

February 28, 2006

To: Christine Hempleman, TMDL Lead  
From: Lawrence Sullivan, TMDL Bacteria Field Lead  
Subject: Oakland Bay TMDL Quarterly Progress Report  
(October through December 2005)

Project Tracker Code: 04-049-01-03

## **Introduction**

Oakland Bay, Hammersley Inlet, and several of their tributaries were placed on the federal 303(d) list (1996, 1998, and proposed 2002/2004) for not meeting state water quality standard for fecal coliform bacteria. Therefore, in accordance with the Federal Clean Water Act, total daily maximum loads (TMDLs) for fecal coliform bacteria must be established to bring these waterbodies into compliance with water quality standards. The field work for the study began in November 2004 to assess the current condition of the waterbodies and to identify and quantify factors contributing to the impairments.

This memorandum summarizes the progress from October 2005 through December 2005 related to data collection and project communications. Data presented are provisional; data quality has not been checked.

## **Progress to Date**

### *Bacteria Data Collection*

Bi-monthly sampling of 27 sites on the major tributaries draining to Oakland Bay and Hammersley Inlet began in November 2004 continued through November 2005. The streams that are sampled include: Mill Creek, Goldsborough Creek, Coffee Creek, Shelton Creek, John's Creek, Cranberry Creek, Deer Creek, Malaney Creek, Uncle John's Creek, and Campbell Creek. Typically, staff members from the Squaxin Island Tribe sample the first run of the month and employees of the Department of Ecology sample the second run of the month.

The tributaries to Oakland Bay and Hammersley Inlet are classified as Class A waterbodies. The water quality standard for fecal coliform bacteria in these streams states that the geometric mean of samples can not exceed 100 cfu/100 mL of water and the 90<sup>th</sup> percentile of samples taken can not exceed 200 cfu/100 mL of water. During the sampling period ending in November 2005, Shelton Creek and Uncle John's Creek have sites that are exceeding the water quality standard. Site SHE 1 (Shelton Creek at Highway 3 Bridge) is exceeding the standard with a 90<sup>th</sup> percentile value of 210 cfu/100ml (Figure 4). Uncle John's Creek has two sites that are exceeding the water quality standard for fecal coliform, UNC 1 (Uncle John's Creek at the culvert on Agate Loop Road) and UNC 2 (Uncle John's Creek at the intersection of Agate Loop Road and Daniels Road). UNC 1 is exceeding with a geomean of 108 cfu/100mL and a 90<sup>th</sup> percentile value of 423

cfu/100mL. UNC 2 is exceeding the standard with a 90<sup>th</sup> percentile value of 291 cfu/100mL (Figure 9).

The Department of Ecology has also accompanied the Department of Health on their sampling runs on Oakland Bay and Hammersly Inlet. On each run, the Department of Ecology sampled a portion of the Department of Health's sites and took CTD (conductivity, temperature, and depth) readings. All of Hammersly Inlet and most of Oakland Bay are classified as Class A waterbodies. Marine water quality standard for fecal coliform bacteria in these waterbodies states that the geometric mean of samples can not exceed 14 cfu/100 mL of water and the 90<sup>th</sup> percentile of samples taken can not exceed 43 cfu/100 mL of water. The Inner Shelton Harbor of Oakland Bay is classified as Class B, with a water quality standard of 100 cfu/100mL for the geometric mean and 200 cfu/100mL for the 90<sup>th</sup> percentile.

The Inner Shelton Harbor Site OAKSH2 is exceeding the 90<sup>th</sup> percentile portion of the water quality standard. OAKSH2 has a 90<sup>th</sup> percentile value of 255 cfu/100mL (Figure 11). Site OAK128 in the mouth of Chapman Cove is also exceeding the 90<sup>th</sup> percentile portion of the water quality standard with a 90<sup>th</sup> percentile value of 153 cfu/100mL (Figure 11). All Hammersly Inlet sites are meeting the water quality standard. The data summarized is from November 2004 through November 2005 and includes only Department of Ecology results, not those from the Department of Health.

On September 21<sup>st</sup>, 2004 the shorelines of Oakland Bay and Hammersly Inlet were surveyed for small drainages and/or discharge points in addition to the major tributaries that may contribute pollution to the marine waterbodies. These include storm water culverts, unnamed tributaries, and direct runoff points from agricultural activities. 279 drainage points were found and mapped (Figure 12). The sites that are located in Chapman Cove and the northern portion of Oakland Bay were Sampled on November 14<sup>th</sup> and 15<sup>th</sup>, 2005. Only the drainage points that were conveying water on those days were sampled. Out of the 48 drainages that were running, only 1 had fecal coliform concentrations greater than 200 cfu/100 mL. The site was located in the southwest corner of the upper portion of Oakland Bay with a value of 210 cfu/100mL.

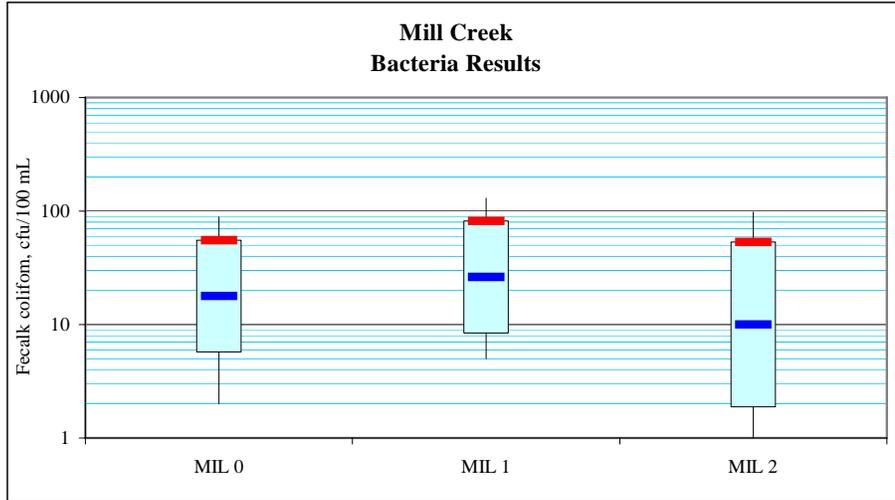
The tide and current meters that were placed in Oakland Bay and Hammersly Inlet on January 13, 2005 and will be removed on February 23, 2006 (Figure 14). An ADCP (acoustic Doppler current profiler) was also placed at the headwaters of Hammersly Inlet from October 13, 2005 to December 28, 2005.

#### *Communication and Coordination*

- Monthly sample coordination meetings with Squaxin Island Tribe.
- Monthly sample coordination meetings with Department of Health.
- Met with Oakland Bay Technical Advisory Group (TAG) on October 26, 2005.
- Discussed sediment sample contracting with Thurston County Department of Health.
- Met with Oakland Bay Technical Advisory Group (TAG) on December 16, 2005.

- Oakland Bay reclassification meeting on January 5, 2006.

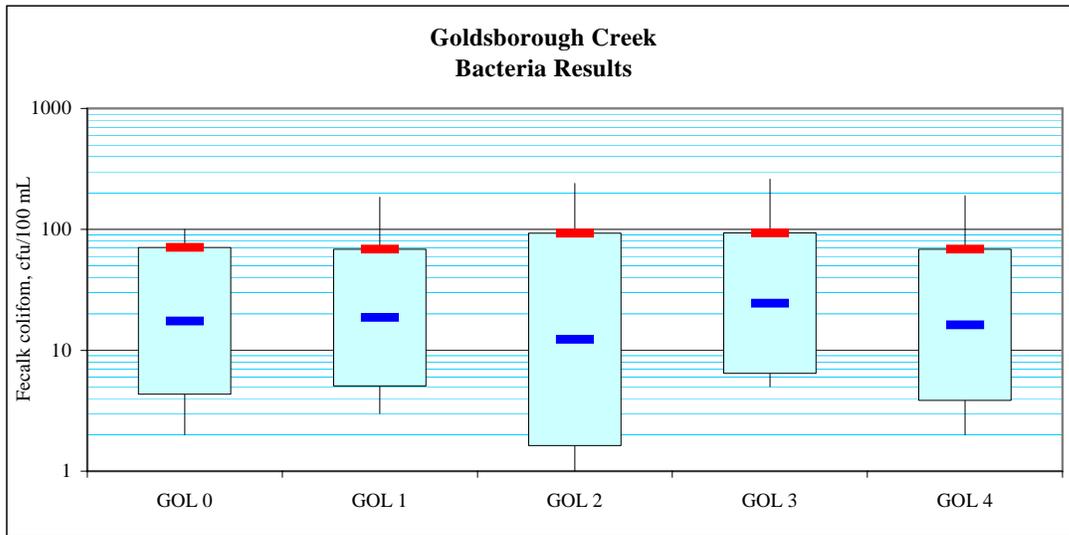
## Figures and Tables



Date	MIL 0	MIL 1	MIL 2
11/22/2004	17	10	8
12/8/2004	29	42	12
12/21/2004	26	30	8
1/4/2005	9	17	7
1/18/2005	80	130	42
2/18/2005	8	13	3
3/1/2005	40	28	1
3/8/2005	2	8	1
3/23/2005	9	11	1
4/5/2005	9	5	1
4/18/2005	8	9	3
5/3/2005	17	27	6
5/17/2005	89	120	38
5/31/2005	18	49	21
6/14/2005	29	29	39
6/27/2005	9	24	25
7/5/2005	12	36	21
7/18/2005	38	94	22
8/1/2005	24	47	20
8/15/2005	41	84	98
8/30/2005	8	22	39
9/13/2005	23	7	10
9/28/2005	27	21	25
10/18/2005	7	19	6
10/26/2005	7	19	5
11/7/2005	75	100	46
11/30/2005	27	31	9

MIL 0	MIL 1	MIL 2	Statistic
6	8	2	10th percentile
2	5	1	min
18	26	10	geometric mean
89	130	98	max
56	82	53	90th percentile

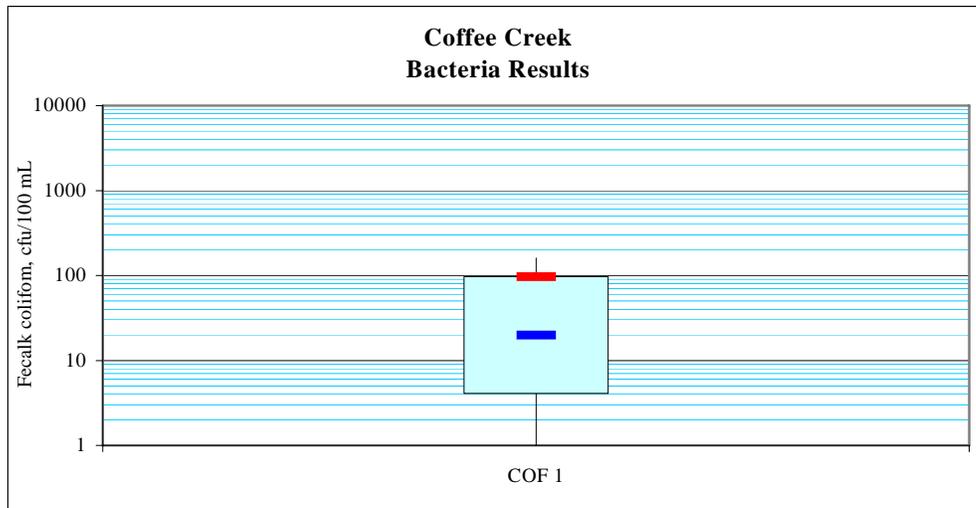
**Figure 1. Mill Creek Fecal Coliform Results**



Date	GOL 0	GOL 1	GOL 2	GOL 3	GOL 4
11/22/2004	2	7	4	8	5
12/8/2004	35	40	38	30	31
12/21/2004	7	12	4	8	2
1/4/2005	6	10	1	14	16
1/18/2005	100	185	240	130	48
2/18/2005	5	3	1	5	11
3/1/2005	49	59	77	110	31
3/8/2005	5	5	2	31	190
3/23/2005	5	7	5	9	7
4/5/2005	11	7	18	2	9
4/18/2005	20	14	7	16	5
5/3/2005	23	18	15	29	32
5/17/2005	32	21	15	37	7
5/31/2005	25	14	6	25	17
6/14/2005	32	36	56	23	11
6/27/2005	29	19	19	29	24
7/5/2005	51	43	47	260	23
7/18/2005	34	25	28	20	29
8/1/2005	43	35	53	21	63
8/15/2005	24	40	25	22	23
8/30/2005	60	20	21	21	57
9/13/2005	12	13	10	19	21
9/28/2005	10	30	10	27	15
10/18/2005	32	28	46	44	40
10/26/2005	22	10	11	23	7
11/7/2005	9	37	23	23	29
11/30/2005	14	17	15	17	11

GOL 0	GOL 1	GOL 2	GOL 3	GOL 4	Statistics
5	6	3	7	5	10th percentile
2	3	1	2	2	min
18	19	14	22	18	geometric mean
100	185	240	260	190	max
60	57	74	77	61	90th percentile

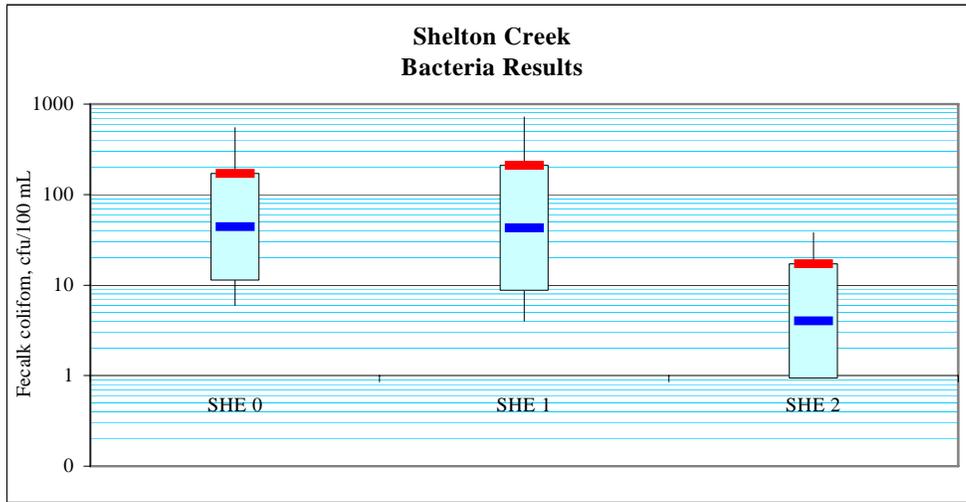
**Figure 2. Goldsborough Creek Fecal Coliform Results**



Date	COF 1
11/22/2004	6
12/8/2004	
12/21/2004	39
1/4/2005	1
1/18/2005	160
2/18/2005	42
3/1/2005	44
3/8/2005	6
3/23/2005	6
4/5/2005	
4/18/2005	8
5/3/2005	
5/17/2005	45
5/31/2005	25
6/14/2005	43
6/27/2005	33
7/5/2005	30
7/18/2005	34
8/1/2005	85
8/15/2005	36
8/30/2005	48
9/13/2005	18
9/28/2005	29
10/18/2005	35
10/26/2005	1
11/7/2005	11
11/30/2005	15

COF 1	Statistic
4	10th percentile
1	min
20	geometric mean
160	max
97	90th percentile

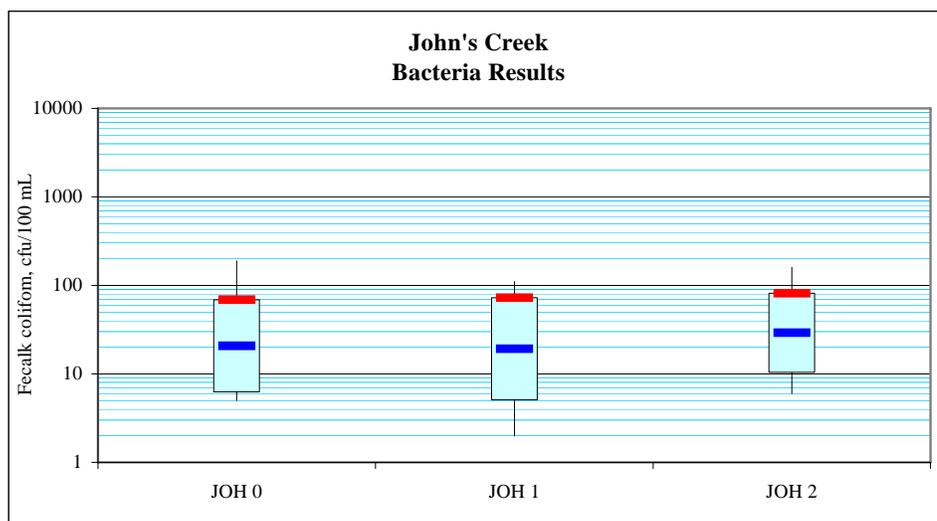
**Figure 3. Coffee Creek Fecal Coliform Results**



Date	SHE 0	SHE 1	SHE 2
11/22/2004	13	10	2
12/8/2004	73	250	3
12/21/2004	19	20	4
1/4/2005	11	10	1
1/18/2005	180	250	38
2/18/2005	11	7	1
3/1/2005	12	29	1
3/8/2005	6	4	1
3/23/2005	18	15	7
4/5/2005	170	110	4
4/18/2005	18	11	1
5/3/2005	27	29	1
5/17/2005	140	60	6
5/31/2005	60	47	4
6/14/2005	84	28	3
6/27/2005	50	42	14
7/5/2005	550	720	24
7/18/2005	32	36	4
8/1/2005	57	220	3
8/15/2005	110	76	13
8/30/2005	120	270	8
9/13/2005	92	39	11
9/28/2005	31	33	14
10/18/2005	29	21	13
10/26/2005	51	55	1
11/7/2005	88	92	13
11/30/2005	35	39	1

SHE 0	SHE 1	SHE 2	Statistics
11	9	1	10th percentile
6	4	1	min
44	43	4	geometric mean
550	720	38	max
172	210	17	90th percentile

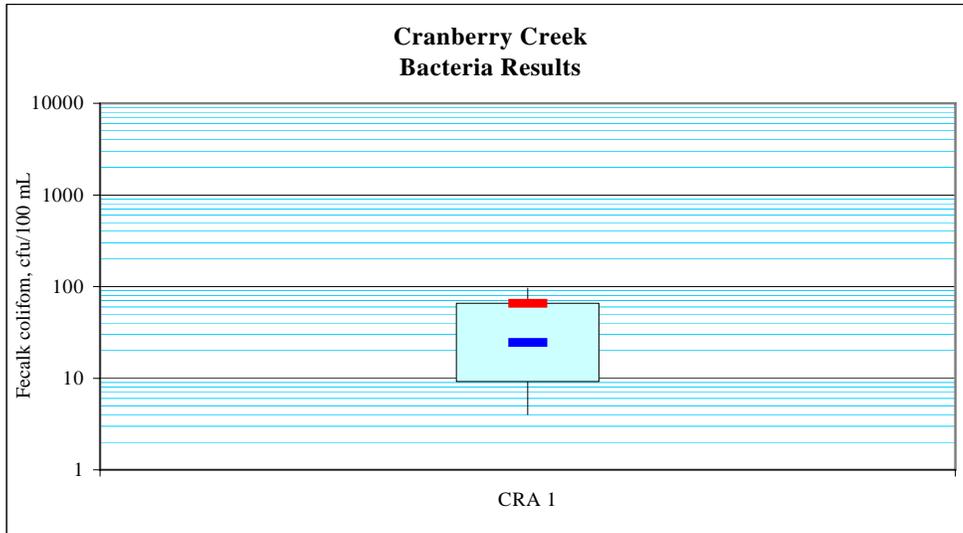
**Figure 4. Shelton Creek Fecal Coliform Results**



Date	JOH 0	JOH 1	JOH 2
11/22/2004	5	2	6
12/8/2004	35	46	42
12/21/2004	22	5	15
1/4/2005	16	11	17
1/18/2005	190	100	160
2/18/2005	7	10	9
3/1/2005	28	34	59
3/8/2005	11	16	14
3/23/2005	9	12	11
4/5/2005	10	4	11
4/18/2005	12	12	15
5/3/2005	14	16	49
5/17/2005	27	36	22
5/31/2005	67	43	29
6/14/2005	45	80	57
6/27/2005	43	110	49
7/5/2005	55	57	67
7/18/2005	35	17	22
8/1/2005	120	88	88
8/15/2005	48	35	40
8/30/2005	25	27	120
9/13/2005	11	10	52
9/28/2005	18	28	23
10/18/2005	18	10	24
10/26/2005	9	6	34
11/7/2005	6	14	23
11/30/2005	5	7	20

JOH 0	JOH 1	JOH 2	Statistic
6	5	10	10th percentile
5	2	6	min
21	19	29	geometric mean
190	110	160	max
69	73	82	90th percentile

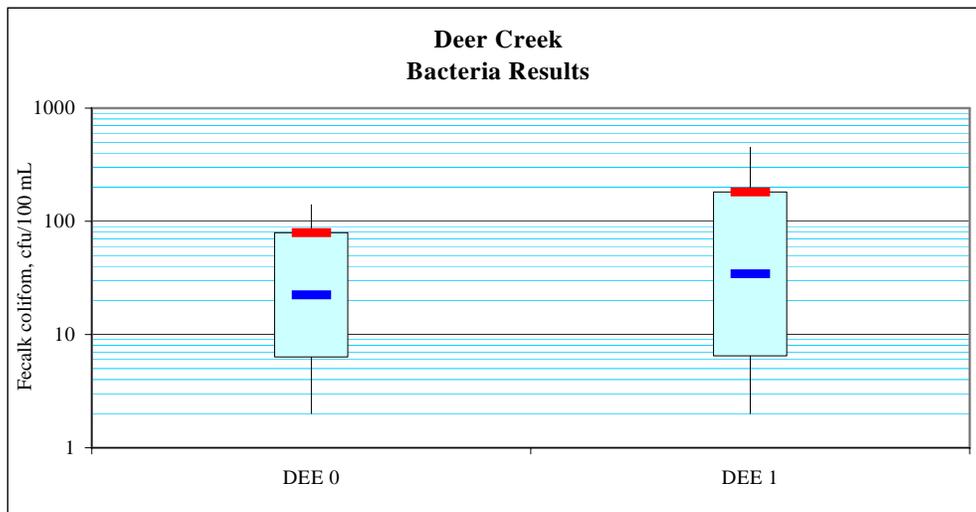
**Figure 5. John's Creek Fecal Coliform Results**



Date	CRA 1
11/22/2004	22
12/8/2004	38
12/21/2004	22
1/4/2005	11
1/18/2005	96
2/18/2005	15
3/1/2005	31
3/8/2005	24
3/23/2005	4
4/5/2005	9
4/18/2005	8
5/3/2005	21
5/17/2005	27
5/31/2005	32
6/14/2005	74
6/27/2005	43
7/5/2005	36
7/18/2005	55
8/1/2005	88
8/15/2005	51
8/30/2005	27
9/13/2005	18
9/28/2005	33
10/18/2005	8
10/26/2005	11
11/7/2005	26
11/30/2005	29

CRA 1	Statistic
9	10th percentile
4	min
25	geometric mean
96	max
66	90th percentile

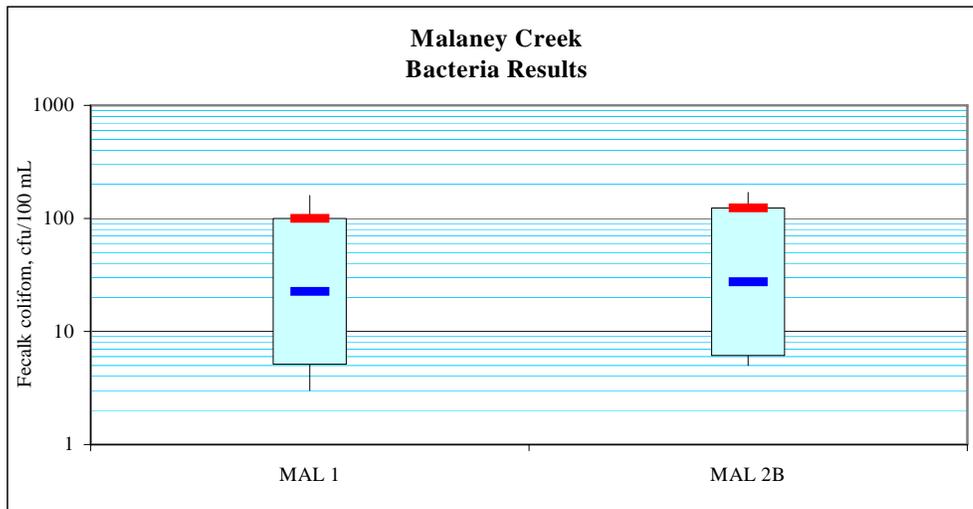
**Figure 6. Cranberry Creek Fecal Coliform Results**



Date	DEE 0	DEE 1
11/22/2004	10	54
12/8/2004	9	65
12/21/2004	27	13
1/4/2005	14	18
1/18/2005	77	150
2/18/2005	9	28
3/1/2005	13	49
3/8/2005	9	10
3/23/2005	5	13
4/5/2005	2	2
4/18/2005	8	14
5/3/2005	32	80
5/17/2005	37	450
5/31/2005	25	15
6/14/2005	69	22
6/27/2005	39	110
7/5/2005	34	400
7/18/2005	140	60
8/1/2005	46	92
8/15/2005	80	230
8/30/2005	57	80
9/13/2005	73	43
9/28/2005	27	21
10/18/2005	10	18
10/26/2005	31	11
11/7/2005	14	6
11/30/2005	19	8

DEE 0	DEE 1	Statistic
6	6	10th percentile
2	2	min
22	34	geometric mean
140	450	max
79	182	90th percentile

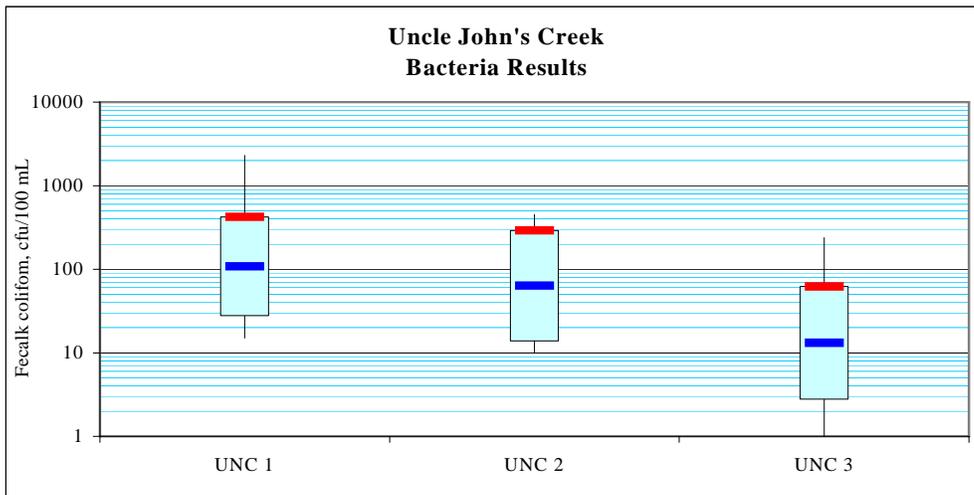
**Figure 7. Deer Creek Fecal Coliform Results**



Date	MAL 1	MAL 2B
11/22/2004	10	6
12/8/2004	28	24
12/21/2004	150	90
1/4/2005	3	14
1/18/2005	110	130
2/18/2005	9	24
3/1/2005	8	29
3/8/2005	3	8
3/23/2005	4	5
4/5/2005	6	6
4/18/2005	6	8
5/3/2005	53	60
5/17/2005	98	45
5/31/2005	49	13
6/14/2005	29	14
6/27/2005	43	95
7/5/2005	47	80
7/18/2005	52	63
8/1/2005	23	170
8/15/2005	20	
8/30/2005	160	9
9/13/2005	36	150
9/28/2005	35	
10/18/2005	29	6
10/26/2005	6	6
11/7/2005	40	29
11/30/2005	17	20

MAL 1	MAL 2B	Statistics
5	6	10th percentile
3	5	min
23	28	geometric mean
160	170	max
100	124	90th percentile

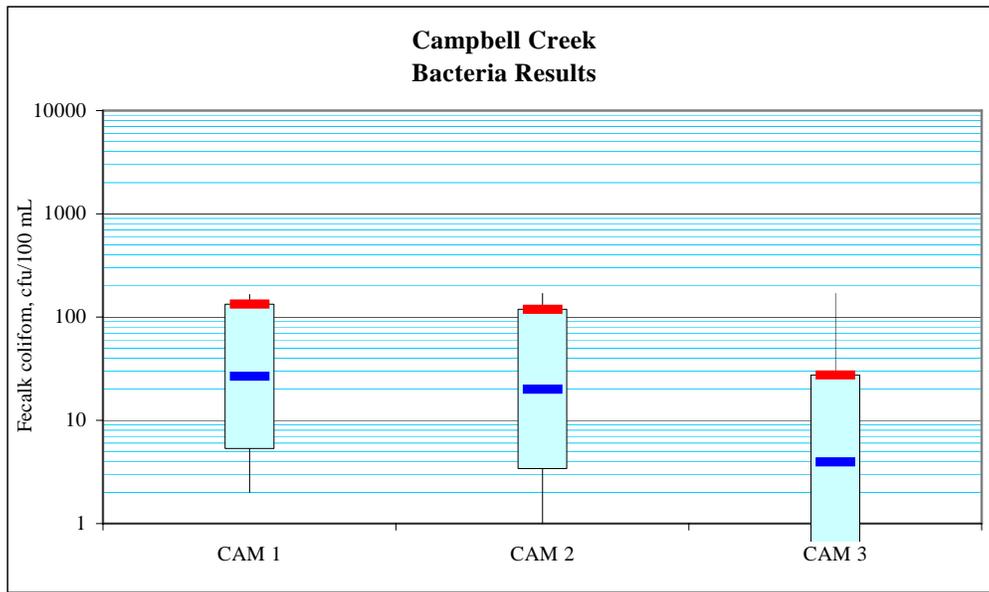
Figure 8. Malaney Creek Fecal Coliform Results



Date	UNC 1	UNC 2	UNC 3
11/22/2004	110	54	20
12/8/2004	225	370	12
12/21/2004	39	13	8
1/4/2005	22	18	42
1/18/2005	200	150	240
2/18/2005	27	28	36
3/1/2005	140	49	2
3/8/2005	100	10	2
3/23/2005	15	13	20
4/5/2005	23	290	10
4/18/2005	48	14	24
5/3/2005	230	180	14
5/17/2005	220	450	190
5/31/2005	80	15	17
6/14/2005	66	22	21
6/27/2005	2300	110	13
7/5/2005	110	400	8
7/18/2005	100	60	10
8/1/2005	235	92	7
8/15/2005	240	230	20
8/30/2005	110	260	3
9/13/2005	310	80	17
9/28/2005	440	69	17
10/18/2005	110	23	9
10/26/2005	110	52	1
11/7/2005	110	110	26
11/30/2005	41	32	4

UNC 1	UNC 2	UNC 3	Statistic
28	14	3	10th percentile
15	10	1	min
108	63	13	geometric mean
2300	450	240	max
423	291	62	90th percentile

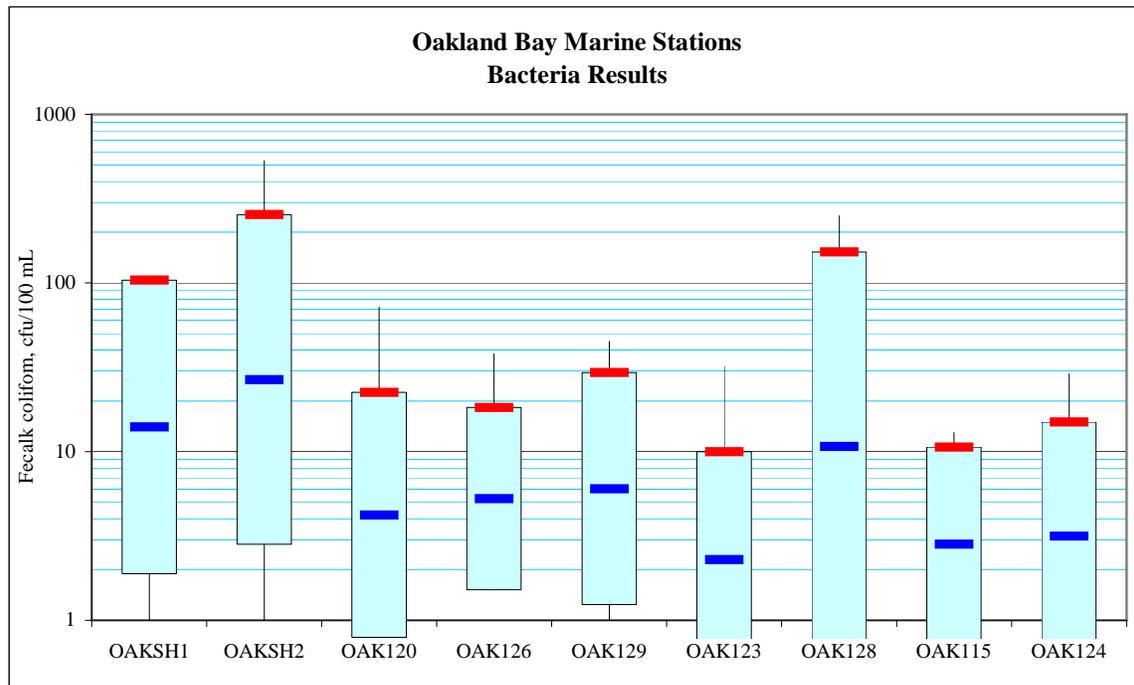
**Figure 9. Uncle John's Creek Fecal Coliform Results**



Date	CAM 1	CAM 2	CAM 3	Rainfall (Previous 24 hrs)
11/22/2004	4	36	1	0.01
12/8/2004	49	170	3	0.44
12/21/2004	5	6	2	0
1/4/2005	5	2	1	0
1/18/2005	120	88	6	1.25
2/18/2005	2	4	1	0
3/1/2005	31	49	1	0.1
3/8/2005	18	8	1	0
3/23/2005	6	1	1	0.04
4/5/2005	47	8	1	0.22
4/18/2005	165	6	1	0.26
5/3/2005	64	28	27	0.29
5/17/2005	140	68	5	0.14
5/31/2005	29	52	170	0
6/14/2005	37	11	9	0.06
6/27/2005	92	94	3	0
7/5/2005	35	30	4	0
7/18/2005	31	52	26	0
8/1/2005	29	38	31	0
8/15/2005	38	37	12	0

CAM 1	CAM 2	CAM 3	Statistic
5	3	1	10th percentile
2	1	1	min
27	20	4	geometric mean
165	170	170	max
133	118	27	90th percentile

**Figure 10. Campbell Creek Fecal Coliform Results**



Date	OAKSH1	OAKSH2	OAK120	OAK126	OAK129	OAK123	OAK128	OAK115	OAK124
11/2/2004	110	150	14	22	23	32	125	11	29
12/2/2004	31	11	2	5	2	5	6	3	1
1/5/2005	40	21	15	7	2	2	4	2	1
2/1/2005	5	9	5	9	3	1	1	13	1
3/1/2005	52	265	1	3	3	1	22	1	12
4/11/2005	1	20	3	2	1	1	1	1	2
5/10/2005	33	530	72	38	45	7	250	12	14
6/8/2005	1	17	2	3	19	1	67	3	4
9/20/2005	7	12	1	2	7	4	1	1	1
10/18/2005	17	1	2	3	19	1	66	3	4
11/16/2005	29	28	4	3	4	1	3	1	2
Statistics	OAKSH1	OAKSH2	OAK120	OAK126	OAK129	OAK123	OAK128	OAK115	OAK124
10th percentile	2	3	1	2	1	1	1	1	1
min	1	1	1	2	1	1	1	1	1
geometric mean	14	27	4	5	6	2	11	3	3
max	110	530	72	38	45	32	250	13	29
90th percentile	104	255	22	18	29	10	153	11	15

Figure 11. Marine Station Fecal Coliform Results

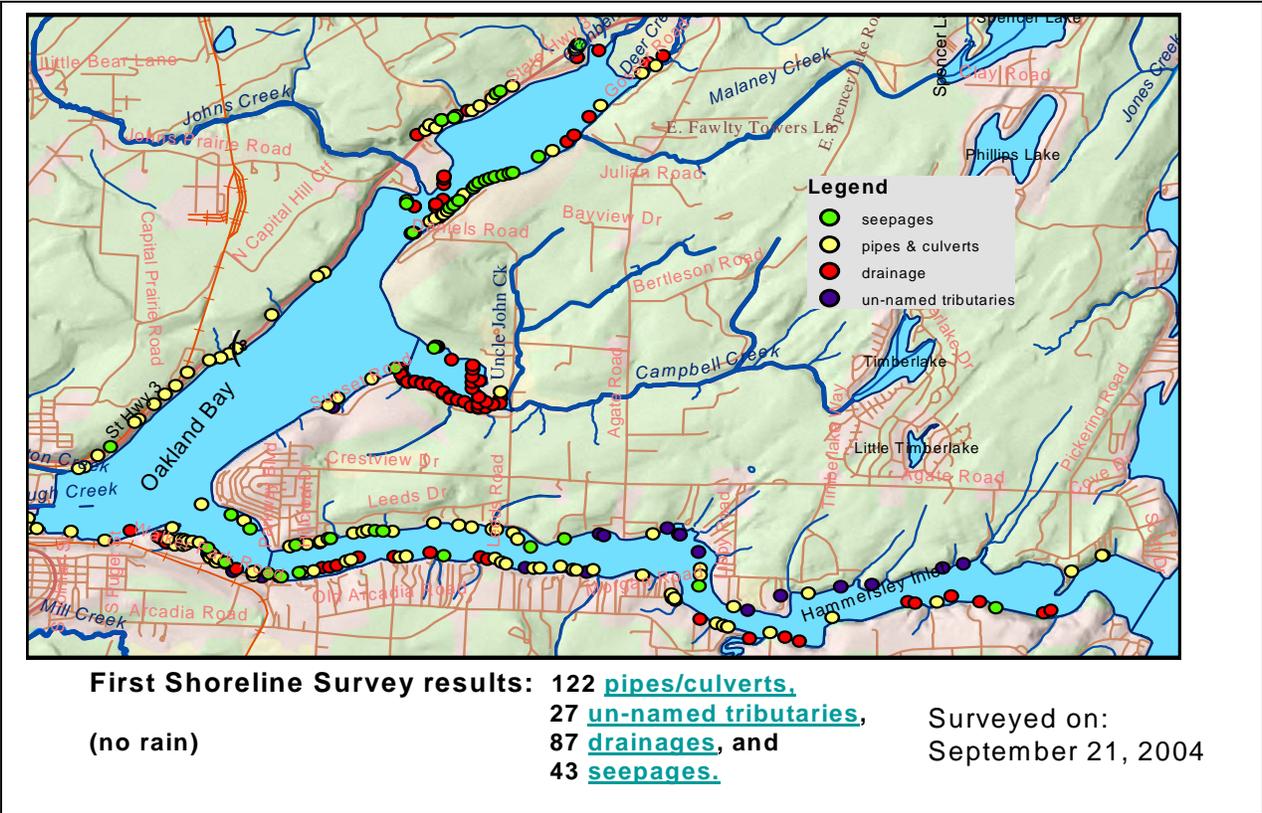


Figure 12. Drainage Locations

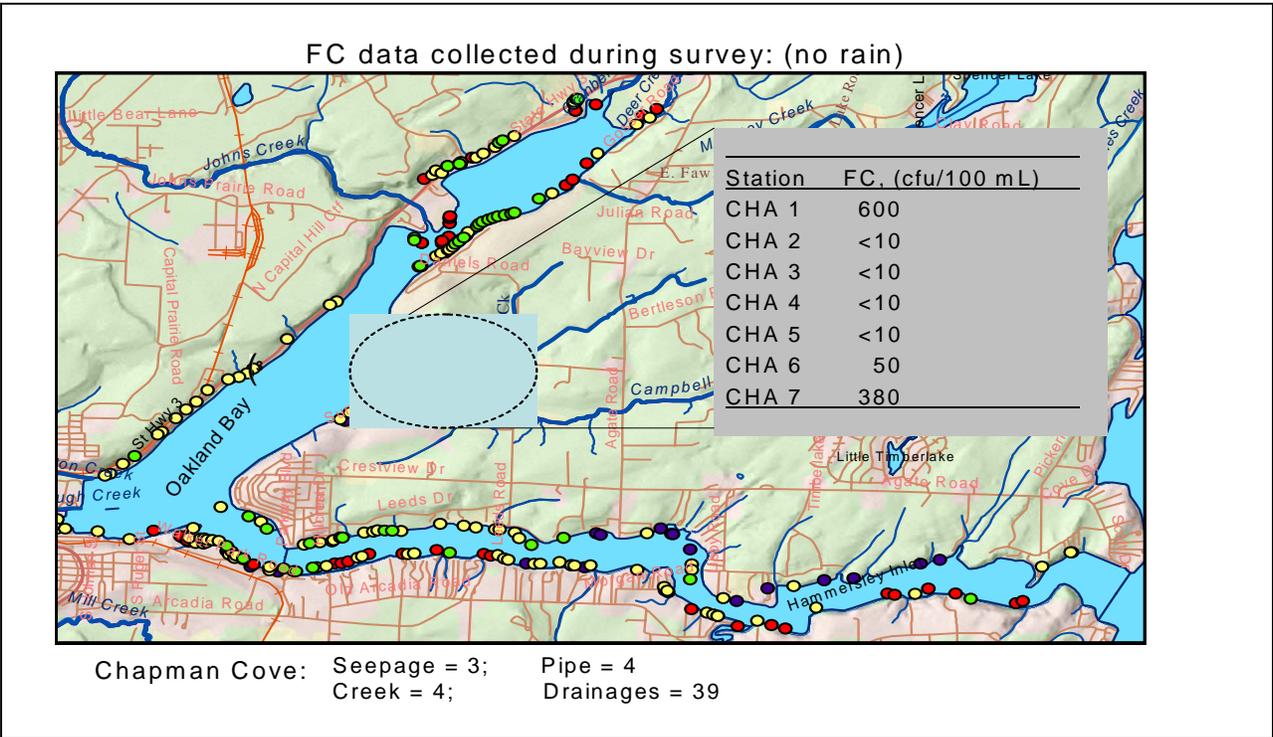


Figure 13. Chapman Cove Drainage Locations

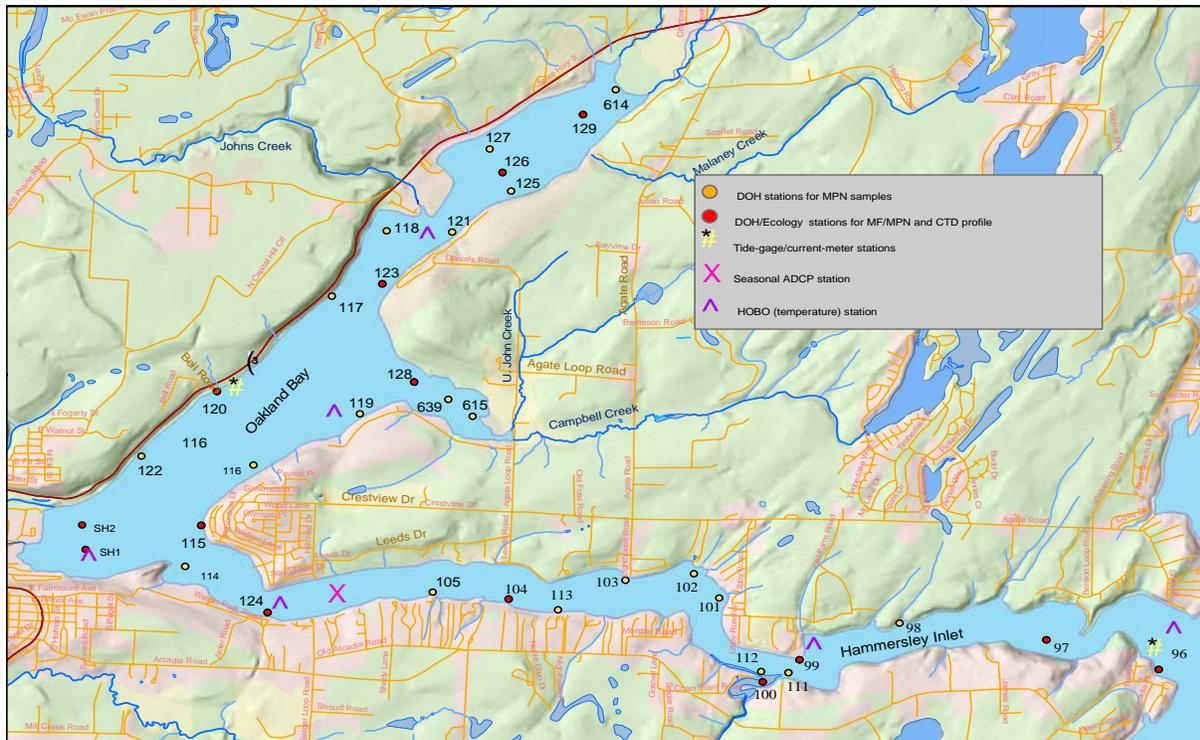


Figure 14. DOH/Ecology Marine Stations and Locations of S4s and ADCP

Creek	Station	Station Location	Flow	Temperature	Conductivity	Fecal coliform	Fecal Coliform Method*
Cranberry	CRA1	At Hwy 3 bridge	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
Deer	DEE1	At Hwy 3 bridge	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
Malaney	MAL1	At Agate Road culvert	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
	MAL2-a	At Access Rd from Scarlet Rd				bi-weekly	MF
	MAL2-b	At E. Spencer lake Rd				bi-weekly	MF
	MAL2	Below Spencer Lake				bi-weekly	MF
Uncle John	UNC1	At Agate Loop culvert (lower)—at ebb tide				bi-weekly	MF
	UNC2	At Agate Loop culvert (upper)—at flood tide	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
	UNC3	At Agate Road culvert				bi-weekly	MF
Campbell	CAM1	At Agate Loop bridge —at ebb tide				bi-weekly	MF
	CAM2	At Agate Road culvert	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
	CAM3	Below Timber Lake, at Timberlake Dr				bi-weekly	MF
John	JOH1	JOH1 at Bayshore Country Golf	bi-weekly	continuous	bi-weekly	bi-weekly	MPN/MF
	JOH2	JOH2 at Johns Creek Drive	continuous	continuous			
Shelton	SHE 1	At Dairy Queen @ Hwy 3 bridge	continuous	continuous	bi-weekly	bi-weekly	MPN/MF
	SHE2	At N 7th St, between N Laurel and W Birch				bi-weekly	MF
	SHE3	Road off Shelton Springs Road				bi-weekly	MF
Goldsborough	GOL1	GOL1 at Hwy 3 bridge	bi-weekly	continuous	bi-weekly	bi-weekly	MPN/MF
	GOL2	GOL2 at Hwy 101 bridge	continuous			bi-weekly	MF
	GOL3	At Shelton-Matlock Road (Schafer Park Rd)				bi-weekly	MF
	GOL4	Little Egypt Road, below confluence of NF/SF				bi-weekly	MF
	COF1	On Coffee Creek at Deegan Road crossing				bi-weekly	MF
Mill	MIL0	At Arcadia Road	bi-weekly	continuous	bi-weekly	bi-weekly	MPN/MF
	MIL2	At the diner on Hwy 3	continuous	continuous			

Table 1. Tributary sampling location, parameters, and frequency of sampling

Cc: Anise Ahmed, TMDL Project Manager  
Karol Erickson, TMDL Bacteria Project Supervisor  
Carol Norsen, Project Tracker Administrator