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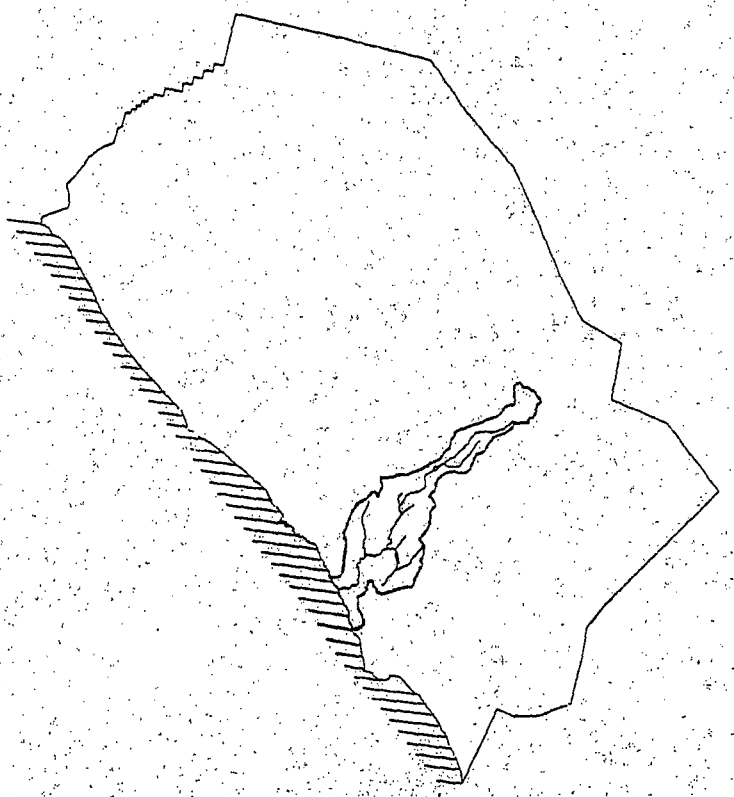
Aliso Creek Water Quality Planning Study

(Full Report w/ J. Haas)

DRAFT FINAL REPORT
ALISO CREEK 205(j) WATER QUALITY PLANNING STUDY

Agreement No. 7-042-250-0
June 2000



parts of Orange County it is expected that organophosphate pesticides are a significant component of the aquatic toxicity in the storm samples in Aliso Creek.

9.6 Bacteriological Water Quality Data Analysis

9.6.1 Water Quality Objectives for Bacteria

Aliso Creek is designated as having REC-1 (contact recreation) and REC-2 (non-contact recreation) beneficial uses at the creek mouth, and a REC-2 beneficial use upstream in the creek and in the Sulphur Creek, Wood Canyon, and English Canyon tributaries (with a potential REC-1 beneficial use in the creek and the same tributaries). The lower mile of Aliso Creek is listed as impaired (303(d)) because of bacteria (1996 Water Quality Assessment) and there is ongoing community concern related to periodic high bacteriological levels at Aliso Beach.

The water quality objectives for REC-1 and REC-2 are based on fecal coliform levels. They are specified in the Basin Plan as follows:

1. **REC-1**: 'fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log (geometric) mean of 200 MPN/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 MPN/100 ml' (Basin Plan, page 3-5).

2. **REC-2**: 'in waters designated for non-contact recreation (REC-2) and not designated for contact recreation (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2,000 MPN/ 100 ml nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000 MPN/100 ml' (Basin Plan, page 3-5).

The water quality objectives for non-contact recreation (REC-2) are based on arithmetic rather than geometric means.

The Basin Plan also indicates that E. coli and enterococcus criteria may be employed in special studies to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation. The objectives for infrequently used freshwater contact recreation waters are 151 colonies per 100 ml (CFU/ 100 ml) for enterococcus and 576 MPN/ 100 ml for E. coli. The objectives for designated beach recreation use are 61 CFU/ 100 ml for enterococcus and 235 MPN/ 100 ml for E. coli.

During the initial water quality investigation (September – December 1998), the County of Orange Health Care Agency (HCA) Public Health Laboratory analyzed all of the samples for total and fecal coliform. Subsequent to the initial water quality investigation and prior to the intensive watershed and J03P02 subwatershed studies, the HCA laboratory revised their testing procedures to produce results that were consistent with new ocean water contact standards (AB 411). This meant that instead of analyzing

bacteriological samples for total and fecal coliform, they now analyzed all bacteriological samples for total coliform, E. Coli and enterococcus.

The relationship between E. coli and fecal coliform indicators is imprecisely defined however; it is generally accepted that E. coli bacteria comprise approximately 80 – 90 % of the fecal coliform organisms in a typical surface water sample. General comparisons of E. coli levels with the REC-2 fecal coliform objectives outlined above are made in the following sections in order to provide additional perspective on the bacteriological results. Such comparisons should be interpreted carefully, recognizing that the objective is not based on E. coli.

9.6.2 Bacteriological Investigations of Aliso Creek and Tributaries 1998 - 2000

The initial and subsequent intensive watershed studies of the Aliso Creek watershed assessed bacteriological contamination at a total of twelve sites in the watershed including five locations along Aliso Creek, six tributaries of the creek, and the J03P02 tributary to Sulphur Creek. Six sites were sampled during the initial investigation (**Figure 9.1**) and twelve sites were sampled during the subsequent intensive watershed study (**Figure 9.3**).

Subsequent monitoring during the Dairy Fork sampling (four sites) (**Figure 9.6**), and the Sulphur Creek/ J03P02 sampling (three sites) (**Figure 9.7**) during early 2000 provided additional information on the bacteriological status of the Aliso Creek watershed.

The bacteriological results of the initial water quality investigation (September – December 1998) are presented in **Table 9.12**. Fecal coliform concentrations in Aliso Creek watershed exceeded the REC-2 guidelines on several occasions at the sampled sites during the initial water quality investigation.

The highest average total and fecal coliform bacteria levels during the September – December 1998 period were observed at the J03P02 tributary to Sulphur Creek. The lowest bacteria levels, which met REC-2 guidelines, occurred at the Aliso Creek @ Cook's Corner site in the comparatively rural, upper watershed. Bacteria levels were highest during the September – October period and appeared to decrease during November and December. This trend was generally evident at each of the sixsampling locations.

The intensive watershed study (June 3 – August 5, 1999) was intended to determine whether any tributary subwatersheds within the Aliso Creek watershed were experiencing elevated levels of bacterial indicators. The results of this study are presented in **Table 9.13**.

Included in **Table 9.13** are the log mean and arithmetic mean concentrations of total coliform, E. Coli, and enterococcus at each sampling location during the period of the intensive watershed investigation. All reported values of total coliform, E. coli, and enterococcus were used in calculating the averages. For values below the reporting

detection limits (RDL), the RDL was used in the log and arithmetic mean calculations. With the exception of the location at the PCH bridge, mean total coliform levels in the intensive watershed investigation were similar or substantially higher than in the initial investigation.

Figure 9.11 is a graphical depiction of the arithmetic mean concentrations of total coliform, E. coli, and enterococcus at each sampling location during the intensive watershed investigation. The furthest upstream station is at the top of the plot and the mouth of the creek is at the bottom. The bars representing the total coliform concentrations are the most useful in comparing bacterial water quality between sampling locations because the E. coli and enterococcus levels used to generate the arithmetic mean values were below the detection limits of 1000 MPN/ 100 ml for E. Coli and 1000 CFU/ 100 ml for enterococcus for many locations.

The mean total coliform in the creek appears to increase after the confluence with each major tributary down to and including the Aliso Creek downstream Aliso Hills and Dairy Fork sampling site. After the confluence with Sulphur Creek the total coliform levels decrease. This same pattern can also be seen in the initial investigation data. The decrease may be the result of the high dissolved solids from Sulphur Creek contributing to the mortality of coliform bacteria. It should also be noted that the mean total coliform level in Aliso Creek downstream of the Dairy Fork and Aliso Hills Channels is much greater than the total coliform levels recorded for the two tributaries. This may be indicative of the high variability of the bacteriological data. One to three orders of magnitude fluctuations in total coliform levels were commonly observed at the sampling site downstream of Dairy Fork and Aliso Hills Channel during the study period. The high total coliform levels in Aliso Creek downstream of the Dairy Fork and Aliso Hills Channels may also be explained by unidentified sources of high total coliform between English Canyon Channel and Aliso Hills Channel.

It can be concluded from the intensive investigation data that some locations on Aliso Creek and certain of its tributaries continued to experience elevated bacteriological values during the period (June – August 1999). The tributary that exhibited the highest bacteria levels was J03P02 (Table 9.13). Eight of the nine samples collected at the the end of the J03P02 30-inch steel pipe had E. coli levels in excess of 4,000 MPN/ 100 ml. The Munger Storm Drain and Dairy Fork tributaries experienced three and two E. coli readings above 4,000 MPN/ 100 ml, respectively. The Sulphur Creek, Aliso Hills Channel, and English Canyon Channel tributaries each had one out of nine samples with E. coli levels above 4,000 MPN/ 1000 ml. The Wood Canyon tributary had no readings in excess of 4,000 MPN/ 100 ml.

The highest E. coli values for Aliso Creek were present at the sampling location located downstream of Dairy Fork and Aliso Hills Channel where six of the nine samples collected had levels above 4,000 MPN/ 100 ml. With the exception of this site, the Aliso Creek locations typically had lower E. coli levels than the tributaries. The Aliso Creek sampling locations at Cook's Corner, downstream of English Canyon Channel,

downstream of Sulphur Creek, and at Pacific Coast Highway had no readings above 4,000 MPN/ 100 ml during the intensive investigation.

Bacteria levels at the Aliso Creek sampling locations downstream of the Sulphur Creek confluence and at Pacific Coast Highway appeared to improve from 1998 to 1999. The Aliso Creek sites at Cook's Corner and downstream of English Canyon exhibited comparable bacteria levels over the two sampling periods.

Additional sampling in Dairy Fork and Aliso Creek upstream and downstream of the Dairy Fork confluence was conducted in January 2000 and indicated significantly lower levels of bacteriological indicators in Dairy Fork than those observed in the summer of 1999 (**Table 9.14**). The Aliso Creek sites upstream and downstream of Dairy Fork were within the Basin Plan REC-2 objective for fecal coliform. The highest fecal coliform level of 5,000 MPN/ 100 ml was observed in the sample collected from the Dairy Fork Retention Basin on January 12, 2000, but concurrent sampling in Dairy Fork downstream of the retention basin indicated a value of 600 MPN/ 100 ml.

Low flow samples collected in January 2000 upstream and downstream of the J03P02/ Sulphur Creek confluence indicated that despite periodic elevated fecal coliform levels in the J03P02 tributary, Sulphur Creek met the REC-2 objective during the sampling period (**Figure 9.7, Table 9.15**). The relatively small effect of J03P02 on the bacterial status of Sulphur Creek is probably due to the comparatively low volume of water from J03P02.

Streamgaging measurements made during the sampling period indicated that dry weather flows in J03P02 decreased significantly from a field estimate of 1 – 2 cubic feet per second (cfs) in April 1998 to a measured flow of 0.2 cfs in late 1999/ early 2000. Public education, the diversion of flow from the upper-J03P02 subwatershed to a previously blocked vegetated swale, and dry conditions have probably combined to contribute to the flow decrease at the outlet. Dry weather flows in Sulphur Creek have varied from approximately 1.5 – 3 cfs depending on the management of water upstream at the Laguna Niguel Lake dam.

9.6.3 J03P02 Bacteriological Data Analysis

During 1999 and 2000 the following bacteriological investigations focused on the J03P02 subwatershed.

1. J03P02 Subwatershed Study (June – August 1999)
2. J03P02 Surface Runoff Study (November 24, 1999)
3. Sulphur Creek/ J03P02 Sampling (January 2000)

Samples were analyzed for total coliform, E. coli, and enterococcus indicator organisms during the J03P02 subwatershed study. The J03P02 surface study and the Sulphur Creek/ J03P02 sampling each assessed total and fecal coliform and enterococcus indicators.

The J03P02 subwatershed study included the sampling of six subsurface sites and the end of the 30-inch steel pipe (**Figure 9.4**). The J03P02 surface water study assessed 22 curb and gutter sites in the J03P02 subwatershed (**Figure 9.5**). The Sulphur Creek/ J03P02 sampling included sampling at the end of the J03P02 30-inch steel pipe, and Sulphur Creek upstream and downstream of the J03P02 confluence (**Figure 9.7**).

Concurrent with these three studies, additional subsurface investigations were performed by the Moulton Niguel Water District (MNWD) and the City of Laguna Niguel in the J03P02 subwatershed. These investigations assessed the structural integrity of the subsurface storm drain and sewer systems.

MNWD videotaped all of the storm drain lines within the sub-watershed boundary in 1999. Although there were no signs of broken pipe or illicit connections, there were signs of groundwater infiltration in the Kite Hill South area (Avocet to Alicia Parkway). MNWD also videotaped the sewers along the Kite Hill South and Sea Bird streets to help confirm that the observed infiltration was caused by groundwater and not a broken sewer line or lateral. The work included all sewer lines that ran parallel or near storm drain pipes in the Kite Hill South area. MNWD reported that all of the lines appeared to be in excellent condition, supporting the fact that groundwater was the source of the infiltration.

As a result of the storm drain and sewer line videotaping, in November 1999 the City of Laguna Niguel cleaned out an 18" bypass line that was located near Highlands Avenue and repaired the section of storm drain along Kite Hill South that was found to have heavy groundwater infiltration. Cleaning the 18" bypass line has allowed runoff water from the upper J03P02 sub-watershed (above Highlands Avenue) to flow through a vegetated swale area before it re-enters the lower J03P02 (surface) drainage approximately 500 feet upstream of the Sulphur Creek confluence.

The results of the J03P02 subwatershed study of June – August 1999 are presented in **Table 9.16**. The levels of total coliform, E. Coli, and enterococcus indicators were elevated at each of the six subsurface sites and at the end of the 30-inch steel pipe that was sampled during the initial and intensive investigations. The mean total coliform levels at the end of the 30-inch steel pipe were higher during the June – August 1999 period (**Tables 9.13 and 9.16**) than the initial investigation (September – December 1998) (**Table 9.12**). However, if the December 1998 data is omitted from the initial investigation data set then the differences between the data sets are insignificant given the inherent variability of the data.

Figure 9.12 is a graphical representation of the arithmetic mean concentrations of total coliform, E. Coli, and enterococcus during the period of the J03P02 subwatershed investigation. The results from the furthest upstream sampling site are shown at the top of the graph and those from the end of the 30-inch steel pipe are shown at the bottom. **Figure 9.13** presents the arithmetic and log mean total coliform and E. coli concentrations for the seven sampling locations superimposed on a map of the J03P02

subwatershed. The results of the J03P02 investigation suggest that bacteria sources are ubiquitous in the subwatershed. There appears to be no observable pattern in the data that would indicate a single bacteriological source. Another important feature of the data is the extremely high variability for each bacterial indicator at most of the sampling sites. For example, E. coli at the Highland site ranged from 1000 to 365,400 MPN/ 100 ml over the sampling period (**Table 9.16**).

On August 5th a surface water sample was collected from the curb/gutter at the intersection of Ridgeview, Highlands, and Kensington (**Table 9.16**). At the time of sampling, this area had the only flowing water of sufficient depth that could be collected. The bacteriological levels from this sample were typical of the underground system and the outlet. The result of this surface sample suggested that at least a portion of the contamination that was detected in the subsurface drainage and at the end of the J03P02 30-inch steel pipe was attributable to surface sources. In addition, the ubiquitous and relatively uniform levels of bacterial contaminants and the apparent soundness of the subsurface infrastructure also suggested that the source of the bacteriological indicators in the J03P02 drainage could be surface runoff.

The J03P02 Surface Runoff Study (see Section 9.2.4) was conducted on November 24, 1999. The surface sampling locations and results are shown in **Figures 9.14 and 9.15**, and **Table 9.17**. High concentrations of fecal coliform (>2000 MPN / 100 ml) in surface samples were observed at approximately 27 % of the sampled locations across the J03P02 subwatershed.

The surface contamination appeared to be randomly distributed geographically and temporally. Fecal coliform concentrations of at least 24,000 MPN/ 100 ml were observed in six samples representing five sites in the sub-watershed. Only one site (Kite Hill Drive @ Becard Drive) exhibited extremely high fecal coliform concentrations at both 6 a.m. and 9 a.m. on November 24, 1999. The other sites that exhibited greater than 24,000 MPN/ 100 ml fecal coliform levels for one of the sample collections had less than detectable levels for the second collection. The fecal coliform levels of these elevated samples were not related to the time of sample collection (6 a.m. or 9 a.m.).

High enterococcus levels also appeared to be randomly distributed in the J03P02 subwatershed on November 24, 1999 (**Figure 9.15**). Many samples that contained high fecal coliform levels had low levels of enterococcus and vice versa.

A single source or sources of bacteria cannot be isolated from these results. In addition, field observations made during the surface sampling indicated no obvious sources for the bacteria. The results of this investigation suggest that unknown sources present on the surface of the J03P02 subwatershed are significant contributors to the elevated bacteria levels in the subsurface drainage. This is consistent with the findings of the June 1 – August 3, 1999 subsurface investigation that indicated the presence of high fecal coliform levels throughout the underground storm drain system.

9.6.4 Summary of Bacteriological Water Quality Findings

1. The sampling locations on the mainstem of Aliso Creek that exhibited average fecal coliform or E. coli levels greater than 2,000 MPN/ 100 mls, and multiple individual readings in excess of 4,000 MPN/ 100 mls during the 1998 – 2000 study period included the locations downstream of Dairy Fork/ Aliso Hills Channel (both studies), and the Pacific Coast Highway site (initial study only). E. coli levels in 1999 were substantially lower than fecal coliform levels in the 1998 initial study for the Aliso Creek sites downstream of Sulphur Creek and at Pacific Coast Highway.

2. The tributary sampling locations with elevated E. coli averages (> 2,000 MPN/ 100 ml) and multiple elevated readings were J03P02, Munger Storm Drain and Dairy Fork. J03P02 had the highest number of E. coli readings in excess of 4,000 MPN/ 100 ml (8 out of 9), followed by Munger Storm Drain (3/9) and Dairy Fork (2/9).

3. Sampling of Dairy Fork and Aliso Creek upstream and downstream of Dairy Fork in January 2000 indicated significantly lower levels of bacteriological indicators than observed in the summer of 1999. The average fecal coliform level for Dairy Fork was significantly below 2,000 MPN/ 100 ml and no sample was in excess of 4,000 MPN/ 100 ml.

4. Several sampling locations had fecal coliform or E. coli averages below 2,000 MPN/ 100 ml and no more than one reading above 4,000 MPN/ 100 ml (**Tables 9.12 and 9.13**). Stations exhibiting this pattern included the Aliso Creek sites located at Cook's Corner and downstream of English Canyon Channel during the initial and intensive investigations, the Aliso Creek sites downstream of the Sulphur Creek confluence and at Pacific Coast Highway during the intensive study, and the English Canyon Channel and Wood Canyon tributaries during the intensive watershed investigation. The Sulphur Creek and Aliso Hills Channel tributaries each had average E. coli levels above 2,000 MPN/ 100 ml and 1 of 9 E. coli readings above 4,000 MPN/ 100 ml during the intensive study.

5. The Aliso Creek sampling location at Pacific Coast Highway had elevated fecal coliform levels during the first four weeks of the initial investigation but much lower levels during the rest of that study. In addition, the arithmetic mean bacterial levels were lower during the intensive study than the initial study with eight of nine samples exhibiting E. coli levels below 1000 MPN/ 100 mls.

6. The results of the J03P02 investigation suggest that fecal coliform levels at the end of the J03P02 30-inch steel pipe cannot be attributed to a single source or area. The results of the J03P02 surface study on November 24, 1999 suggest that a significant portion of the bacteria that have been observed at the outlet originate on the subwatershed surface.

7. Fecal coliform levels at the end of the J03P02 30-inch steel pipe were lower in January 2000 than in the previous investigations. In addition, recent measurements of

the discharge rate from the J03P02 30-inch steel pipe are lower than past field flow estimates. This indicates that bacterial loading to Sulphur Creek from the subwatershed has been decreased by reestablishing flow through a vegetated swale area below Highlands Avenue (Section 9.6.3). The ongoing sampling and discharge measurements conducted by the County of Orange and the City of Laguna Niguel will enable a more accurate assessment of this trend.

8. A significant feature of each bacteriological data set collected during the 1998 – 2000 period is high variability. Bacteria levels routinely exhibited order of magnitude fluctuations from one sampling to the next. Two to three order of magnitude fluctuations were also observed in each investigation. The J03P02 surface study illustrated that this bacteriological data variability in water bodies is also inherent in surface sources on neighborhood streets. Most of the surface samples that were collected during the one-day study had fecal coliform levels below the laboratory limits of detection (<200 MPN/ 100 ml), however; approximately 27 % of the samples had concentrations greater than 2,000 MPN/ 100 mls.

Many factors may influence bacteria levels in surface and subsurface drainage waters. Among these are water temperature, topography, runoff dynamics and irrigation practices, and land usage.

The effects of ambient water temperature and ultraviolet radiation on bacteria levels in the Aliso Creek watershed may be an important relationship to understand more precisely. The seasonal fluctuations of these parameters may effect the concentrations and life cycles of bacterial indicator organisms in ways that are not well understood at this time. The initial study was the only investigation that encompassed a wide enough seasonal range to begin to evaluate these relationships. The ongoing sampling of Sulphur Creek and J03P02 by the County of Orange and the City of Laguna Niguel may provide additional information to allow these issues to be better understood.

The steep topography in much of the Aliso Creek watershed may also contribute to the bacteria problem by allowing irrigation water to flow readily along the land surface and into the drainage system without infiltrating into the ground. Management actions that promote the slowing of surface water runoff and that enhance infiltration may be effective in reducing bacteria levels.

The data collected during this study indicate that important management initiatives to decrease bacteria in Aliso Creek should include the following:

1. Reduction of excess irrigation runoff
   While the irrigation water being applied in the watershed is sterile and potable, it appears to efficiently transport bacterial indicators from the watershed surface into the storm drain system.

2. Additional research-level investigations

There is a need to more precisely determine the sources of bacteria in Aliso Creek watershed including those on the surface of the streets. One of these investigations may be focused on soil amendments (organic fertilizers and mulches) that may serve as a source or a medium for regrowth of bacterial indicators. This information will allow the watershed communities to institute more specific and effective source control measures, and more focused public education initiatives then are currently possible.

3. Creek restoration initiatives
   Effective restoration will promote the natural removal of bacteria from the creek water. Examples of potential creek restoration programs include wetland construction and riparian revegetation and habitat restoration

Initiatives 1 and 3 above are addressed in more detail in subsequent chapters, as is the current state of the art for bacterial source control measures.

Figure 9.11: Arithmetic Mean Bacteriological Levels in Aliso Creek and Tributaries June 3 - August 5, 1999

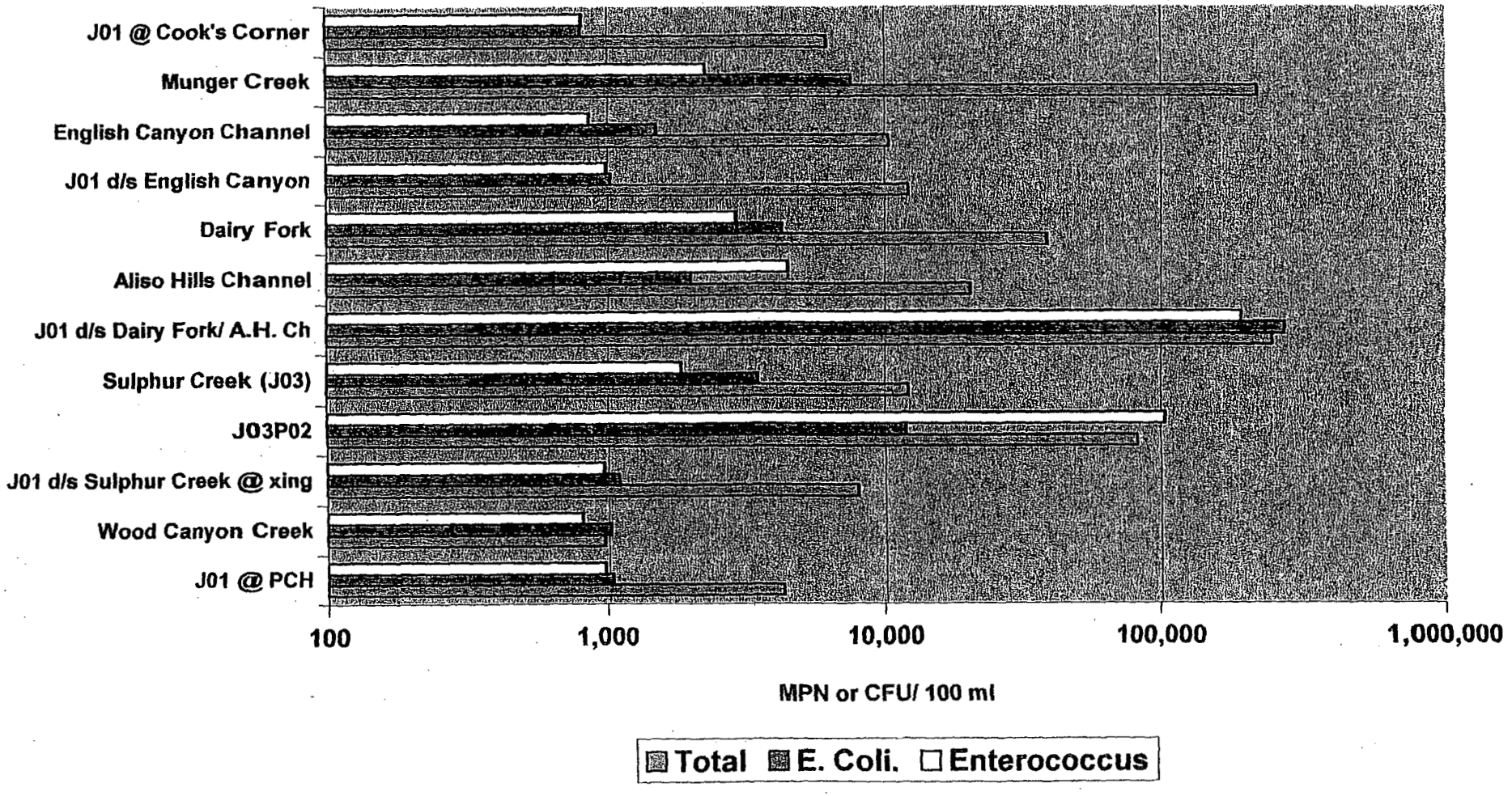


Figure 9.12: Arithmetic Mean Bacteriological Levels in the J03P02 Subwatershed
June 1 - August 3, 1999

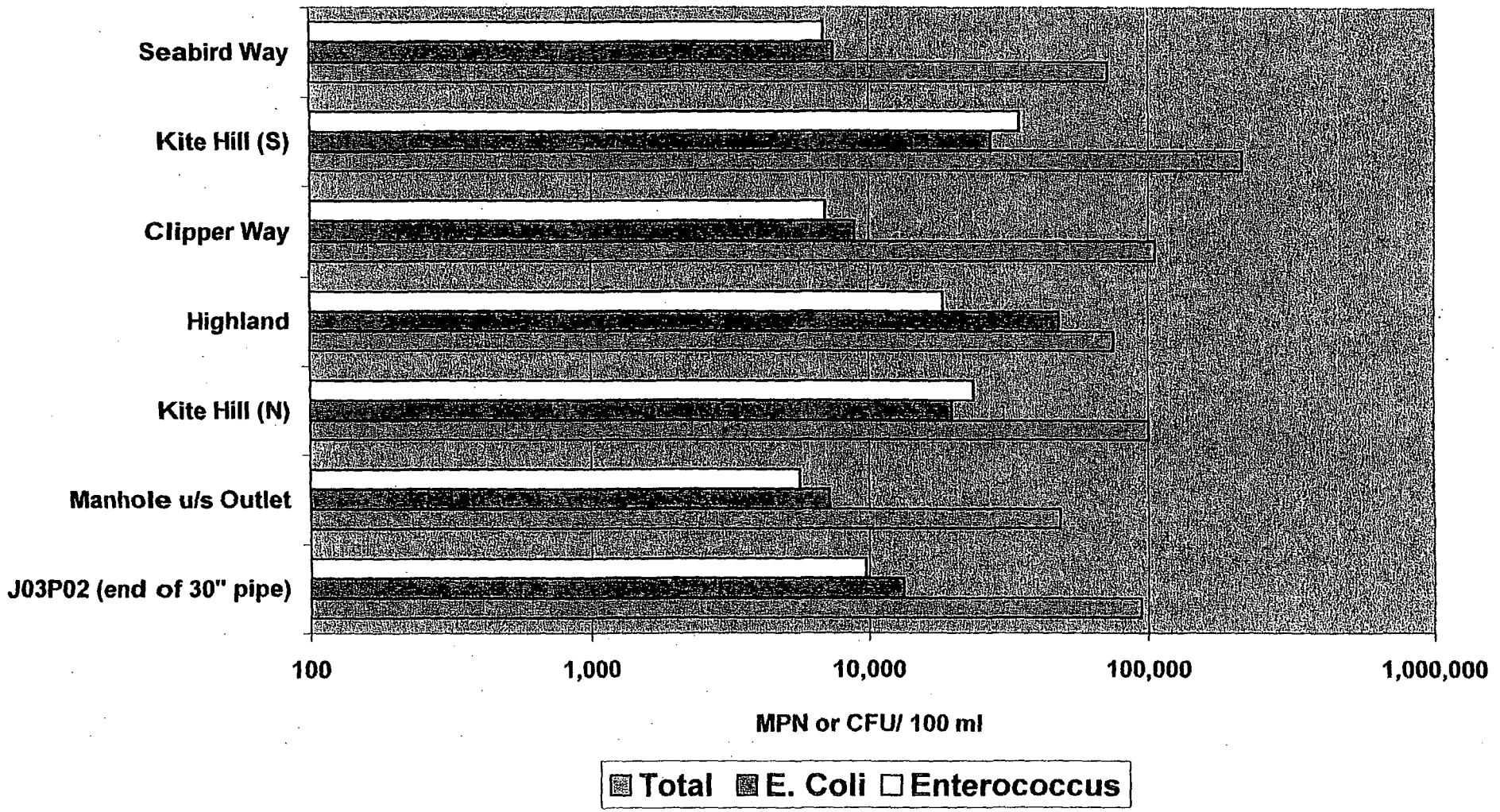


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Table 9.12 - Bacteriological Results Of Initial Water Quality Investigation

(MPN/100 mls)

	Aliso Creek at Cook's Corner		Aliso Creek d/s English Canyon		Aliso Creek d/s Dairy Fk & A.Hills		J03P02 (end of 30"pipe)		Aliso Creek d/s Sulphur Creek		Aliso Creek at PCH	
Sample Date	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**	**Total**	**Fecal**
9/30/98	2,800	130	5,000	1,100	50,000	3,000	50,000	30,000	2,400	2,400	16,000	3,000
10/7/98	1,600	1,600	17,000	1,300	16,000	3,000	160,000	90,000	50,000	8,000	5,000	3,000
10/14/98	<20	<20	5,000	400	17,000	11,000	7,000	5,000	13,000	1,100	30,000	8,000
10/21/98	1,600	500	16,000	500	16,000	3,000	16,000	16,000	240	240	9,000	9,000
10/28/98	1,100	22	22,000	5,000	50,000	5,000	24,000	500	2,200	1,100	2,800	500
11/4/98	900	900	500000*	800	9,000	1,300	50,000	5,000	16,000	230	24,000	800
11/19/98	50	4	130	13	500	130	9000	700	2400	90	900	13
11/23/98	5,000	500	5,000	500	30,000	1,700	22,000	13,000	17,000	500	3,000	300
12/9/98	2,300	40	3,000	1,700	30,000	2,300	3,300	1,400	24,000	5,000	3,000	20
12/17/98	1,300	<2	1,300	<2	17,000	<2	30,000	1,100	3,000	400	1,700	400
12/23/98	30	<2	50	<2	22	8	240	50	30	4	23	8
12/30/98	2,600	70	11,000	200	800	200	17,000	70	2,100	200	1,100	200
log mean	700	100	3,000	200	7,000	600	14,000	2,300	3,400	500	3,000	400
arithmetic mean	1,600	300	7,800	1,000	20,000	2,600	32,000	14,000	11,000	1,600	8,000	2,100

GM = 1074

GM = 4305

GM = 10,155

GM = 2184

GM = 1410

GM = 5045

GM = 3178

Objectives For Aliso Creek Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* false positive result due to presence of interfering organisms highly probable (reading omitted from log and arithmetic mean calculations)

[redacted]tributaries

Table 9.13: Bacteriological Results of Intensive Watershed Study
(MPN/ 100 mls or CFU/ 100 mls)

Date	Aliso Creek @ Cook's Corner			Munger Storm Drain			English Canyon Channel			Aliso Creek d/s English Canyon		
	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.
6/3/99	1,300	218	278	16,000	3,654	4,611	16,000	960	717	16,000	1,100	836
* 6/10/99	13,000	100	<100	5,000	3,290	2,750	5,000	410	<100	5,000	200	<100
5 ** 6/17/99	700	<1,000	1,000	1,600,000	42,800	2,000	23,000	<1,000	<1,000	3,000	1,000	<1,000
6/24/99	3,000	<1,000	<1,000	23,000	9,800	1,000	8,000	1,000	1,000	17,000	2,000	2,000
7/1/99	8,000	<1,000	<1,000	110,000	1,000	<1,000	8,000	<1,000	1,000	11,000	<1,000	<1,000
7/15/99	1,700	1,000	<1,000	50,000	1,000	2,000	13,000	6,300	1,000	17,000	<1,000	<1,000
4 07/22/99	2,400	<1,000	<1,000	23,000	<1,000	2,000	11,000	<1,000	<1,000	6,000	1,000	1,000
07/29/99	3,000	<1,000	1,000	80,000	5,200	4,100	8,000	<1,000	<1,000	30,000	1,000	<1,000
8/5/99	23,000	1,000	1,000	80,000	1,000	1,000	1,700	<1,000	1,000	5,000	<1,000	<1,000
logmean	3,500	<700	<700	51,000	<3,100	<2,000	8,500	<1,100	<700	9,600	<900	<800
arithmetic mean	6,200	<800	<800	220,000	<7,600	<2,300	10,000	<1,500	<900	12,000	<1,000	<1,000

Date	Dairy Fork			Aliso Hills Channel			Aliso Cr. d/s Dairy Fork& A.H. Chan.			Sulphur Creek		
	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	3,441	3,873	>16,000	8,164	1,918	>16,000	3,654	1,076	>16,000	>24,192	2,282
* 6/10/99	30,000	860	740	8,000	960	2,820	24,000	730	630	5,000	310	<100
** 6/17/99	13,000	<1,000	<1,000	8,000	2,000	7,400	110,000	4,100	<1,000	7,000	1,000	<1,000
6/24/99	30,000	<1,000	1,000	11,000	<1,000	9,700	6,600	<1,000	<1,000	8,000	<1,000	4,100
7/1/99	50,000	19,900	<1,000	5,000	<1,000	2,000	240,000	5,200	1,000	22,000	<1,000	<1,000
7/15/99	50,000	3,100	8,600	50,000	1,000	3,100	80,000	12,100	4,100	17,000	<1,000	<1,000
7/22/99	50,000	1,000	2,000	50,000	2,000	6,300	60,000	>2,419,200	1,732,870	13,000	1,000	<1,000
7/29/99	30,000	3,100	3,000	13,000	<1,000	4,100	110,000	12,100	4,100	17,000	<1,000	5,200
8/5/99	80,000	5,200	5,200	23,000	1,000	3,100	>1,600,000	28,200	4,100	5,000	<1,000	<1,000
logmean	>34,000	<2,400	<2,100	>15,000	<1,500	3,900	>73,000	>9,400	<3,500	>11,000	1,300	<1,200
arithmetic mean	>39,000	<4,300	<2,900	>20,000	<2,000	4,500	>250,000	>280,000	<190,000	>12,000	3,500	<1,900

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event

Table 9.13 (cont): Bacteriological Results of Intensive Watershed Study (MPN/ 100 mls or CFU/ 100 mls)

	J03P02 (end of 30" pipe)			Aliso d/s Sulphur Cr. @ NPDES			Wood Canyon Creek			Aliso Creek @ PCH		
Date	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.	Total	E. Coli	Enterococ.	Total	E. Coli.	Enterococ.
6/3/99	>16,000	15,531	12,033	>16,000	2,755	1,664	1,400	131	243	>16,000	2,247	583
* 6/10/99	11,000	2,920	4,220	2,300	200	<100	1,100	<100	<100	2,300	100	200
** 6/17/99	50,000	9,800	866,400	3,000	<1,000	1,000	270	<1,000	<1,000	8,000	<1,000	<1,000
6/24/99	80,000	5,200	18,500	3,000	1,000	<1,000	400	<1,000	<1,000	3,000	<1,000	<1,000
7/1/99	240,000	12,100	6,300	5,000	<1,000	<1,000	700	2,000	1,000	3,000	<1,000	<1,000
7/15/99	50,000	12,200	4,100	8,000	1,000	1,000	800	<1,000	<1,000	1,100	<1,000	<1,000
7/22/99	80,000	5,200	6,200	3,000	<1,000	<1,000	1,700	2,000	<1,000	1,100	<1,000	2,000
7/29/99	170,000	9,800	17,500	30,000	<1,000	<1,000	1,300	<1,000	<1,000	3,000	<1,000	<1,000
8/5/99	50,000	35,000	3,100	2,300	<1,000	1,000	1,100	<1,000	<1,000	1,300	<1,000	<1,000
logmean	>56,000	9,500	12,000	>5,200	<900	<800	800	<700	<700	>2,900	<800	<900
arithmetic mean	>83,000	12,000	100,000	>8,100	<1,100	<1,000	1,000	<1,000	<800	>4,300	<1,000	<1,000

	4" MWD Pipe		
Date	Total	E. Coli	Enterococ.
7/15/99	<20	<1,000	<1,000

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objectives For Aliso Creek, English Canyon, Sulphur Creek, and Wood Canyon Samples

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

* - The samples submitted on 6/10/99 were analyzed using a 1X dilution
** - The samples submitted on and after 6/17/99 were analyzed using a 2X dilution
No samples were submitted on 7/8/99 due to a storm event

Table 9.14: Dairy Fork Bacteriological Sampling - January 2000

Date	Dairy Fork			Aliso Creek u/s Dairy Fork			Aliso Creek d/s Dairy Fork			Dairy Fork Retarding Basin		
	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.	Total	Fecal	Enterococ.
1/11/00	900	<200	1,008	30,000	<200	26	900	<200	288			
1/12/00	30,000	600	1,140	2,300	<200	63	14,000	<200	720	>160,000	5,000	450
1/13/00	17,000	<200	870	1,100	<200	715	3,000	<200	1,150			
1/14/00	>16,000	1,300	55	1,300	140	138	5,000	800	415			
1/18/00	50,000	<200	<200	2,700	500	75	800	700	126			
1/19/00	5,000	300	>200	2,400	300	66	9,000	3,000	189			
logmean	>11,000	<400	400	2,900	<200	96	3,300	<500	370			
arith. mean	>20,000	<500	600	6,600	<300	181	5,400	<800	481			

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Objective for Aliso Creek samples
In waters designated for non-contact recreation (REC-2) and not designated for contact recreation, (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2000/100 ml, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000/100 ml.

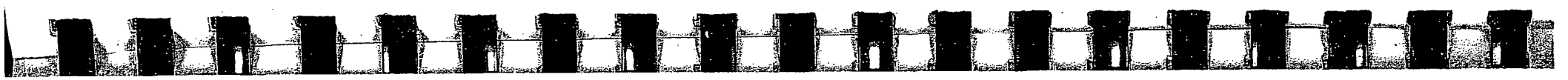

Table 9.15: County of Orange PFRD Bacteriological Sampling Sulphur Creek/ J03P02 January 2000

J03P02 (end of 30" steel pipe)

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Enterococcus CFU/100 ml
1/6/00	2,200	<20	480
1/7/00	5,000	900	<1
1/10/00	30,000	30,000	1,440
1/11/00	5,000	600	576
1/12/00	5,000	1,100	1,008
1/13/00	1,100	700	416
1/14/00	>16,000	>16,000	2,450
1/18/00	50,000	<200	>200
1/19/00	22,000	3,000	>200
1/20/00	160,000	17,000	138
1/21/00	90,000	22,000	>200
1/24/00	400	<200	>200
log mean	**>10,000**	**1,500**	**300**
arithmetic mean	**>32,000**	**7,600**	**600**

OK

Sulphur Creek u/s J03P02

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Enterococcus CFU/100 ml
1/6/00	2,800	<20	54
1/7/00	3,000	<20	<1
1/10/00	1,700	1,700	288
1/11/00	300	300	144
1/12/00	8,000	400	1,226
1/13/00	3,000	800	300
1/14/00	900	700	279
1/18/00	8,000	800	>200
1/19/00	3,000	500	96
1/20/00	1,300	220	148
1/21/00	9,000	2,600	>200
1/24/00	1,700	1,300	>200
log mean	**2,400**	**<400**	**100**
arithmetic mean	**3,600**	**<800**	**300**

OK

Sulphur Creek d/s J03P02

Date	Total Coliform MPN/100 ml	Fecal Coliform MPN/100 ml	Entero-coccus CFU/100 ml
1/6/00	3,000	<20	89
1/7/00	2,400	900	<1
1/10/00	2,400	2,400	288
1/11/00	1,700	1,700	720
1/12/00	8,000	170	432
1/13/00	<200	<200	200
1/14/00	9,000	3,000	279
1/18/00	13,000	500	>200
1/19/00	3,000	800	126
1/20/00	2,400	500	>200
1/21/00	13,000	8,000	>200
1/24/00	13,000	<200	>200
log mean	**<4,000**	**<600**	**100**
arithmetic mean	**<6,000**	**<1,500**	**200**

OK

Table 9.16: J03P02 Sub-Watershed Bacteriological Results June 1 - August 3, 1999 (MPN/100 mls)

(MPN/ 100 ml or CFU/ 100 ml)

	J03P02 (end of 30" steel pipe)			Manhole u/s Structure			Kite Hill (N)			Highland		
Date	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus
6/1/99	>16,000	3,873	10,462	>16,000	1,515	7,701	>16,000	1,576	6,131	>16,000	24,192	19,863
6/8/99	>16,000	5,475	6,131	16,000	1,483	8,664	>16,000	3,448	10,462	>16,000	3,873	6,488
* 6/15/99	80,000	7,400	8,600	60,000	2,000	6,300	30,000	16,100	1,000	50,000	3,100	3,100
6/22/99	500,000	7,400	9,700	28,000	16,000	5,200	23,000	5,200	1,000	50,000	1,000	5,200
6/29/99	80,000	5,100	4,100	80,000	6,200	5,100	300,000	12,200	17,100	50,000	22,600	5,200
7/6/99	50,000	8,600	3,000	30,000	6,300	<1,000	50,000	2,000	3,100	30,000	5,200	8,500
7/13/99	50,000	7,400	6,300	70,000	3,000	3,100	300,000	7,400	18,900	300,000	365,400	4,100
7/20/99	30,000	2,000	5,200	30,000	9,700	16,000	22,000	4,100	12,100	50,000	7,400	4,100
7/27/99	11,000	62,400	38,400	130,000	21,100	2,000	140,000	139,600	160,700	170,000	45,000	120,100
8/3/99	110,000	22,800	5,200	23,000	5,200	2,000	110,000	6,300	6,300	23,000	3,100	7,300
log mean	>49,000	8,000	7,300	>38,000	5,000	<4,300	>55,000	7,000	7,700	>47,000	10,000	8,200
arithmetic mean	>94,000	13,000	9,700	>48,000	7,200	<5,700	>100,000	20,000	23,700	>76,000	48,000	18,400

	Clipper Way			Kite Hill (S)			Seabird Way		
Date	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus	Total	E. Coli	Enterococcus
6/1/99	>16,000	4,611	24,192	>16,000	17,329	>24,192	>16,000	15,531	11,199
6/8/99	16,000	670	6,488	9,000	216	>24,192	>16,000	250	7,701
* 6/15/99	50,000	9,800	4,100	17,000	<1,000	<1,000	30,000	1,000	<1,000
6/22/99	13,000	<1,000	<1,000	23,000	<1,000	1,000	17,000	1,000	<1,000
6/29/99	130,000	6,300	6,200	130,000	7,400	6,300	80,000	2,000	3,000
7/6/99	300,000	4,100	3,100	900,000	8,500	18,700	130,000	6,300	1,000
7/13/99	300,000	43,500	9,800	900,000	88,000	88,000	220,000	24,300	24,300
7/20/99	80,000	<1,000	1,000	130,000	2,000	1,000	22,000	3,100	4,100
7/27/99	80,000	11,000	13,400	230	133,300	172,500	110,000	9,800	12,100
8/3/99	80,000	7,400	1,000	50,000	14,800	9,600	80,000	12,000	4,100
log mean	>60,000	<4,400	<4,200	>40,000	<6,000	10,000	>47,000	3,600	<4,100
arithmetic mean	>100,000	<8,900	<7,000	>220,000	<27,000	35,000	>72,000	7,500	<7,000

Gutter of Highland/ Ridgeview/Kensington			
Date	Total	E. Coli	Enterococcus
8/3/99	80,000	16,100	29,200

* - The samples submitted on and after 6/15/99 were analyzed using a 2X dilution

Total Coliform, E. coli - MPN/ 100 ml
enterococcus - CFU/ 100 ml

Table 9.17: Surface Bacteriological Sampling in J03P02 Subwatershed

November 24, 1999

Sampling Location	Sampling Time	Total Coliform MPN/100ml*	Fecal Coliform MPN/100ml*	Enterococcus CFU/100ml**
Sea Bird Way at Pelican Way	9:49	2,300	<200	>5,700
Pelican Way at Sea Bird Way	7:35	30,000	<200	<1
Pelican Way at Sea Bird Way	9:40	24,000	<200	<1
Across the street from 29602 Belmar Circle	7:12	30,000	<200	1,113
29602 Belmar Circle	7:11	>160,000	<200	<1
29602 Belmar Circle	9:15	90,000	<200	<1
Bobolink Drive at Kite Hill Drive (South)	7:04	160,000	<200	>5,700
Bobolink Drive at Kite Hill Drive (South)	9:19	24,000	<200	<1
Kite Hill Drive (South) opposite Bobolink Drive	6:28	30,000	<200	<1
Kite Hill Drive (South) opposite Bobolink Drive	9:06	24,000	24,000	<1
Pelican Way at Shell Cove	7:15	30,000	<200	318
Pelican Way at Shell Cove	9:29	5,000	<200	320
Across from 29343 Kensington Drive U/S Balloch Street	7:19	>160,000	30,000	<1
29311 Troon Street at Balloch Street	6:46	160,000	<200	<1
Across From 29036 Ridgeview Drive at Highlands Avenue	6:37	>160,000	50,000	<1
29036 Ridgeview Drive at Highlands Avenue	9:37	160,000	<200	<1
29082 Dean Street at Highlands Avenue	7:05	13,000	3,000	<1
29082 Dean Street at Highlands Avenue	9:25	50,000	<200	1,120
Across from 29092 Dean Street at Highlands Avenue	7:00	8,000	5,000	<1
Across from 29092 Dean Street at Highlands Avenue	9:22	>160,000	<200	1,600
29062 Jarod Way	7:10	50,000	<200	1,920
29062 Jarod Way	9:15	30,000	3,000	640
28951 Drakes Bay at Highlands Avenue	9:42	>160,000	<200	<1
Kite Hill Recreational Center (Private Road)	6:46	30,000	<200	<1
Jaeger Drive between Cormorant Lane and Ironhead Lane	6:41	3,000	<200	795
Jaeger Drive between Cormorant Lane and Ironhead Lane	9:19	>160,000	<200	2,240
Kite Hill Drive and Becard Drive	6:55	90,000	50,000	785
Kite Hill Drive and Becard Drive	9:23	90,000	30,000	<1
Brant Lane Culdesac	6:36	22,000	<200	1,092
Brant Lane Culdesac	9:14	>160,000	30,000	<1
Culdesac at Shrike Drive	6:22	90,000	<200	<1
Kite Hill Drive across from Jaeger Drive	6:46	30,000	<200	<1
Kite Hill Drive across from Jaeger Drive	9:07	50,000	<200	800
Swallowtail Drive and Kite Hill Drive	6:34	>160,000	<200	<1
Snipe Lane Culdesac	9:02	50,000	<200	<1

Most Probable Number per 100 ml

* Colony Forming Units per 100 ml

Aliso Creek

From: Deborah Jayne
To: Bob Morris; James Smith; Jeremy Haas
Date: 8/18/03 5:23PM
Subject: Fwd: Monterey Formation as source of Selenium contamination

I just received this e-mail from Region 8. Its not urgent, but worth looking into. Are any of you aware of any data on selenium in Aliso Creek or vicinity? In addition to bacteria, Aliso Creek is 303(d) listed for phosphorus and toxicity. Terri's email may explain why... "The upper portions of Aliso Creek have been extensively mined for phosphate in the past which may have resulted in an acceleration of Se mobilization into the sediments and fauna in the creek." Perhaps the Se is the cause of the toxicity. Anyway here's a heads-up on the topic. Let me know if you have any info on this. thanks.

>>> Terri Reeder 08/18/03 04:30PM >>>
Deborah -

Joanne suggested that I send the following web link to you:
http://wrgis.wr.usgs.gov/wreg/env/monterey.html

Elevated levels of selenium have been recently measured in runoff from Crystal Cove creek. As the Monterey Formation outcrops in that area it was identified as a potential source rock. A quick web search turned up the article at the link above.

I am particularly concerned about potentially elevated Se in the Aliso Creek area. The Se in the Monterey Fm is associated with high organic carbon and phosphate deposits. The upper portions of Aliso Creek have been extensively mined for phosphate in the past which may have resulted in an acceleration of Se mobilization into the sediments and fauna in the creek. Se is highly bioaccumulative and can result in the gradual decline of species as it tends to lower the immune system, has negative reproductive effects, and can inhibit growth in fish and birds.

Anyway, just an FYI (not like you don't have enough other things to worry about TMDL-wise!).

Regards -

Terri

Terri S. Reeder, CEG, CHG
Associate Engineering Geologist
Basin Planning - Coastal Waters
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501-3348
Phone: 909-782-4995
Fax: 909-686-8113
e-mail: treeder@rb8.swrcb.ca.gov

CC: Christina Arias; David Barker; Lesley Dobalian

From: Jeremy Haas
To: Bob Morris; Deborah Jayne; James Smith
Date: 8/19/03 9:11AM
Subject: Re: Fwd: Monterey Formation as source of Selenium contamination

I have found one record of selenium data in the Aliso watershed.
It is from STORET for the Golf Course at the bottom of the watershed. Attached is an excel file of the selenium records. Data is from 1981-1987 for sediment and total.

The USACE Recon study from 2000 didn't mention selenium.
The MS4 NPDES monitoring doesn't include selenium.

Enjoy the data.

-JCH

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Anyway, just an FYI (not like you don't have enough other things to worry about TMDL-wise!).

Regards -

Terri

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The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at http://www.swrcb.ca.gov/rwqcb8. Thank you for your attention to this important matter.

CC: Christina Arias; David Barker; Lesley Dobalian

Organizatic	Organizatic	Primary St	Station	Loc	Station Loc	Start Date	Parameter	Long Name	Result	Valu	Latitude	Longitude	Hydrologic	Legacy ST	Surface Wi	Sample Co
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	26-May-81	SELENIUM IN BOTTOM DEPOS		0.17	33.51472	117.7483	18070301	/TYPA/AMI	S		18682601
□21CAOCI	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	15-Jun-82	SELENIUM IN BOTTOM DEPOS		0.70	33.51472	117.7483	18070301	/TYPA/AMI	S		18682620
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	23-Nov-82	SELENIUM IN BOTTOM DEPOS		0.38	33.51472	117.7483	18070301	/TYPA/AMI	S		18682621
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	15-Nov-83	SELENIUM IN BOTTOM DEPOS		0.72	33.51472	117.7483	18070301	/TYPA/AMI	S		18682638
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	5-Jun-84	SELENIUM IN BOTTOM DEPOS		2.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682643
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	14-Nov-84	SELENIUM IN BOTTOM DEPOS		1.60	33.51472	117.7483	18070301	/TYPA/AMI	S		18682649
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	21-Oct-86	SELENIUM IN BOTTOM DEPOS		1000.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682667
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	14-May-73	SELENIUM, TOTAL (UG/L AS S		40.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682519
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	18-Jan-77	SELENIUM, TOTAL (UG/L AS S		6.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682541
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	5-Jul-77	SELENIUM, TOTAL (UG/L AS S		2.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682549
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	4-Apr-78	SELENIUM, TOTAL (UG/L AS S		8.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682565
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	20-May-80	SELENIUM, TOTAL (UG/L AS S		10.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682586
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	21-Oct-80	SELENIUM, TOTAL (UG/L AS S		5.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682590
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	15-Jun-82	SELENIUM, TOTAL (UG/L AS S		22.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682618
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	23-Nov-82	SELENIUM, TOTAL (UG/L AS S		6.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682621
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	16-May-83	SELENIUM, TOTAL (UG/L AS S		21.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682626
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	15-Nov-83	SELENIUM, TOTAL (UG/L AS S		12.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682638
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	4-Jun-84	SELENIUM, TOTAL (UG/L AS S		4.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682642
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	13-Nov-84	SELENIUM, TOTAL (UG/L AS S		5.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682648
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	28-Oct-85	SELENIUM, TOTAL (UG/L AS S		48.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682653
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	21-Oct-86	SELENIUM, TOTAL (UG/L AS S		20.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682667
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	25-Feb-87	SELENIUM, TOTAL (UG/L AS S		20.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682670
21CAOCF(	ORANGE (	ACJ01	ALISO CRI	ALISO CRI	27-May-87	SELENIUM, TOTAL (UG/L AS S		67.00	33.51472	117.7483	18070301	/TYPA/AMI	S		18682676

End Date	UMK	Composite	Composite	Sample De	Start Time	End Time	Effluent Mo	Replicate N	Parameter Code		Remark Co	Composite Statistic Code
	B				910	0			1148			A
	B	—			1050	0			1148		K	A
	B				1030	0			1148		K	A
	B				1240	0			1148		K	A
	B				1200	0			1148		K	A
	B				1130	0			1148		K	A
	B				1030	0			1148		K	A
	B				930	0			1147			A
	B				1255	0			1147			A
	B				1355	0			1147		K	A
	B				1300	0			1147		K	A
	B				935	0			1147		K	A
	B				1045	0			1147		K	A
	B				1045	0			1147			A
	B				1030	0			1147		K	A
17-May-83	G		23		1055	855			1147		K	A
	B				1240	0			1147		K	A
5-Jun-84	G		26		1015	1115			1147		K	A
14-Nov-84	G		24		1225	1125			1147		K	A
29-Oct-85	G		25		1020	1020			1147		K	A
	B				1030	0			1147		K	A
	B				1022	0			1147		K	A
	B				1230	0			1147			A