



Memorandum

To: Rick Whetsel, SAWPA

*From: Richard Meyerhoff, CDM
Thomas Lo, CDM*

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Subject: QA/QC Report for MSAR Pathogen TMDL BMP Implementation Project

This technical memorandum serves as the Quality Assurance/Quality Control (QA/QC) report for the Middle Santa Ana River (MSAR) Pathogen TMDL BMP Implementation Project. This report evaluates QA/QC for water quality data collected under the following monitoring programs: Watershed-wide Compliance¹, Urban Source Evaluation Plan (USEP), and the BMP Pilot Study. The basis for this evaluation is the Quality Assurance Project Plan (QAPP) approved for this project.

Field data were checked to ensure that all necessary data and activities were completed; including collection of all water samples, field blanks, and field duplicates. This review was conducted to ensure correct units of measurements were reported, and that reported values were within expected ranges.

Laboratory analysis was conducted for four water quality constituents: fecal coliform, *E. coli*, *Bacteroides*, and total suspended solids (TSS). Data validation included a check to ensure that samples were delivered to laboratories within required holding times and that all sample handling and custody protocols were followed. In addition, validation of water quality analysis results involved a review of 10% of all laboratory water quality analysis reports. The review verified that all required parameters were measured and reported in the correct units, and that results fell within expected ranges.

This report discusses each of the monitoring programs conducted under the Grant project. Quality assurance issues reported below include a highlighted discussion of sample frequency and issues related to missed samples. The report also highlights field sampling quality control for field blanks and field duplicates.

¹ The Grant Project only funded watershed-wide compliance monitoring for the 2007 dry season and 2007-2008 wet season (including storm event sampling). However, this report includes additional information for 2008 and 2009 because data from this sample period was used in a Grant Project deliverable.

Watershed-Wide Compliance Monitoring

Sample Frequency

Table 1 describes the number of samples planned for collection versus the actual number collected for the Watershed-wide Compliance Monitoring Program. For the 2007 dry season, the Icehouse Canyon (WW-C1) sampling location was dry on 15 site visits which resulted in collection of 75 of 90 planned samples.

The 2008 dry season sampling included a single missed sample because of a road closure in Icehouse Canyon due to a fire. During 2008, dry season sampling began as scheduled. However, laboratory contract issues, which prevented the laboratory from accepting samples for analysis, resulted in the suspension of sampling for a six week period from the week of July 20 through the end of August. Once the contract issues were resolved, weekly sample collection resumed the week of September 1. To ensure the collection of 20 warm, dry season samples in 2008 (as required by the Monitoring Plan), the TMDL Task Force (which provides oversight to the monitoring program) agreed to extend the dry season sample period into the first week of November.

With Santa Ana Regional Water Quality Control Board (SARWQCB) approval, Icehouse Canyon was eliminated as a compliance monitoring site prior to the 2009 dry season. The monitoring program collected all 100 planned samples.

Table 1. Summary of Watershed-Wide Compliance Water Sample Collection Activity

Sample Period	Planned	Collected	Site Dry	Sample Missed
Dry Season 2007	90	75	15 ¹	0
Dry season 2008	120	119	0	1 ²
Dry Season 2009	100 ³	100	0	0
Wet Season 2007-08	60	50	10 ¹	0
Storm Event Sampling 2007-08	24	20	4 ¹	0
Wet Season 2008-09	66	66	0	0
Storm Event Sampling 2008-09	24	24	0	0

¹ Icehouse Canyon (WW-C1) was dry- no sample collected

² Sample missed - road closure in Icehouse Canyon due to fire

³ Icehouse Canyon sample site was eliminated – decision approved by RWQCB

Field Blanks/Field Duplicates

For the Watershed-wide Compliance Monitoring Program, the QAPP called for a single field blank to be collected for each sample event (weekly). Eighty-three (83) field blanks were collected in total, in accordance with the required frequency. Field blank results were all below detectable counts (< 9 cfu/100mL) for *E. coli* and fecal coliform, except for a single field blank sample which showed an *E.coli* result of 70 cfu/100mL. For TSS, all field blanks were below the target reporting limit (1.0 mg/L) except for 4 samples which showed results above the target reporting limit (1.33, 1.50, 2.75, and 10.0 mg/L).

For field duplicates, the QAPP called for a field duplicate to be collected for at least 5% of the total number of samples. Field duplicates were collected well above this required frequency at 16% of total samples collected.

Urban Source Evaluation Plan Monitoring

Sample Frequency

The USEP monitoring program was evaluated based on planned sample frequency versus actual samples collected (Table 2). For the 2007 dry season, of 130 samples planned, 111 samples were collected. Eighteen (18) samples were not collected due to dry site conditions plus a single sample was not collected due to lack of access to the sample site. During the 2007-08 wet season sampling, of 78 planned samples, 15 samples were not collected due to dry site conditions. During storm event sampling, 44 of 52 planned samples were collected. Four samples were not collected due to a locked gate.

Table 2. Summary of USEP Water Sample Collection Activity

Sample Period	Planned	Collected	Site Dry	Sample Missed
Dry Season 2007	130	111	18 ¹	1 ²
Wet Season 2007-08	78	63	15 ³	0
Storm Event Sampling 2007-08	52	44	4	4 ⁴

¹ Santa Ana River at La Cadena (US-SAR), Day Creek (US-DAY), and San Sevaine Channel (US-SSCH) – dry site conditions; no samples collected dry

² San Antonia Channel (US-SACH) - access problem issue

³ County Line Channel (US-CLCH), Cypress Channel at Kimball (US-CYP), and US-SAR – dry site conditions, no samples collected

⁴ Access issue – gate locked at US-CLCH

Field Blanks/Field Duplicates

The QAPP requires a single field blank to be collected for each sample event (weekly event). Twenty field blanks were collected in total in accordance with the required frequency. Field

blank results were all below detectable counts (<9 cfu/100mL) for *E. coli*, fecal coliform, and *Bacteroides*.

For TSS, all field blanks were below the target reporting limit (1.0 mg/L) except for a single sample which showed a result above the target reporting limit. This field blank (US-TEM, 8/28/07) showed a result of 4 mg/L.

The QAPP requires that field duplicate be collected for at least 5% of the total number of samples. Field duplicates were collected well above this required frequency at 9% of total samples collected.

BMP Pilot Study

Sample Frequency

The BMP Pilot Study was evaluated based on planned samples versus actual samples collected at BMP monitoring sites (Table 3). For dry weather sampling, 106 samples were collected with 74 samples missed due to dry conditions. For wet weather, of 172 samples planned, 112 samples were collected. Dry (no flow) conditions at BMP sites accounted for 36 samples not being collected. Twenty-four samples were missed due to a combination of site access and logistical challenges in meeting holding times for bacteria analyses. During a wet weather event, the Bioswale BMP site was by-passed in order to deliver samples to the laboratory so as not to jeopardize meeting holding times for samples already collected at other BMP sites.

Table 3. Summary of number of water sample collected for BMP Pilot Study during dry and wet weather conditions

Sample Period	Planned	Collected	Site Dry	Sample Missed
Dry Weather	180	106	74 ¹	0
Wet Weather	136	112	24 ²	0

¹ No flow or insufficient flow during time of dry weather sample event

² No flow or insufficient flow during time of wet weather sample event

Field Blanks/Field Duplicates

The QAPP requires a single field blank to be collected for each sample event (weekly event). Four field blanks were collected for nine sample events. Field blank results were all below detectable counts (< 9 cfu/100mL) for *E. coli* and fecal coliform.

For TSS, all field blanks results were below the target reporting limit of 1.0 mg/L. For field duplicates, the QAPP requires for a field duplicate to be collected for at least 5% of the total number of samples. Field duplicates were collected at the 5% required frequency.

Evaluation of Field Duplicates Pairs

In addition to reviewing that required field duplicates were collected for each monitoring program, all monitoring studies were evaluated to examine how field duplicates compared to its sample pair in meeting absolute percent difference control limits of 25%. Figure 1 indicates that for *E.coli*, approximately 65% of duplicate pairs met the control limit (approximately 35% did not). For fecal coliform, 75% of duplicate pairs met the control limit (25% did not). For TSS, 95% of duplicate pairs met the control limit (5% did not).

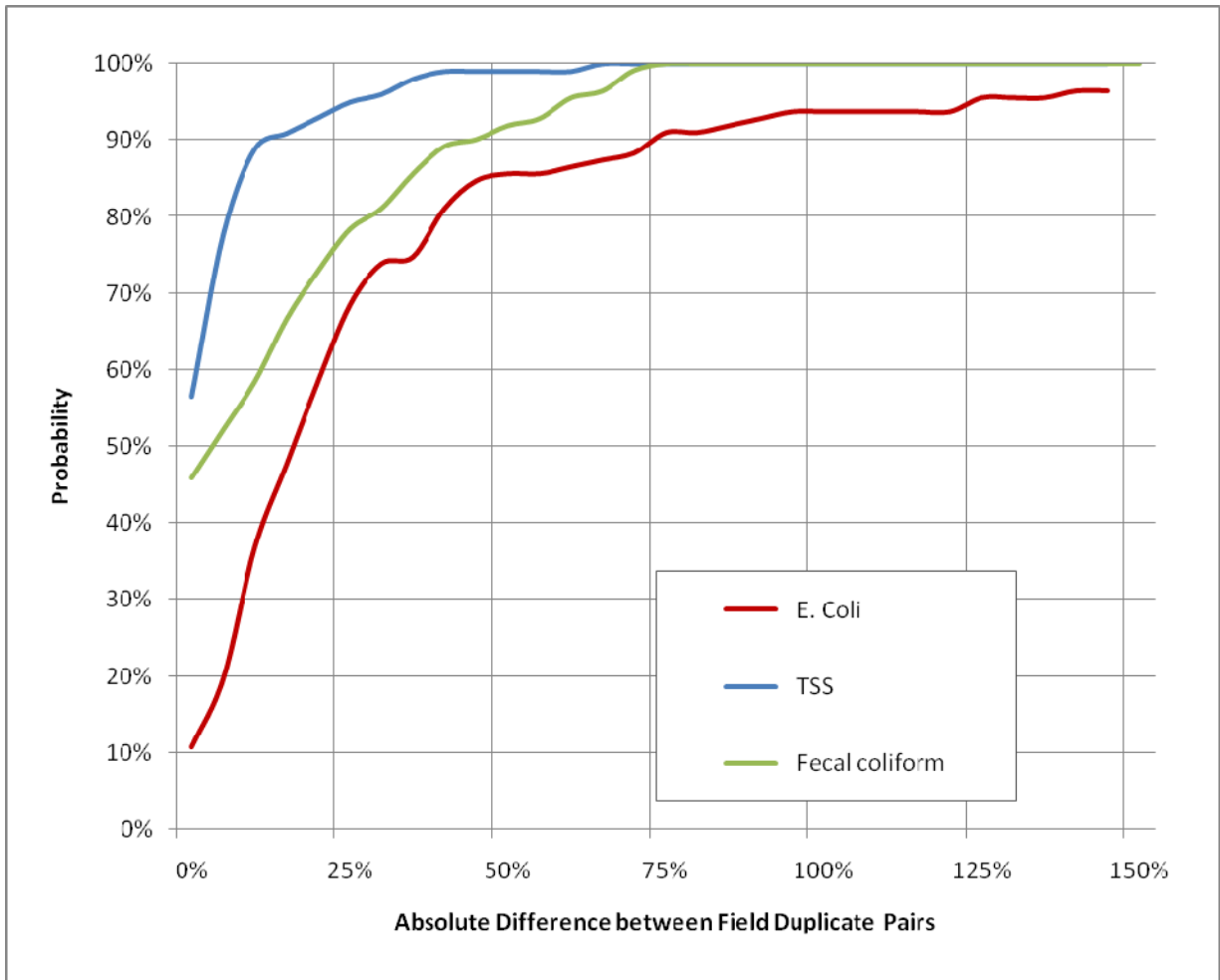


Figure 1
Evaluation of Field Duplicate Pairs