20.3	MG/L	2	20
B56ASD01	17-Sep-04	SW6010B	CA	CALCIUM	19.3	MG/L	0.1	1
B56ASD01	17-Sep-04	SW6010B	K	POTASSIUM	2.21	MG/L	1	5
B56ASD01	17-Sep-04	SW6010B	MG	MAGNESIUM	14.1	MG/L	0.1	1
B56ASD01	17-Sep-04	SW6010B	NA	SODIUM	59.5	MG/L	0.25	1
B56ASD01	17-Sep-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.41	UG/L	0.15	1
B56ASD01	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	0.19	UG/L	0.13	1
B56ASD01	17-Sep-04	SW8260B	DBCME	DIBROMOCHLOROMETHANE	0.2	UG/L	0.19	1
B56ASD01	17-Sep-04	SW8260B	DCA11	1,1-DICHLOROETHANE	0.23	UG/L	0.12	1
B56ASD01	17-Sep-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.22	UG/L	0.15	1
B56ASD01	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	9.9	UG/L	0.13	1

**ATTACHMENT A**  
**September 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B56ASD01	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	0.34	UG/L	0.15	1
B56ASD01	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	19	UG/L	0.15	1
B56ASD01	17-Sep-04	SW8260B	TCLME	CHLOROFORM	25	UG/L	0.12	1
B56ASD02	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	318	MG/L	5	10
B56ASD02	17-Sep-04	E300	CL	CHLORIDE (AS CL)	112	MG/L	10	50
B56ASD02	17-Sep-04	E300	SO4	SULFATE (AS SO4)	16.7	MG/L	2	20
B56ASD02	17-Sep-04	SW6010B	CA	CALCIUM	19.3	MG/L	0.1	1
B56ASD02	17-Sep-04	SW6010B	K	POTASSIUM	3.03	MG/L	1	5
B56ASD02	17-Sep-04	SW6010B	MG	MAGNESIUM	19.2	MG/L	0.1	1
B56ASD02	17-Sep-04	SW6010B	NA	SODIUM	88.8	MG/L	0.25	1
B56ASD02	17-Sep-04	SW8260B	106-94-5	1-BROMOPROPANE	1.4	UG/L	0	0
B56ASD02	17-Sep-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.51	UG/L	0.15	1
B56ASD02	17-Sep-04	SW8260B	DCA11	1,1-DICHLOROETHANE	0.15	UG/L	0.12	1
B56ASD02	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	7	UG/L	0.13	1
B56ASD02	17-Sep-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	0.28	UG/L	0.15	1
B56ASD02	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	12	UG/L	0.15	1
B56ASD02	17-Sep-04	SW8260B	TCLME	CHLOROFORM	25	UG/L	0.12	1
B057AHP005 (PZ)	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	6050	MG/L	5	10
B057AHP005 (PZ)	17-Sep-04	E300	CL	CHLORIDE (AS CL)	2430	MG/L	100	500
B057AHP005 (PZ)	17-Sep-04	SW6010B	CA	CALCIUM	110	MG/L	0.1	1
B057AHP005 (PZ)	17-Sep-04	SW6010B	K	POTASSIUM	50.2	MG/L	1	5
B057AHP005 (PZ)	17-Sep-04	SW6010B	MG	MAGNESIUM	195	MG/L	0.1	1
B057AHP005 (PZ)	17-Sep-04	SW6010B	NA	SODIUM	1780	MG/L	5	20
B057AHP005 (PZ)	17-Sep-04	SW8260B	ACE	ACETONE	4.6	UG/L	1.9	10
B057AHP005 (PZ)	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	4.9	UG/L	0.13	1
B057AHP005 (PZ)	17-Sep-04	SW8260B	DCA11	1,1-DICHLOROETHANE	0.21	UG/L	0.12	1
B057AHP005 (PZ)	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	0.51	UG/L	0.13	1
B057AHP005 (PZ)	17-Sep-04	SW8260B	EBZ	ETHYLBENZENE	0.15	UG/L	0.11	1
B057AHP005 (PZ)	17-Sep-04	SW8260B	XYLO	O-XYLENE	0.17	UG/L	0.12	1

**ATTACHMENT A**  
**September 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B089SD01	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	1470	MG/L	5	10
B089SD01	17-Sep-04	E300	CL	CHLORIDE (AS CL)	673	MG/L	10	50
B089SD01	17-Sep-04	E300	SO4	SULFATE (AS SO4)	112	MG/L	2	20
B089SD01	17-Sep-04	SW6010B	CA	CALCIUM	32.8	MG/L	0.1	1
B089SD01	17-Sep-04	SW6010B	K	POTASSIUM	9.73	MG/L	1	5
B089SD01	17-Sep-04	SW6010B	MG	MAGNESIUM	35.7	MG/L	0.1	1
B089SD01	17-Sep-04	SW6010B	NA	SODIUM	239	MG/L	0.25	1
B089SD01	17-Sep-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.4	UG/L	0.15	1
B089SD01	17-Sep-04	SW8260B	DBCME	DIBROMOCHLOROMETHANE	0.25	UG/L	0.19	1
B089SD01	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	7.9	UG/L	0.13	1
B089SD01	17-Sep-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	4.9	UG/L	0.15	1
B089SD01	17-Sep-04	SW8260B	TCLME	CHLOROFORM	9.8	UG/L	0.12	1
B089SD01	17-Sep-04	SW8260B	VC	VINYL CHLORIDE	0.91	UG/L	0.25	1
PZ-5	17-Sep-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	6400	MG/L	5	10
PZ-5	17-Sep-04	E300	CL	CHLORIDE (AS CL)	2820	MG/L	100	500
PZ-5	17-Sep-04	SW6010B	CA	CALCIUM	146	MG/L	0.1	1
PZ-5	17-Sep-04	SW6010B	K	POTASSIUM	62.9	MG/L	1	5
PZ-5	17-Sep-04	SW6010B	MG	MAGNESIUM	288	MG/L	0.1	1
PZ-5	17-Sep-04	SW6010B	NA	SODIUM	2360	MG/L	5	20
PZ-5	17-Sep-04	SW8260B	20536-40-7		0.75	UG/L	0	0
PZ-5	17-Sep-04	SW8260B	ACE	ACETONE	2.7	UG/L	1.9	10
PZ-5	17-Sep-04	SW8260B	CDS	CARBON DISULFIDE	2.4	UG/L	0.13	1
PZ-5	17-Sep-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	0.14	UG/L	0.13	1

**ATTACHMENT B**

**October 2004 Storm Drain Sampling**

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
<b>BUILDING 165 GROUP</b>								
CitySD02	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	114	MG/L	5	10
CitySD02	28-Oct-04	E300	CL	CHLORIDE (AS CL)	4.52	MG/L	0.1	0.5
CitySD02	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.237	MG/L	0.05	0.2
CitySD02	28-Oct-04	E300	SO4	SULFATE (AS SO4)	18.2	MG/L	0.2	2
CitySD02	28-Oct-04	E300	SO4	SULFATE (AS SO4)	119	MG/L	2	20
CitySD02	28-Oct-04	SW6010B	CA	CALCIUM	17.5	MG/L	0.1	1
CitySD02	28-Oct-04	SW6010B	MG	MAGNESIUM	3.49	MG/L	0.1	1
CitySD02	28-Oct-04	SW6010B	NA	SODIUM	7.63	MG/L	0.25	1
CitySD02	28-Oct-04	SW8260B	ACE	ACETONE	4.2	UG/L	1.9	10
CitySD02	28-Oct-04	SW8260B	BZME	TOLUENE	0.32	UG/L	0.12	1
CitySD02	28-Oct-04	SW8260B	TMB124	1,2,4-TRIMETHYLBENZENE	0.2	UG/L	0.14	1
B165SD01	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	564	MG/L	5	10
B165SD01	28-Oct-04	E300	CL	CHLORIDE (AS CL)	131	MG/L	5	25
B165SD01	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.48	MG/L	0.05	0.2
B165SD01	28-Oct-04	E300	SO4	SULFATE (AS SO4)	99	MG/L	2	20
B165SD01	28-Oct-04	SW6010B	CA	CALCIUM	52.1	MG/L	0.1	1
B165SD01	28-Oct-04	SW6010B	K	POTASSIUM	3.44	MG/L	1	5
B165SD01	28-Oct-04	SW6010B	MG	MAGNESIUM	30.6	MG/L	0.1	1
B165SD01	28-Oct-04	SW6010B	NA	SODIUM	125	MG/L	0.25	1
B165SD01	28-Oct-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.52	UG/L	0.15	1
B165SD01	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	170	UG/L	13	100
B165SD01	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	13	UG/L	0.15	1
B165SD01	28-Oct-04	SW8260B	PCE	TETRACHLOROETHYLENE	1.3	UG/L	0.18	1
B165SD01	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE	860	UG/L	15	100
B165SD01	28-Oct-04	SW8260B	TCLME	CHLOROFORM	0.38	UG/L	0.12	1
B165SD01	28-Oct-04	SW8260B	VC	VINYL CHLORIDE	9.8	UG/L	0.25	1
B165SD03	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	1210	MG/L	5	10

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B165SD03	28-Oct-04	E300	CL	CHLORIDE (AS CL)	431	MG/L	10	50
B165SD03	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.894	MG/L	0.05	0.2
B165SD03	28-Oct-04	E300	SO4	SULFATE (AS SO4)	156	MG/L	2	20
B165SD03	28-Oct-04	SW6010B	CA	CALCIUM	75.9	MG/L	0.1	1
B165SD03	28-Oct-04	SW6010B	K	POTASSIUM	6.72	MG/L	1	5
B165SD03	28-Oct-04	SW6010B	MG	MAGNESIUM	62.9	MG/L	0.1	1
B165SD03	28-Oct-04	SW6010B	NA	SODIUM	327	MG/L	0.25	1
B165SD03	28-Oct-04	SW8260B	ACE	ACETONE	2.2	UG/L	1.9	10
B165SD03	28-Oct-04	SW8260B	BZME	TOLUENE	0.45	UG/L	0.12	1
B165SD03	28-Oct-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.32	UG/L	0.15	1
B165SD03	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	97	UG/L	6.6	50
B165SD03	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	8.1	UG/L	0.15	1
B165SD03	28-Oct-04	SW8260B	PCE	TETRACHLOROETHYLENE	0.79	UG/L	0.18	1
B165SD03	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	410	UG/L	7.8	50
B165SD03	28-Oct-04	SW8260B	TCLME	CHLOROFORM	0.46	UG/L	0.12	1
B165SD03	28-Oct-04	SW8260B	VC	VINYL CHLORIDE	6.2	UG/L	0.25	1
B165SD05	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	1270	MG/L	5	10
B165SD05	28-Oct-04	E300	CL	CHLORIDE (AS CL)	248	MG/L	10	50
B165SD05	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.571	MG/L	0.05	0.2
B165SD05	28-Oct-04	E300	SO4	SULFATE (AS SO4)	286	MG/L	20	200
B165SD05	28-Oct-04	SW6010B	CA	CALCIUM	126	MG/L	0.1	1
B165SD05	28-Oct-04	SW6010B	K	POTASSIUM	6.22	MG/L	1	5
B165SD05	28-Oct-04	SW6010B	MG	MAGNESIUM	55.7	MG/L	0.1	1
B165SD05	28-Oct-04	SW6010B	NA	SODIUM	208	MG/L	0.25	1
B165SD05	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	2.2	UG/L	0.13	1
B165SD05	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	2.6	UG/L	0.15	1
B165SD05	28-Oct-04	SW8260B	TCLME	CHLOROFORM	0.52	UG/L	0.12	1
B165SD20	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	682	MG/L	5	10

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B165SD20	28-Oct-04	E300	CL	CHLORIDE (AS CL)	145	MG/L	2.5	12.5
B165SD20	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.13	MG/L	0.05	0.2
B165SD20	28-Oct-04	E300	SO4	SULFATE (AS SO4)	221	MG/L	5	50
B165SD20	28-Oct-04	SW6010B	CA	CALCIUM	89.9	MG/L	0.1	1
B165SD20	28-Oct-04	SW6010B	K	POTASSIUM	4.51	MG/L	1	5
B165SD20	28-Oct-04	SW6010B	MG	MAGNESIUM	51.5	MG/L	0.1	1
B165SD20	28-Oct-04	SW6010B	NA	SODIUM	131	MG/L	0.25	1
B165SD20	28-Oct-04	SW8260B	CDS	CARBON DISULFIDE	0.23	UG/L	0.13	1
B165SD20	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	5.2	UG/L	0.13	1
B165SD20	28-Oct-04	SW8260B	ISOPRE	ISOPROPYL ETHER	0.34	UG/L	0.13	5
B165SD20	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	2.2	UG/L	0.15	1
<b>BUILDING 91/161 GROUP</b>								
B091SD02	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	986	MG/L	5	10
B091SD02	28-Oct-04	E300	CL	CHLORIDE (AS CL)	90.5	MG/L	2.5	12.5
B091SD02	28-Oct-04	E300	NO2N	NITROGEN, NITRITE (AS N)	0.152	MG/L	0.05	0.2
B091SD02	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.56	MG/L	0.05	0.2
B091SD02	28-Oct-04	E300	SO4	SULFATE (AS SO4)	242	MG/L	5	50
B091SD02	28-Oct-04	SW6010B	CA	CALCIUM	98.3	MG/L	0.1	1
B091SD02	28-Oct-04	SW6010B	K	POTASSIUM	1.5	MG/L	1	5
B091SD02	28-Oct-04	SW6010B	MG	MAGNESIUM	53.1	MG/L	0.1	1
B091SD02	28-Oct-04	SW6010B	NA	SODIUM	167	MG/L	0.25	1
B091SD02	28-Oct-04	SW8260B	ACE	ACETONE	2.9	UG/L	1.9	10
B091SD02	28-Oct-04	SW8260B	DCBZ14	1,4-DICHLOROBENZENE	0.7	UG/L	0.14	1
B091SD02	28-Oct-04	SW8260B	DCE11	1,1-DICHLOROETHENE	0.16	UG/L	0.15	1
B091SD02	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	9.1	UG/L	0.13	1
B091SD02	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	0.69	UG/L	0.15	1
B091SD02	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	11	UG/L	0.15	1
B091SD02	28-Oct-04	SW8260B	TCLME	CHLOROFORM	0.12	UG/L	0.12	1

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B091SD02	28-Oct-04	SW8260B	VC	VINYL CHLORIDE	0.32	UG/L	0.25	1
B091SD04	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	910	MG/L	5	10
B091SD04	28-Oct-04	E300	CL	CHLORIDE (AS CL)	68.1	MG/L	2.5	12.5
B091SD04	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.19	MG/L	0.05	0.2
B091SD04	28-Oct-04	E300	SO4	SULFATE (AS SO4)	229	MG/L	5	50
B091SD04	28-Oct-04	SW6010B	CA	CALCIUM	105	MG/L	0.1	1
B091SD04	28-Oct-04	SW6010B	MG	MAGNESIUM	54.3	MG/L	0.1	1
B091SD04	28-Oct-04	SW6010B	NA	SODIUM	154	MG/L	0.25	1
B091SD04	28-Oct-04	SW8260B	ACE	ACETONE	3.3	UG/L	1.9	10
B161SD02	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	970	MG/L	5	10
B161SD02	28-Oct-04	E300	CL	CHLORIDE (AS CL)	107	MG/L	2.5	12.5
B161SD02	28-Oct-04	E300	NO2N	NITROGEN, NITRITE (AS N)	0.163	MG/L	0.05	0.2
B161SD02	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.41	MG/L	0.05	0.2
B161SD02	28-Oct-04	E300	SO4	SULFATE (AS SO4)	239	MG/L	2	20
B161SD02	28-Oct-04	SW6010B	CA	CALCIUM	95.1	MG/L	0.1	1
B161SD02	28-Oct-04	SW6010B	K	POTASSIUM	5.82	MG/L	1	5
B161SD02	28-Oct-04	SW6010B	MG	MAGNESIUM	54	MG/L	0.1	1
B161SD02	28-Oct-04	SW6010B	NA	SODIUM	168	MG/L	0.25	1
B161SD02	28-Oct-04	SW8260B	ACE	ACETONE	3.7	UG/L	1.9	10
B161SD02	28-Oct-04	SW8260B	DCBZ14	1,4-DICHLOROETHYLENE	0.68	UG/L	0.14	1
B161SD02	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	5.4	UG/L	0.13	1
B161SD02	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHYLENE	0.34	UG/L	0.15	1
B161SD02	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	5.1	UG/L	0.15	1
B161SD02	28-Oct-04	SW8260B	TCLME	CHLOROFORM	0.38	UG/L	0.12	1
B161SD02	28-Oct-04	SW8270C	15687-27-1	IBUPROFEN	4.2	UG/L	0	0
B161SD02	28-Oct-04	SW8270C	57-10-3	N-HEXADECANOIC ACID	5.3	UG/L	0	0
B161SD02	28-Oct-04	SW8270C	58-08-2	CAFFEINE	6.6	UG/L	0	0
<b>BUILDING 116 GROUP</b>								

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
B116SD01	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	114	MG/L	5	10
B116SD01	28-Oct-04	E300	CL	CHLORIDE (AS CL)	147	MG/L	5	25
B116SD01	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.674	MG/L	0.05	0.2
B116SD01	28-Oct-04	E300	SO4	SULFATE (AS SO4)	74.4	MG/L	2	20
B116SD01	28-Oct-04	SW6010B	CA	CALCIUM	41.4	MG/L	0.1	1
B116SD01	28-Oct-04	SW6010B	K	POTASSIUM	3.24	MG/L	1	5
B116SD01	28-Oct-04	SW6010B	MG	MAGNESIUM	27.5	MG/L	0.1	1
B116SD01	28-Oct-04	SW6010B	NA	SODIUM	121	MG/L	0.25	1
B116SD01	28-Oct-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.41	UG/L	0.15	1
B116SD01	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	3.5	UG/L	0.13	1
B116SD01	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	0.24	UG/L	0.15	1
B116SD01	28-Oct-04	SW8260B	ISOPRE	ISOPROPYL ETHER	0.31	UG/L	0.13	5
B116SD01	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	11	UG/L	0.15	1
B116SD01	28-Oct-04	SW8260B	TCLME	CHLOROFORM	2.2	UG/L	0.12	1
Sump1GR01	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	928	MG/L	5	10
Sump1GR01	28-Oct-04	E300	CL	CHLORIDE (AS CL)	290	MG/L	10	50
Sump1GR01	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.991	MG/L	0.05	0.2
Sump1GR01	28-Oct-04	SW6010B	CA	CALCIUM	71.9	MG/L	0.1	1
Sump1GR01	28-Oct-04	SW6010B	K	POTASSIUM	6.19	MG/L	1	5
Sump1GR01	28-Oct-04	SW6010B	MG	MAGNESIUM	43.4	MG/L	0.1	1
Sump1GR01	28-Oct-04	SW6010B	NA	SODIUM	222	MG/L	0.25	1
Sump1GR01	28-Oct-04	SW8260B	CLBZ	CHLOROBENZENE	1.1	UG/L	0.12	1
Sump1GR01	28-Oct-04	SW8260B	DCBZ14	1,4-DICHLOROBENZENE	0.36	UG/L	0.14	1
Sump1GR01	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	11	UG/L	0.13	1
Sump1GR01	28-Oct-04	SW8260B	DCE12T	trans-1,2-DICHLOROETHENE	0.72	UG/L	0.15	1
Sump1GR01	28-Oct-04	SW8260B	ISOPRE	ISOPROPYL ETHER	0.22	UG/L	0.13	5
Sump1GR01	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	31	UG/L	0.15	1
Sump1GR01	28-Oct-04	SW8260B	TCLME	CHLOROFORM	1	UG/L	0.12	1

**ATTACHMENT B**  
**October 2004 Storm Drain Sampling Detected Water Results**  
**Former Benicia Arsenal, Benicia, California**

Sample Name	Sample Date	Analytical Method	Analyte	Analyte Name	Result	Units	Detection Limit	Reporting Limit
Sump1GR01	28-Oct-04	SW8260B	VC	VINYL CHLORIDE	0.64	UG/L	0.25	1
<b>BUILDING 56A/89 Group</b>								
B089SD01	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	660	MG/L	5	10
B089SD01	28-Oct-04	E300	CL	CHLORIDE (AS CL)	205	MG/L	5	25
B089SD01	28-Oct-04	E300	NO3N	NITRATE (AS N)	1.39	MG/L	0.05	0.2
B089SD01	28-Oct-04	E300	SO4	SULFATE (AS SO4)	70.7	MG/L	2	20
B089SD01	28-Oct-04	SW6010B	CA	CALCIUM	36.6	MG/L	0.1	1
B089SD01	28-Oct-04	SW6010B	K	POTASSIUM	6.96	MG/L	1	5
B089SD01	28-Oct-04	SW6010B	MG	MAGNESIUM	28.5	MG/L	0.1	1
B089SD01	28-Oct-04	SW6010B	NA	SODIUM	165	MG/L	0.25	1
B089SD01	28-Oct-04	SW8260B	BDCME	BROMODICHLOROMETHANE	0.22	UG/L	0.15	1
B089SD01	28-Oct-04	SW8260B	DCE12C	cis-1,2-DICHLOROETHYLENE	7	UG/L	0.13	1
B089SD01	28-Oct-04	SW8260B	ISOPRE	ISOPROPYL ETHER	0.24	UG/L	0.13	5
B089SD01	28-Oct-04	SW8260B	TCE	TRICHLOROETHYLENE (TCE)	5.4	UG/L	0.15	1
B089SD01	28-Oct-04	SW8260B	TCLME	CHLOROFORM	5	UG/L	0.12	1
B089SD01	28-Oct-04	SW8260B	VC	VINYL CHLORIDE	0.86	UG/L	0.25	1
B089SD02	28-Oct-04	E160.1	TDS	TOTAL DISSOLVED SOLIDS	204	MG/L	5	10
B089SD02	28-Oct-04	E300	CL	CHLORIDE (AS CL)	18.6	MG/L	1	5
B089SD02	28-Oct-04	E300	NO3N	NITRATE (AS N)	0.471	MG/L	0.05	0.2
B089SD02	28-Oct-04	E300	SO4	SULFATE (AS SO4)	46.3	MG/L	2	20
B089SD02	28-Oct-04	SW6010B	CA	CALCIUM	17.7	MG/L	0.1	1
B089SD02	28-Oct-04	SW6010B	K	POTASSIUM	2.73	MG/L	1	5
B089SD02	28-Oct-04	SW6010B	MG	MAGNESIUM	12.5	MG/L	0.1	1
B089SD02	28-Oct-04	SW6010B	NA	SODIUM	38.4	MG/L	0.25	1
B089SD02	28-Oct-04	SW8260B	BDCME	BROMODICHLOROMETHANE	1	UG/L	0.15	1
B089SD02	28-Oct-04	SW8260B	DBCME	DIBROMOCHLOROMETHANE	0.36	UG/L	0.19	1
B089SD02	28-Oct-04	SW8260B	TCLME	CHLOROFORM	4.1	UG/L	0.12	1