

Appendix VIIIa. Fluorescent Whitening Agents, Microbial Source Tracking, Fecal Coliform, and Flow Results at "Hot Spots" April 2007

Sample Site	4/24/2007 (Baseflow)			4/25/2007 (Baseflow)						4/26/2007 (Baseflow)			2007 MST Interpretation		2006 MST Interpretation	
	Time	Fecal Coliform	Time	Fecal Coliform	esp gene	Bacteroides spp.	Quantitative Bacteroides spp.	polyomavirus	Sediment General Bacteroides spp.	Flow (cms)	Time	Fecal Coliform	FWA	Source	Signal	Signal
		(CFU/100 mL)		(CFU/100 mL)	ID PCR (+/-)	ID PCR (+/-)	ID PCR (copies/100 mL)	ID PCR (+/-)	PCR			(CFU/100 mL)				
ELIZARBOR	8:50	8,100	12:46	790	NEGATIVE	Negative	BDL	Negative	Negative	too low	12:55	1,480	ND	NA	Very Strong Negative	Very Strong Negative
ELIZNW23	9:00	3,200	12:55	1,250	POSITIVE	Negative	BDL	Negative	Positive	0.00134	13:00	2,760	ND	Residual	Weak positive	Strong Positive (upstream at ELIZUNIV)
ELIZNW7DS	8:42	1,230	12:35	7,100	NEGATIVE	Negative	BDL	Negative	Negative	0.00191	12:46	3,120	ND	NA	Very Strong Negative	NA
HOGCETTRIB	10:50	26	14:10	258	NEGATIVE	Negative	BDL	Positive	Positive	too low	14:10	180	ND	Residual	Moderate positive	
HOGGHSN	10:58	780	14:25	3,200	POSITIVE	Positive	59,400,000	Negative	Positive	0.00011	14:18	1,140	ND	Recent	Strong Positive	Very Strong Negative (upstream at HOGGHSNASH)
HOGNW16	9:50	1,150	13:50	710	POSITIVE	Negative	BDL	Positive	Positive	NM	13:50	400	ND	Residual	Strong Positive	NA
HOGNW23	10:38	140	14:00	1,250	POSITIVE	Negative	BDL	Positive	Positive	0.03155	14:02	280	ND	Residual	Strong Positive	NA
HOGNW8	8:26	800	12:10	980	NEGATIVE	Negative	BDL	Negative	Negative	0.02134	12:30	1,080	ND	NA	Very Strong Negative	NA
HOGUSRAT	9:23	1,570	13:15	580	POSITIVE	Negative	BDL	Positive	Positive	0.02858	13:20	304	ND	Residual	Strong Positive	NA
LFCNE25	15:55	144	10:10	110	NEGATIVE	Negative	BDL	Negative	Negative	0.00192	10:25	122	ND	NA	Very Strong Negative	Very Strong Negative (Upstream at LFCNE3AVE)
LHATNB		NM	9:50	140	POSITIVE	Positive	2,790	Positive	Positive	NM	11:20	160	ND	Recent	Very Strong Positive	NA
LHATWALDO	15:30	344	9:40	302	POSITIVE	Positive	49,000,000	Positive	Positive	too low	11:10	180	Weak Positive/moderate Positive	Recent	Very Strong Positive	NA
POSNW16	11:25	184	14:35	960	POSITIVE	Negative	BDL	Negative	Positive	NM	14:35	280	ND	Residual	Weak Positive	NA
POSNW36DR	11:45	1,170	14:50	680	POSITIVE	Positive	7,240,000	Negative	Positive	0.01661	14:45	280	ND	Recent	Strong Positive	NA
POSNW8	8:35	260	12:20	940	NEGATIVE	Negative	BDL	Negative	Negative	0.02008	12:40	280	ND	NA	Very Strong Negative	NA
RATNW8	10:10	194	13:35	138	POSITIVE	Positive	2,640,000	Negative	Positive	0.00091	13:30	180	ND	Recent	Strong Positive	NA
RATUSHOG	9:15	220	13:10	168	POSITIVE	Negative	BDL	Positive	Positive	0.00101	13:15	880	ND	Residual	Strong Positive	NA
ROSESE7	14:40	9,200	8:55	1,530	NEGATIVE	Negative	BDL	Negative	Negative	0.00101	10:10	1,600	ND	NA	Very Strong Negative	NA
ROSESE9	14:32	1,030	8:50	2,800	POSITIVE	Negative	BDL	Negative	Positive	0.00104	10:07	920	ND	Residual	Weak Positive	NA
ROSEUNIV	14:50	56	9:00	288	NEGATIVE	Negative	BDL	Negative	Positive	0.00008	10:32	184	ND	NA	Very Strong Negative	NA
SWB331	14:05	28	8:10	70	NEGATIVE	Negative	BDL	Negative	Negative	0.17720	9:30	120	Slight Positive	NA	Very Strong Negative	NA
SWBLF		NM	8:20	398	POSITIVE	Positive	12,500,000	Negative	Positive	0.00914	9:40	920	ND	Recent	Strong Positive	NA
SWBNE10	15:10	144	9:25	450	NEGATIVE	Negative	BDL	Negative	Negative	0.00002	10:55	320	ND	NA	Very Strong Negative	Very Strong and Weak Positive
SWBSE1	15:00	216	9:10	160	NEGATIVE	Negative	BDL	Negative	Positive	0.00342	10:44	360	ND	NA	Very Strong Negative	NA
SWBSE8ST	14:19	136	8:40	334	POSITIVE	Negative	BDL	Positive	Negative	0.00701	9:55	1,120	ND	Residual	Strong Positive	NA
TUM441	13:10	40	10:35	284	NEGATIVE	Negative	BDL	Positive	Negative	NM	8:40	398	ND	Residual	Moderate Positive	NA
TUMPORTERS	13:35	52	10:48	164	NEGATIVE	Negative	BDL	Positive	Negative	NM	9:05	212	ND	Residual	Moderate Positive	NA
TUMSW11	13:23	158	10:40	262	POSITIVE	Positive	46,500	Negative	Positive	0.00444	8:55	360	ND	Recent	Strong Positive	NA
TUMSW5	13:45	580	10:55	340	POSITIVE	Negative	BDL	Negative	Positive	0.00174	9:12	396	ND	Residual	Weak Positive	Very Strong Negative

Quantified Human bacteroides in human sewage was 250,000,000 BDL = Below Detection Limit

Fluorescent Whitening Agent samples were analyzed by Ozark Underground Laboratory, Inc.

Both sides of each cloth were analyzed for FWAs. If only one result is reported both sides had the same result. Two results are listed when the sides had different results.

All other samples were analyzed by Biological Consulting Services

NM = Not Measured; ND = Not Detected; NA = Not Applicable

If flow is recorded as too low, flow was observed; however velocity or water depth were too low to measure

**Appendix VIIIb. Stations selected for additional sampling, May 16, 2007 - Lab Data**

Station	Date	Time	Compound	Units	Result	Qualifier
ELIZARBOR	5/16/2007	12:10	Alkalinity EPA 310.1	mg/L	132	
ELIZARBOR	5/16/2007	12:10	Ammonia, Total EPA 350.1	mg/L	0.085	
ELIZARBOR	5/16/2007	12:10	Calcium Total EPA 200.7/6010 (ICP)	mg/L	61.4	
ELIZARBOR	5/16/2007	12:10	Chloride, Total EPA 325.2	mg/L	30	
ELIZARBOR	5/16/2007	12:10	Color by Nessler Tubes EPA 110.2	cpu	20	
ELIZARBOR	5/16/2007	12:10	Fecal Coliform SM9222D	CFU/100mL	4400	
ELIZARBOR	5/16/2007	12:10	Fluoride by EPA 300.0	mg/L	0.448	
ELIZARBOR	5/16/2007	12:10	Iron Total EPA 200.7/6010 (ICP)	ug/L	102	
ELIZARBOR	5/16/2007	12:10	Magnesium Total EPA 200.7/6010 (ICP)	mg/L	11.3	
ELIZARBOR	5/16/2007	12:10	Nitrate-Nitrite, Total EPA 353.2	mg/L	1.78	
ELIZARBOR	5/16/2007	12:10	Nitrogen, Total - Calculation	mg/L	2.51	
ELIZARBOR	5/16/2007	12:10	Potassium Total EPA 200.7/6010 (ICP)	mg/L	1.72	
ELIZARBOR	5/16/2007	12:10	Soluble Reactive Phosphate EPA 365.2	mg/L	0.72	
ELIZARBOR	5/16/2007	12:10	Sulfate, Total EPA 375.4	mg/L	32.6	
ELIZARBOR	5/16/2007	12:10	Total Dissolved Solids EPA 160.1	mg/L	245	
ELIZARBOR	5/16/2007	12:10	Total Kjeldahl Nitrogen, Total EPA 351.2	mg/L	0.73	
ELIZARBOR	5/16/2007	12:10	Total Organic Carbon EPA 415.1	mg/L	6.37	
ELIZARBOR	5/16/2007	12:10	Total Phosphorus, Total EPA 365.3 (Spec)	mg/L	0.678	
ELIZARBOR	5/16/2007	12:10	Total Suspended Solids EPA 160.2 - 100mL	mg/L	8	
ELIZUNIVUS	5/16/2007	12:35	Alkalinity EPA 310.1	mg/L	96	
ELIZUNIVUS	5/16/2007	12:35	Ammonia, Total EPA 350.1	mg/L	0.061	
ELIZUNIVUS	5/16/2007	12:35	Calcium Total EPA 200.7/6010 (ICP)	mg/L	47.9	
ELIZUNIVUS	5/16/2007	12:35	Chloride, Total EPA 325.2	mg/L	30	
ELIZUNIVUS	5/16/2007	12:35	Color by Nessler Tubes EPA 110.2	cpu	30	
ELIZUNIVUS	5/16/2007	12:35	Fecal Coliform SM9222D	CFU/100mL	1020	
ELIZUNIVUS	5/16/2007	12:35	Fluoride by EPA 300.0	mg/L	0.234	
ELIZUNIVUS	5/16/2007	12:35	Iron Total EPA 200.7/6010 (ICP)	ug/L	62.7	
ELIZUNIVUS	5/16/2007	12:35	Magnesium Total EPA 200.7/6010 (ICP)	mg/L	7.04	
ELIZUNIVUS	5/16/2007	12:35	Nitrate-Nitrite, Total EPA 353.2	mg/L	0.378	
ELIZUNIVUS	5/16/2007	12:35	Nitrogen, Total - Calculation	mg/L	1.04	
ELIZUNIVUS	5/16/2007	12:35	Potassium Total EPA 200.7/6010 (ICP)	mg/L	1.77	
ELIZUNIVUS	5/16/2007	12:35	Soluble Reactive Phosphate EPA 365.2	mg/L	0.476	
ELIZUNIVUS	5/16/2007	12:35	Sulfate, Total EPA 375.4	mg/L	36.8	
ELIZUNIVUS	5/16/2007	12:35	Total Dissolved Solids EPA 160.1	mg/L	210	
ELIZUNIVUS	5/16/2007	12:35	Total Kjeldahl Nitrogen, Total EPA 351.2	mg/L	0.66	
ELIZUNIVUS	5/16/2007	12:35	Total Organic Carbon EPA 415.1	mg/L	9.28	
ELIZUNIVUS	5/16/2007	12:35	Total Phosphorus, Total EPA 365.3 (Spec)	mg/L	0.458	
ELIZUNIVUS	5/16/2007	12:35	Total Suspended Solids EPA 160.2 - 100mL	mg/L	3	l
HOGGHSN	5/16/2007	11:15	Alkalinity EPA 310.1	mg/L	120	
HOGGHSN	5/16/2007	11:15	Ammonia, Total EPA 350.1	mg/L	0.061	
HOGGHSN	5/16/2007	11:15	Calcium Total EPA 200.7/6010 (ICP)	mg/L	48.6	
HOGGHSN	5/16/2007	11:15	Chloride, Total EPA 325.2	mg/L	19	
HOGGHSN	5/16/2007	11:15	Color by Nessler Tubes EPA 110.2	cpu	20	
HOGGHSN	5/16/2007	11:15	Fecal Coliform SM9222D	CFU/100mL	700	
HOGGHSN	5/16/2007	11:15	Fluoride by EPA 300.0	mg/L	0.463	
HOGGHSN	5/16/2007	11:15	Iron Total EPA 200.7/6010 (ICP)	ug/L	282	
HOGGHSN	5/16/2007	11:15	Magnesium Total EPA 200.7/6010 (ICP)	mg/L	10.7	
HOGGHSN	5/16/2007	11:15	Nitrate-Nitrite, Total EPA 353.2	mg/L	0.467	
HOGGHSN	5/16/2007	11:15	Nitrogen, Total - Calculation	mg/L	0.757	

**Appendix VIIIb. Stations selected for additional sampling, May 16, 2007 - Lab Data**

Station	Date	Time	Compound	Units	Result	Qualifier
HOGGHSN	5/16/2007	11:15	Potassium Total EPA 200.7/6010 (ICP)	mg/L	1.22	
HOGGHSN	5/16/2007	11:15	Soluble Reactive Phosphate EPA 365.2	mg/L	0.823	
HOGGHSN	5/16/2007	11:15	Sulfate, Total EPA 375.4	mg/L	20	
HOGGHSN	5/16/2007	11:15	Total Dissolved Solids EPA 160.1	mg/L	202	
HOGGHSN	5/16/2007	11:15	Total Kjeldahl Nitrogen, Total EPA 351.2	mg/L	0.29	I
HOGGHSN	5/16/2007	11:15	Total Organic Carbon EPA 415.1	mg/L	5.47	
HOGGHSN	5/16/2007	11:15	Total Phosphorus, Total EPA 365.3 (Spec)	mg/L	0.843	
HOGGHSN	5/16/2007	11:15	Total Suspended Solids EPA 160.2 - 100mL	mg/L	12	
LFCNE25	5/16/2007	10:35	Alkalinity EPA 310.1	mg/L	60	
LFCNE25	5/16/2007	10:35	Ammonia, Total EPA 350.1	mg/L	0.04	
LFCNE25	5/16/2007	10:35	Calcium Total EPA 200.7/6010 (ICP)	mg/L	30.9	
LFCNE25	5/16/2007	10:35	Chloride, Total EPA 325.2	mg/L	26	
LFCNE25	5/16/2007	10:35	Color by Nessler Tubes EPA 110.2	cpu	20	
LFCNE25	5/16/2007	10:35	Fecal Coliform SM9222D	CFU/100mL	110	
LFCNE25	5/16/2007	10:35	Fluoride by EPA 300.0	mg/L	0.661	
LFCNE25	5/16/2007	10:35	Iron Total EPA 200.7/6010 (ICP)	ug/L	980	
LFCNE25	5/16/2007	10:35	Magnesium Total EPA 200.7/6010 (ICP)	mg/L	13.4	
LFCNE25	5/16/2007	10:35	Nitrate-Nitrite, Total EPA 353.2	mg/L	0.062	
LFCNE25	5/16/2007	10:35	Nitrogen, Total - Calculation	mg/L	0.332	
LFCNE25	5/16/2007	10:35	Potassium Total EPA 200.7/6010 (ICP)	mg/L	1.12	
LFCNE25	5/16/2007	10:35	Soluble Reactive Phosphate EPA 365.2	mg/L	0.02	
LFCNE25	5/16/2007	10:35	Sulfate, Total EPA 375.4	mg/L	54.6	
LFCNE25	5/16/2007	10:35	Total Dissolved Solids EPA 160.1	mg/L	202	
LFCNE25	5/16/2007	10:35	Total Kjeldahl Nitrogen, Total EPA 351.2	mg/L	0.27	I
LFCNE25	5/16/2007	10:35	Total Organic Carbon EPA 415.1	mg/L	3.94	I
LFCNE25	5/16/2007	10:35	Total Phosphorus, Total EPA 365.3 (Spec)	mg/L	0.085	
LFCNE25	5/16/2007	10:35	Total Suspended Solids EPA 160.2 - 100mL	mg/L	6	I
RATUSHOG	5/16/2007	11:50	Alkalinity EPA 310.1	mg/L	96	
RATUSHOG	5/16/2007	11:50	Ammonia, Total EPA 350.1	mg/L	0.05	
RATUSHOG	5/16/2007	11:50	Calcium Total EPA 200.7/6010 (ICP)	mg/L	48.2	
RATUSHOG	5/16/2007	11:50	Chloride, Total EPA 325.2	mg/L	34	
RATUSHOG	5/16/2007	11:50	Color by Nessler Tubes EPA 110.2	cpu	30	
RATUSHOG	5/16/2007	11:50	Fecal Coliform SM9222D	CFU/100mL	240	
RATUSHOG	5/16/2007	11:50	Fluoride by EPA 300.0	mg/L	0.332	
RATUSHOG	5/16/2007	11:50	Iron Total EPA 200.7/6010 (ICP)	ug/L	107	
RATUSHOG	5/16/2007	11:50	Magnesium Total EPA 200.7/6010 (ICP)	mg/L	7.98	
RATUSHOG	5/16/2007	11:50	Nitrate-Nitrite, Total EPA 353.2	mg/L	0.367	
RATUSHOG	5/16/2007	11:50	Nitrogen, Total - Calculation	mg/L	0.877	
RATUSHOG	5/16/2007	11:50	Potassium Total EPA 200.7/6010 (ICP)	mg/L	2.37	
RATUSHOG	5/16/2007	11:50	Soluble Reactive Phosphate EPA 365.2	mg/L	0.632	
RATUSHOG	5/16/2007	11:50	Sulfate, Total EPA 375.4	mg/L	31.9	
RATUSHOG	5/16/2007	11:50	Total Dissolved Solids EPA 160.1	mg/L	207	
RATUSHOG	5/16/2007	11:50	Total Kjeldahl Nitrogen, Total EPA 351.2	mg/L	0.51	
RATUSHOG	5/16/2007	11:50	Total Organic Carbon EPA 415.1	mg/L	7.41	
RATUSHOG	5/16/2007	11:50	Total Phosphorus, Total EPA 365.3 (Spec)	mg/L	0.611	
RATUSHOG	5/16/2007	11:50	Total Suspended Solids EPA 160.2 - 100mL	mg/L	2	U

U = Analyte not detected at or above the method detection limit

I = Analyte not detected above the practical quantitation limit

**Appendix VIIIc. Stations selected for additional sampling, May 16, 2007 - Field Data**

Station	Date	Time	Water		Spec Cond		Turbidity	
			Temp (°C)	pH (S.U.)	(µmhos/cm)	DO (mg/L)	(NTU)	Flow (cms)
LFCNE25	5/16/2007	10:35	20.9	7.08	38	5.77	3.08	too low
HOGGHSN	5/16/2007	11:15	20.4	7.48	343	8.92	4.65	0.000061
RATUSHOG	5/16/2007	11:50	20.9	7.55	371	8.19	1.02	0.003208
ELIZARBOR	5/16/2007	12:10	21.2	7.44	425	5.54	0.89	too low
ELIZUNIVUS	5/16/2007	12:35	21.6	7.12	354	7.10	0.61	0.000495

If flow is recorded as too low, flow was observed; however velocity or water depth were too low to measure

**Appendix VIII.d. Stations selected for additional Microbial Source Tracking sampling, August 7, 2007**

Station	Flow (cms)	Free Available Chlorine (mg/L)	<i>esp</i> gene ID PCR (+/-)	<i>Bacteroides</i> spp. ID PCR (+/-)	Quantitative <i>esp</i> gene ID PCR (Ratio)	Quantitative <i>Bacteroides</i> spp. (copies/100 mL)	polyomavirus ID PCR (+/-)	Fecal Coliform (CFU/100 mL)	
LHATWALDO	0.063	0.72	Negative	Negative	Below LOD	Below LOD	Negative	1500	1600
BEUPSTREAM	0.0078	0.07	Negative	Negative	Below LOD	Below LOD	Negative	2500	1800
BEINFLUENT	NM	NM	Positive	Positive	1.20%	1.60E+07	Positive	NM	
BEEFFLUENT	NM	0.51	Positive	Positive	1.10%	1.10E+04	Positive	1000	200
LHATARBOR	0.0432	0.01	Negative	Negative	Below LOD	Below LOD	Negative	500	100

NM = Not Measured

LOD = Limit of Detection

Flow calculated based on surface velocity estimates

\*Ratio of approximately 1.5% corresponds to domestic sewage

Triple Positive = High Probability human fecal pollution; results conclusive; resample to confirm

Triple Negative = Low Probability human fecal pollution; results conclusive; resample to confirm for regulatory purposes