

DISTRICT OF SOOKE
WASTEWATER TREATMENT
AND COLLECTION SYSTEM

OPERATED BY
EPCOR WATER SERVICES INC.



2009 ANNUAL REPORT
REGISTRATION NUMBER RE-17300



TABLE OF CONTENTS

INTRODUCTION.....1

OVERVIEW1

OPERATIONS3

 Table 1: Certification.....3

 Table 2: Average Monthly Quality.....4

 Operations, Maintenance & Improvements.....5

 Incidents.....6

 Odour Control.....7

COMMUNITY INVOLVEMENT7

MONTHLY DATA SUMMARY8

 Monthly Data Summaries

 Outfall Monitoring Report - March 2009

 Outfall Monitoring Report - October 2009

INTRODUCTION

The Sooke wastewater collection and treatment system is owned by the District of Sooke and operated by EPCOR Water Services Inc.

Construction of the Sooke collection system and wastewater treatment plant began in 2004 and the system was commissioned in November 2005. Individual domestic and commercial hook-ups began in January 2006 and continued throughout 2006 and 2007, with the majority completed by December 2006.

The system consists of:

- 34 km of collection system piping
- 4 pump lift stations (Sooke Road, West Coast Road, Helgeson Road & Sunriver)
- Secondary wastewater treatment plant with 1.7 km long, 30 m deep outfall
- Sequencing Batch Reactor treatment process with UV disinfection
- Capacity: annual average daily flow of 3,000 m³/day
peak wet weather flow of 6,900 m³/day
- Plant is expandable by an additional 3,000 m³/day (average daily flow)
- Servicing Sooke core area of approximately 5,500 residents

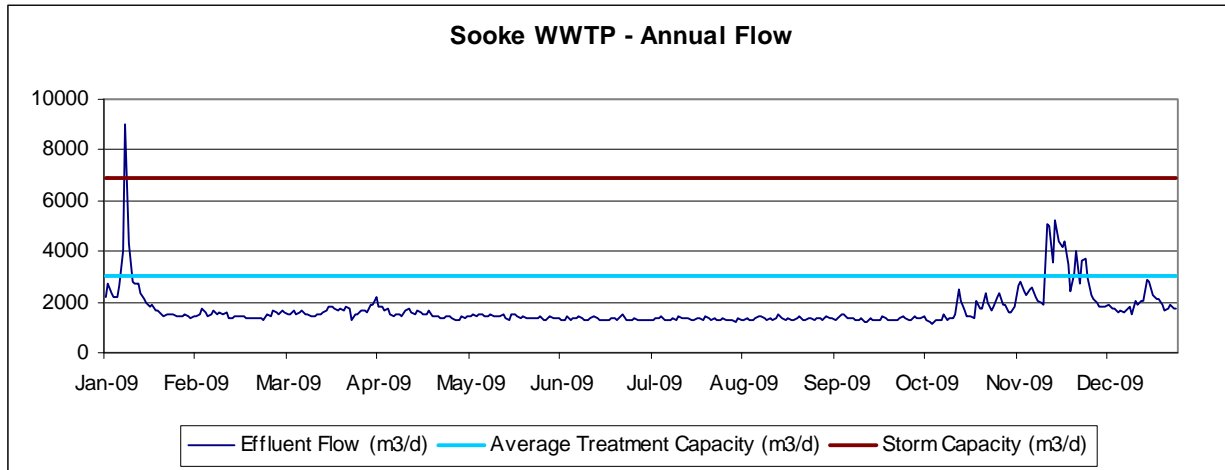
Secondary sewage treatment typically removes 90% of the total suspended solids and high levels of other contaminants, providing significant environmental benefits to the District of Sooke.

OVERVIEW

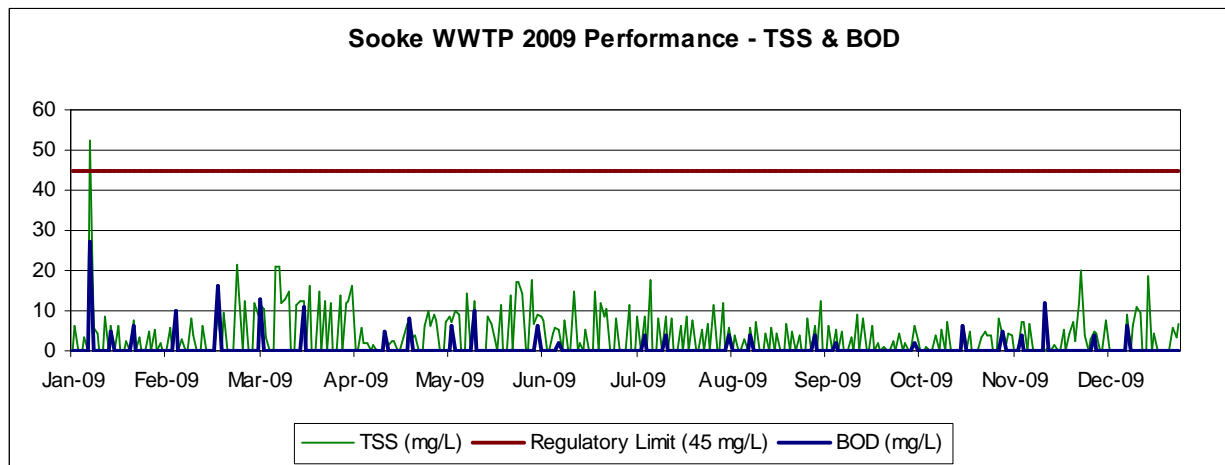
The wastewater treatment plant is performing very well. The primary parameters monitored for plant performance are flow, total suspended solids (TSS), biochemical oxygen demand (BOD) and fecal coliform (FC) concentrations. Each of these parameters provides an indication of how well the plant is meeting design and regulatory standards.

The annual average flow treated in the plant in 2009 was 1685 m³/day. This flow is below the volumes expected from the collection system by this point in time, and is approximately 55% of the average treatment capacity of the plant. The following figure summarizes the daily flows in 2009.

**SOOKE WASTEWATER AND COLLECTION SYSTEM
ANNUAL REPORT 2009**

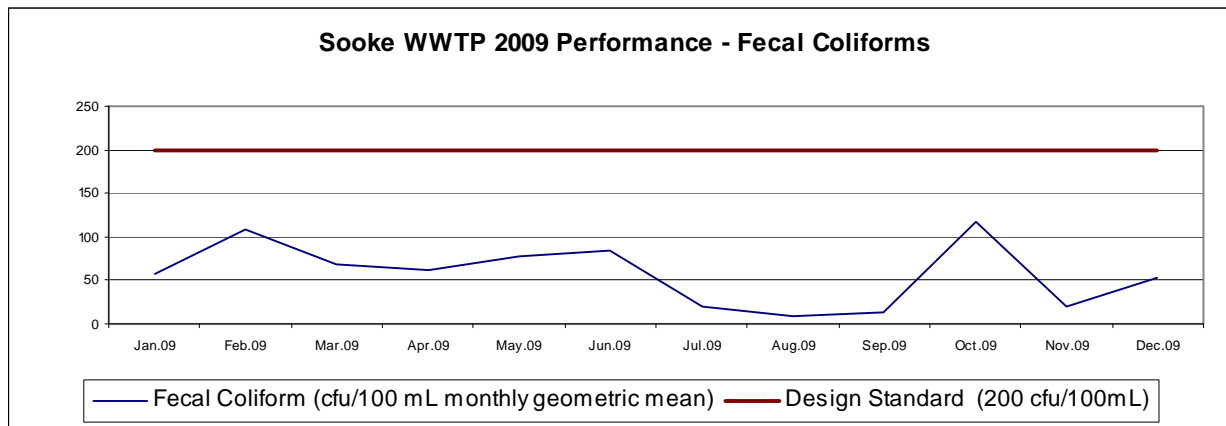


The following figure summarizes the TSS and BOD concentrations in the plant effluent through the year compared to the regulatory standards. The TSS and BOD in the plant effluent were consistently better than the regulatory requirements throughout the year. Over 95% of the average TSS & BOD in the plant influent was removed by the treatment process.





The following figure summarizes the monthly average fecal coliform concentrations in the plant effluent through the year compared to the design standards. The disinfection treatment process performed better than design standards throughout the year.



OPERATIONS

Table 1: Certification

The wastewater collection system is a Class III Wastewater Collection System, Certification # 1827, in accordance with the Environmental Operators Certification Program.

The wastewater treatment plant is a Class III Wastewater Treatment Plant, Certification # 1358, in accordance with the Environmental Operators Certification Program.

The following table summarizes the operators working at the Sooke WWTP in 2009.

Name	Position	Qualifications
John Reynolds	Senior Operator	British Columbia Environmental Operators Certification Program Certified: Level IV Municipal Wastewater Treatment
Shawn Pearson	Operator	Uncertified

Table 2: Average Monthly Quality

The following table summarizes the average monthly plant quality through the year. Appendix 1 includes the detailed quality data for each month.

Regulatory Limit	INFLUENT			EFFLUENT					BIO-SOLIDS
	Average BOD mg/L	Average TSS mg/L	Average NH ₃ mg/L	* Average Flow m ³ /day	45 mg/L Average BOD mg/L	45 mg/L Average TSS mg/L	* Average NH ₃ mg/L	+ FC CFU/100mL	
January	105	84	20	2282	13	23	10	58	50,470
February	200	213	30	1474	13	11	22	108	52,370
March	141	125	22	1606	12	12	21	69	20,570
April	298	233	29	1585	7	7	23	62	39,900
May	205	202	41	1421	8	12	31	77	50,560
June	154	198	28	1348	4	8	24	84	40,940
July	236	205	40	1326	4	6	22	20	30,480
August	203	237	29	1331	3	7	21	8	40,910
September	201	186	50	1339	3	6	15	13	30,910
October	223	192	29	1566	4	5	5	117	31,890
November	159	182	18	2974	7	7	7	20	31,710
December	135	224	26	1963	5	8	18	52	46,660
AVERAGE	188	185	37	1685	7	9	17	62	38,698
TOTAL				614,987 m ³					464,370 kg

NOTES:

Data presented in table is conducted by an external CALA certified laboratory (Canadian Association for Laboratory Accreditation).

+ Monthly average reported for fecal coliforms is a geometric mean.

* Limits being clarified with Ministry of Environment.

The District of Sooke continues to proceed with completion of the final stages of the Liquid Waste Management Plan (LWMP) for the community. Steering Committees were very active in 2009 for both the Storm Water Plan and the Sanitary Plan, and public consultation was conducted in the latter part of the year. The final Stage 3 LWMP is expected to be submitted to the Ministry of Environment in 2010.

The final Stage 3 Sanitary LWMP will include a draft Operating Certificate for the plant, which will provide an update to the current Registration. The Registration for discharge was submitted to the Ministry of Water, Land and Air Protection in 2002 as required for the grant funding process, however, this was before the plant design was finalized and the construction contract

was awarded. Several parameters contained in the registration (flow, fecal coliform concentration and ammonia removal) do not reflect the final design of the plant and need to be updated. While the operational certificate is being finalized, EPCOR uses the provincial Municipal Sewage Regulation (MSR) as guidance for quality parameters.

Receiving environment monitoring around the outfall was conducted in March and November 2009. Results continue to be excellent, with most parameters below detection limits. The reports are attached in Appendices 2 and 3.

Operations, Maintenance & Improvements

Ongoing operations and maintenance activities and improvements occurred throughout the year. Some highlights are included below.

- Bio-solids extracted from the centrifuge are trucked to the Hartland Landfill for disposal under Control Waste Permit # 09-043. During 2009, on average, approximately 19 tonnes of bio-solids per month were trucked to the landfill.
- Emery Electric Ltd. completed the maintenance of the Main Electrical distribution and Motor Control Centre (MCC) at the Wastewater Treatment Plant. This involved inspection, cleaning of the Variable Frequency Drives (VFD's) and an Infrared Scanning of all electrical components to ensure there were no undiscovered loose connections or hotspots.
- The annual lift station maintenance was completed. This entailed employing a vactor truck to remove any settled debris in the wetwell. Emery Electric inspected all Lift Station electrical components for any defects and the pumps were meggered to ensure the wire insulation and motor windings were in good state. The pumps at the Lift Stations were removed, inspected for impeller wear, checked to ensure oil levels were sufficient and quality had not been compromised due to leaky seals.
- The five standby generators were serviced and load tested by Cummins Western Canada to ensure proper operation during power outages.
- Two pump failures occurred at the Sunriver lift station. A large amount of rock and gravel suspected to be construction debris was found in the impeller. Discussions between the developer, builder and the District are ongoing to help alleviate these problems in the future.
- Pump # 2 at the Helgeson Rd. lift station had its impeller replaced due to excessive rock.
- During the year, a number of power outages of varying duration (from one half hour to several hours) occurred.
Back up generator power at the plant and the four lift stations started and functioned properly during the outages.
- A heavy rain storm on January 6 & 7 resulted in extremely high flows to the plant. Daily flows during the event were approximately 9,000 m³/day with instantaneous peaks

through the outfall line equivalent to 17,000 m³/day. This flow anomaly was outside the Registration flow and design standards. The Ministry of the Environment was notified of the conditions by telephone and a follow up email was sent.

Over the night of January 6/7, the effluent total suspended solids (TSS) increased to approximately 30 mg/L versus the normal concentration less than 10 mg/L. On the morning of January 7 the TSS samples were 50-58 mg/L, which is over the permit level (45 mg/L) but within the acceptable storm condition standards of the MSR. By 6 pm January 7, TSS returned to less than 10 mg/L, even though flows into the plant were still approximately 7000 m³/d.

- Other significant rain events occurred in November and December that affected the plant. One event occurred over an eight day period from November 16-23, resulting in influent flows averaging over 4100 m³/day.

On December 16 & 17 another high rainfall event triggered high level UV channel alarms, but caused no unusual operating parameters.

- The Seaparc Recreation Centre tie-in was completed in March 2009. This allowed waste from the washrooms to be sent to the treatment plant. Backwash water from the pool was sent to the plant as part of the treatment stream as of April 09, 2009.

Audits & Inspections

A number of internal audits and inspections were completed in 2009. Internally, EPCOR Quality Assurance staff completed an annual lab audit which included calibration of lab equipment, and a review of procedures and documentation.

The District of Sooke Fire Department and Western Fire Protection carried out inspections on emergency equipment.

The Ministry of Environment conducted their annual inspection of the facilities on March 26th, 2009 with the District of Sooke and EPCOR. The inspection went well, and the only outstanding issue is the inaccurate registration with MOE. This will be addressed when the District completes the Liquid Waste Management Plan.

Incidents

On September 28, 2009 a concerned citizen discovered and reported wastewater flowing from a Low Pressure Pump connection chamber. It was immediately investigated and resolved. The finding was that a Pressure Test Port on a low pressure pump system was left in the open position upon testing the system.

The flow coming from the port was intermittent and only happened when the pump ran. The flow was estimated at 12 to 15 litres/min while the pump ran. The wastewater was flowing across a vacant area and posed no health risks or human contact. It flowed for about 10 meters and disappeared into the soil. It did not reach any water course or water way. PEP was notified and an incident report was completed. The PEP number for this spill is 901713.

Odour Control

The Calgon Carbon Filter at the Sooke Road lift station has been operating very efficiently. Once the Centaur® Carbon has absorbed its maximum amount of odour causing compounds, then break through of odours occurs. When this takes place the activated carbon must be regenerated through a 24 hour cleaning cycle. Cleaning and back flushing of the carbon took place on June 22 and 23. After 18 hours of back flushing all of the carbon, it was removed and washed along with the cleaning the carbon unit's bottom screen.

A continuation of Bioxide injection at the Sunriver Lift station is ongoing to minimize odours developing in the forcemain from Sunriver Lift Station to the wetwell at the Sooke Road Lift Station.

COMMUNITY INVOLVEMENT

EPCOR continues to be committed to investing in communities in numerous ways. These investments include direct contributions and sponsorships, employee volunteerism, and our support as a major contributor to the United Way.

One of the ways EPCOR supports the District of Sooke is by investigating opportunities in the community that provide us with chances to connect with customers. For example, we support annual sponsorships of Canada Day celebrations, Sooke Legion Remembrance Day ceremonies, the Sooke Salmon Enhancement Society fishing derby and Holiday family skate and swim sessions at SEAPARC recreation centre.

For 2009, in addition to our annual sponsorships, we chose to support the Chamber of Commerce Community Awards Gala and the Artist Demonstration Project at the Sooke Fine Arts Show. As well, EPCOR participated in the Sooke Rotary Fair and Auction and co-hosted, along with the District of Sooke and CRD, a Toxic Round-Up Day to help residents dispose of household hazardous waste safely.

EPCOR's Road to Excellence program recognizes EPCOR's commitment to fostering innovation, creativity, leadership and achieving excellence among youth in its communities across Canada. In 2009 the Road to Excellence program continued for the fourth year in Sooke and from a field of many eligible, talented youth, awards were presented to pianist and composer Carmyn Slater, for Youth Excellence in Arts and Culture, to attend take specialized training classes in piano performance and composition with Mr. Edward Parker at the Royal Oak Conservatory of Music in Burnaby, BC, and to the Sooke Minor Fastball Association, the Sports Excellence award for equipment to aid in player development, coach training and a Youth Umpire Development program.

**MONTHLY DATA SUMMARY
2009**

Jan. Date	Eff	INFLUENT							SBR 1 EFFLUENT							FC CFU / 100 mL	SBR 2 EFFLUENT							FC CFU / 100 mL
		IN HOUSE				EXTERNAL			IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL			
		NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	NH ₃	
1	2228																							
2	2691		7.1	82					6.8	8								6.4	4					
3	2325																							
4	2168																							
5	2178		7.1	87					6.5	2								6.3	4					
6	2652														54									
7	3996			58		6	54	2		50		55	27	3.2										
8	8985		6.9	37						6					350			6.4	5					
9	4315		7.3	78					6.2	5								6.0	3					
10	2802																							
11	2714																							
12	2702		7.2	112					6.3	9					28			6.2	9					
13	2342																							
14	2154	10	7.2	124	330	141	83	23	5	6.3	6	35	8	5	10	36		6.3	4					
15	1947															82								
16	1822		7.1	172						6.4	5							6.3	7					
17	1858																							
18	1668																							
19	1652		7.1	129						6.4	3	85				62		6.4	2					
20	1536															30								
21	1467	33	7.5	203	470	169	114	36		6.4	8	47	7	6	16	44		6.7	8					
22	1524																							
23	1481		7.5	194						6.6	5							6.5	2					
24	1486																							
25	1404																							
26	1446		7.5	105						6.9	4							6.9	6					
27	1415																							
28	1543	29	7.3	204					14	6.8	9	28						6.5	1					
29	1431																							
30	1372		7.5	149						6.8	1							6.6	3					
31	1445																							
Min	1372	10	6.9	37	330	6	54	2	5	6	1	28	7	5	3	28		6	1					
Max	8985	33	7.5	204	470	169	114	36	14	7	50	85	55	27	16	350		7	9					
AVG	2282	24	7.2	124	400	105	84	20	9	7	9	49	23	13	10	58		6	4					

Feb.	Date	Eff	INFLUENT						SBR 1 EFFLUENT						FC CFU /100 mL	SBR 2 EFFLUENT						FC CFU /100 mL	
			IN HOUSE			EXTERNAL			IN HOUSE			EXTERNAL				IN HOUSE			EXTERNAL				
			NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS		BOD	NH ₃	NH ₃	pH	TSS	COD		TSS
1	1460																						
2	1522		7.6	160					7.0	9						270		6.8	3				
3	1722																						
4	1565	41	7.7	217	672	204	318	30	23	7.0	9	55	8	10	18	680		6.9	4				
5	1421																						
6	1479		7.3	182						6.9	4							7.0	2				
7	1639																						
8	1548																						
9	1556		7.5	119						7.0	10					90		6.9	6				
10	1508	35	7.4	172	308				24	6.9	7	40				12		6.8	1				
11	1571																						
12	1365																						
13	1380		7.8	264						7.0	6												
14	1424																						
15	1452																						
16	1457																						
17	1413															1090							
18	1376	31	7.4	142	283	196	107	30	27	6.9	10	27	13	16	26	20	24	6.8	6	61			
19	1380															40							
20	1350									7.0	16							7.0	3				
21	1364																						
22	1401																						
23	1393																						
24	1296		7.7	232						7.0	21												
25	1515	35	7.5	254					29	7.0	14	84											
26	1449																						
27	1675		7.4	149	550					6.9	12												
28	1583																						
Min	1296	31	7.3	119	283	196	107	30	23	6.9	4	27	8	10	18	12	24	6.8	1	61			
Max	1722	41	7.8	264	672	204	318	30	29	7.0	21	84	13	16	26	1090	24	7.0	6	61			
AVG	1474	36	7.5	189	453	200	213	30	26	7.0	11	52	11	13	22	108	24	6.9	4	61			

* Monthly average reported for fecal coliforms is a geometric mean.

Mar. Date	INFLUENT								SBR 1 EFFLUENT							FC CFU /100mL	SBR 2 EFFLUENT						FC CFU /100mL
	IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL				IN HOUSE			EXTERNAL			
	Eff	NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	
1	1545																						
2	1689		7.4	141	411				6.9	12						370							
3	1623									9													
4	1506	38	8.0	226	337	192	118	29	28	6.9	13	85	10	13	22	460		6.9					
5	1483										10												
6	1670		7.6	154						6.9	3												
7	1543																						
8	1573																						
9	1643		7.4	119						6.9	21												
10	1530										21												
11	1488	36	7.5	197	422				28	6.9	12	10				30							
12	1408										13					30							
13	1444		7.5	107						7.0	15												
14	1479																						
15	1485																						
16	1605		7.5	116						6.9	12					60							
17	1643										13												
18	1844	28	7.7	89	306	90	131	15	26	6.9	10	24	14	11	20	18							
19	1805															44							
20	1724		7.4	200						6.8	16												
21	1699																						
22	1720																						
23	1691		7.4	132						6.8	15												
24	1854																						
25	1774	30	7.4	114	495				24	7.0	13	44											
26	1307		7.5	127																			
27	1549										12												
28	1550																						
29	1644																						
30	1670		7.4	144						6.8	14												
31	1604																						
MIN	1307	28	7.4	89	306	90	118	15	24	6.8	3	10	10	11	20	18		6.9					
MAX	1854	38	8.0	226	495	192	131	29	28	7.0	21	85	14	13	22	460		6.9					
AVG	1606	33	7.5	144	394	141	125	22	26	6.9	13	41	12	12	21	69		6.9					

* Monthly average reported for fecal coliforms is a geometric mean.

April Date	Eff	INFLUENT							SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL
		IN HOUSE				EXTERNAL			IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL			
		NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	NH ₃	
1	1922		7.7	156	418				6.9	12	69													
2	1888									12														
3	2199		7.6	133					6.8	16														
4	1810																							
5	1789																							
6	1700		7.7	216					6.5	11							6.5	1						
7	1728																	2						
8	1550		7.5	236													6.9	2						
9	1476																							
10	1511		7.6	114	341												6.9	1	38					
11	1479																							
12	1454																							
13	1693																							
14	1750	34	7.5	102	489	396	111	31									24	7.0	2	6	6	5	21	92
15	1572																		2					1
16	1530																		3					
17	1690		7.3	200													6.9	2						
18	1582																							
19	1531																							
20	1513		7.3	184													6.9	3						249
21	1632																		7					230
22	1462	40	7.6	250	585	199	354	27									27	6.8	8	46	7	8	24	180
23	1460																		3					
24	1409		7.2	154														6.8	4					
25	1383																							
26	1373																							
27	1414		7.4	189														6.8	6					
28	1421																		10					
29	1329		7.5	289	590													6.8	6	61				
30	1309																		9					
MIN	1309	34	7.2	102	341	199	111	27	6.5	10.6	69						24	6.5	1	6	6	5	21	1
MAX	2199	40	7.7	289	590	396	354	31	6.9	16	69						27	7.0	10	61	7	8	24	249
AVG	1585	37	7.5	185	485	298	233	29	6.7	13	69						26	6.8	4	38	7	7	23	62

* Monthly average reported for fecal coliforms is a geometric mean.

May	Date	INFLUENT							SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL
		IN HOUSE				EXTERNAL			IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL			
		Eff	NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD		NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	
1	1285		7.4	158													6.9	8						
2	1467																							
3	1381																							
4	1438		7.3	187													6.9	7						
5	1437																	8						980
6	1507	38	7.3	170	314	121	182	30									33	6.9	4	48	10	6	29	20
7	1465																	10						
8	1504		7.3	154													6.7	9						
9	1514																							
10	1453																							
11	1477		7.3	280													6.9	14						110
12	1478																							
13	1409	55	7.4	263	415	289	222	52									37	6.9	11	42	14	10	33	18
14	1448																							
15	1437		7.1	231													6.9							
16	1516																							
17	1350																							
18	1289			256														9						
19	1488																	7						
20	1511	43	7.3	235	405												33	6.8	3	34				70
21	1437																							
22	1378		7.0														6.9	11						
23	1457																							
24	1388																							
25	1398		7.2	212													6.8	14						
26	1398																							
27	1381	33	7.3	138	330						11						31	6.8	23	72				
28	1334										12							23						
29	1430		7.3	294						7.0	5						6.8	24						
30	1289																							
31	1303																							
MIN	1285	33	7.0	138	314	121	182	30		7.0	5						31	6.7	3	34	10	6	29	18
MAX	1516	55	7.4	294	415	289	222	52		7.0	12						37	6.9	24	72	14	10	33	980
AVG	1421	42	7.3	215	366	205	202	41		7.0	9						33	6.8	12	49	12	8	31	77

* Monthly average reported for fecal coliforms is a geometric mean.

June	Date	Eff	INFLUENT						SBR 1 EFFLUENT						FC CFU /100 mL	SBR 2 EFFLUENT						FC CFU /100 mL	
			IN HOUSE			EXTERNAL			IN HOUSE			EXTERNAL				IN HOUSE			EXTERNAL				
			NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS		BOD	NH ₃	NH ₃	pH	TSS	COD		TSS
1	1412		7.3	182					6.9	13							6.9	23					
2	1336									7													
3	1359	31	7.3	166	165	93	135	28	26	6.9	8	37	10	6	21	130							
4	1372										9					40							
5	1305		7.3	192						6.8	8												
6	1279																						
7	1437																						
8	1310		7.5	255						6.9	4												
9	1364										6					440							
10	1333		7.2	224	290	215	261	27		7.1	4	52	6	2	27	60							
11	1444																						
12	1345		7.4	217						6.9	2							6.9	13				
13	1273																						
14	1288																						
15	1367		7.2	124						6.8	15					30		6.7	15				
16	1405																						
17	1338		7.2							6.8	2												
18	1304																						
19	1306		7.5	147						6.8	5												
20	1317																						
21	1300																						
22	1333		7.1	218						6.9	15												
23	1340																						
24	1294		7.3	130						6.8	16							6.7	8				
25	1460										9												
26	1518		7.2	130						6.8	11												
27	1320																						
28	1308																						
29	1312	37	7.5	242	380				23	6.8	10	49						6.7	6				
30	1346																						
MIN	1273	31	7.1	124	165	93	135	27	23	6.8	2	37	6	< 4	21	30		6.7	6				
MAX	1518	37	7.5	255	380	215	261	28	26	7.1	16	52	10	6	27	440		6.9	23				
AVG	1348	34	7.3	186	278	154	198	28	25	6.9	8	46	8	4	24	84		6.8	13				

* Monthly average reported for fecal coliforms is a geometric mean.

July Date	INFLUENT								SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL	
	IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL				
	Eff	NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		
1	1255																								
2	1258																								
3	1274		7.1	216					6.8	14							6.6	8							
4	1296																								
5	1297																								
6	1317		6.9	214					6.8	12							6.5	6							
7	1328																								10
8	1353	36	7.1	217	544	247	198	36	6.6	14						29	6.8		55	4	4	22		80	
9	1407																								
10	1293		6.8	222					6.8	22							6.6	13							
11	1261																								
12	1301																								
13	1346		7.1	164					6.6	10							6.5	6							
14	1264																								10
15	1455	49	7.7	294	310	225	211	43	7.0	11						28	6.8	7	43	8	4	21		10	
16	1382																								
17	1345		7.3	232					6.8	10							6.7	6							
18	1339																								
19	1291																								
20	1320		7.3	194					7.0	6							6.7								40
21	1385																								
22	1331	38	7.3	281	314				7.0	11						26	6.8	7	40						
23	1316																								
24	1420		7.2	188					6.7	7							6.7	8							
25	1352																								
26	1304																								
27	1367		7.1	222					6.7	6							6.6	4							
28	1259																								
29	1316	38	7.0	222	347				6.6	7						23	6.6	6	36						
30	1400																								
31	1276		7.1	146					6.8	11															
MIN	1255	36	6.8	146	310	225	198	36	6.6	6						23	6.5	4	36	4	4	21		10	
MAX	1455	49	7.7	294	544	247	211	43	7.0	22						29	6.8	13	55	8	4	22		80	
AVG	1326	40	7.2	216	379	236	205	40	6.8	11						26	6.7	9	44	6	4	22		20	

* Monthly average reported for fecal coliforms is a geometric mean.

Aug.	Date	INFLUENT							SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL
		IN HOUSE				EXTERNAL			IN HOUSE				EXTERNAL				IN HOUSE				EXTERNAL			
		Eff	NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD		NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	
1	1319																							
2	1297																							
3	1208		7.0	156					6.6	11								12						
4	1365																							290
5	1304	42	7.3	266	324	286	255	33	6.5	6							29	6.6	3	52	8	4	18	3
6	1303																							
7	1327		7.3	289					6.5	4														
8	1288																							
9	1266																							
10	1338		6.7	231					6.3	3														
11	1413																							
12	1425	32	7.1	189	320				6.7	3							29	6.8	8	28	6	< 4	24	< 10
13	1401																							
14	1272		7.3	272		119	218	24	6.5	5								6.5	9					
15	1328																							
16	1308																							
17	1345		7.1	257					6.7	3								6.7	6					
18	1486																							
19	1335	37	7.5	224	180				7.1	3							18	7.2	8	37				
20	1291																							2
21	1351		7.0	146					6.5	2								6.6	6					
22	1283																							
23	1308																							
24	1355		7.4	106					6.9	2								6.4	11					< 10
25	1430																							
26	1299	35	7.4	250	338				6.9	5							13	7.0	4	36				
27	1273																							
28	1356		7.2	181					6.8	3								6.9	5					
29	1334																							
30	1314																							
31	1329		7.4	158					7.0	10								7.0	7					
MIN	1208	32	6.7	106	180	119	218	24	6.3	2							13	6.4	3	28	6	4	18	2
MAX	1486	42	7.5	289	338	286	255	33	7.1	11							29	7.2	12	52	8	4	24	290
AVG	1331	37	7.2	210	291	203	237	29	6.7	5							22	6.8	7	38	7	3	21	8

* Monthly average reported for fecal coliforms is a geometric mean.

Sept.	Date	Eff	INFLUENT						SBR 1 EFFLUENT						FC CFU /100 mL	SBR 2 EFFLUENT						FC CFU /100 mL		
			IN HOUSE			EXTERNAL			IN HOUSE			EXTERNAL				IN HOUSE			EXTERNAL					
			NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS		BOD	NH ₃	NH ₃	pH	TSS	COD		TSS	BOD
1	1356														5									
2	1300	53	7.9	270	345	233	149	52	19	7.0	5	35	7	4	19	10		6.9	6					
3	1403															80								
4	1351		7.6	219						7.0	9								15					
5	1333																							
6	1260																							
7	1329		7.6	288						7.0	6													
8	1487															20								
9	1528	39	7.3	236	470	168	222	48	9	6.8	4	54	4	2	10	5		6.7	9					
10	1335																							
11	1332		7.4	233						6.8	5													
12	1334																							
13	1299																							
14	1311	48	7.6	242	287					6.8	3	45												
15	1385																							
16	1227		7.4	255							9													
17	1248																							
18	1352		7.7	326						6.5	8													
19	1258																							
20	1311																							
21	1318		7.4	285						6.5	6													
22	1435																							
23	1382		7.9	300	707					6.7	2													
24	1278																							
25	1310									6.6	1													
26	1292																							
27	1290																							
28	1334		7.2	324						6.3	3													
29	1413																							
30	1378		7.9	183	520					6.4	4	34												
MIN	1227	39	7.2	183	287	168	149	48	9	6.3	1	34	4	2	10	5		6.7	6.2					
MAX	1528	53	7.9	326	707	233	222	52	19	7.0	9	54	7	4	19	80		6.9	15					
AVG	1339	47	7.6	263	466	201	186	50	14	6.7	5	42	6	3	15	13		6.8	10					

* Monthly average reported for fecal coliforms is a geometric mean.

Oct. Date	Eff	INFLUENT							SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL
		IN HOUSE				EXTERNAL			CFU				EXTERNAL				IN HOUSE				EXTERNAL			
		NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	NH ₃	
1	1255																							
2	1279		7.6	137					6.7	2														
3	1424																							
4	1346																							
5	1375		7.9	233		258	182	45	7.2	6		6	2	8	100									
6	1424								7.1	2	27													
7	1302		7.9	248	670																			
8	1190																							
9	1153		7.9	263					7.1	1														
10	1291																							
11	1314																							
12	1312			143							4													
13	1494																							
14	1262		7.8	213	519				7.1	5	50													
15	1397																							
16	1339			222							7													
17	1514																							
18	2484																							
19	2039			259											7100									
20	1630																							
21	1429			225	405	188	202	13		6	12	4	6	1	810									
22	1459														6									
23	1378			185							5													
24	2039																							
25	1718																							
26	1728		7.6	124					6.8						28									
27	2338										3				27									
28	1934	32	7.5	139	328				7		5	40												
29	1671										4													
30	1836		7.4	113					6.9	4														
31	2195																							
MIN	1153	32	7.4	113	328	188	182	13	7	6.7	1	12	4	2	1	6								
MAX	2484	32	7.9	262	670	258	202	45	7	7.2	7	50	6	6	8	7100								
AVG	1566	32	7.7	193	481	223	192	29	7	7.0	4	32	5	4	5	117								

* Monthly average reported for fecal coliforms is a geometric mean.

Nov. Date	INFLUENT								SBR 1 EFFLUENT							FC CFU /100 mL	SBR 2 EFFLUENT							FC CFU /100 mL
	IN HOUSE				EXTERNAL				CFU				EXTERNAL				IN HOUSE				EXTERNAL			
	Eff	NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS	BOD	NH ₃		NH ₃	pH	TSS	COD	TSS	BOD	NH ₃	
1	2328																							
2	1907		7.4	210					6.8	8														
3	1859	11	7.6	147	261	153	178	13	9	6.8	2	28	6	5	6	8								
4	1593										2					12								
5	1556										4													
6	1832		7.5	124					6.8	4														
7	2652																							
8	2838																							
9	2405	30	7.7	182	292	164	185	23	12	6.9	6	30	8	4	8	200								
10	2249										7													
11	2521																							
12	2575		7.7	110					6.9	7														
13	2178																							
14	2070																							
15	1960																							
16	1918															5								
17	5061													12										
18	5012			203	148						1	19												
19	3528																							
20	5219			68							2													
21	4429																							
22	4185																							
23	4396		7.7	111						7.0	5													
24	3469									6.2														
25	2426	26	7.7	120					12	6.7	4													
26	3076										7					50								
27	3998		7.4	91						6.6	2							3						
28	2703																	12						
29	3605										20													
30	3676										4					14								
MIN	1556	11	7.4	68	148	153	178	13	9	6.2	1	19	6	4	6	5		2.6						
MAX	5219	30	7.7	210	292	164	185	23	12	7.0	20	30	8	12	8	200		12						
AVG	2974	22	7.6	137	234	159	182	18	11	6.7	5	26	7	7	7	20		7						

* Monthly average reported for fecal coliforms is a geometric mean.

Dec.	Date	Eff	INFLUENT						SBR 1 EFFLUENT						FC CFU /100 mL	SBR 2 EFFLUENT						FC CFU /100 mL	
			IN HOUSE			EXTERNAL			IN HOUSE			EXTERNAL				IN HOUSE			EXTERNAL				
			NH ₃	pH	TSS	COD	BOD	TSS	NH ₃	NH ₃	pH	TSS	COD	TSS		BOD	NH ₃	NH ₃	pH	TSS	COD		TSS
1	2950																						
2	2283	15	7.5	76	249				13	6.8	3	19											
3	2148					116	199	24					5	4	10	78							
4	1932		7.7	160						7.0	4												
5	1851																						
6	1796																						
7	1828			222							8												
8	1858																						
9	1754				531							37											
10	1706																						
11	1563																						
12	1643																						
13	1568																						
14	1638			239		153	248	28			8		10	6	25	38							
15	1817																						
16	1548		7.7	184	341					7.1	6	60											
17	2071		7.8	197						7.1	9								13				
18	1881		7.8	200	360					7.1	11	60						7.1	8	53			
19	2059																						
20	2027																						
21	2899										19					26							
22	2787															192							
23	2277			140	288						4	30											
24	2152																						
25	2124																						
26	1862																						
27	1697																						
28	1742		7.7	89						7.1													
29	1883		7.6	78						7.1	10					26		7.0	2				
30	1753		7.8	168	307					7.0	3	47											
31	1753			170							7												
MIN	1548	15	7.5	76	249	116	199	24	13	6.8	3	19	5	4	10	26		7.0	2	53			
MAX	2950	45	7.8	239	531	153	248	28	13	7.1	19	60	10	6	25	192		7.1	13	53			
AVG	1963	15	7.7	160	346	135	224	26	13	7.1	8	42	8	5	18	52		7.0	8	53			

* Monthly average reported for fecal coliforms is a geometric mean.

**APPENDIX 2
OUTFALL MONITORING REPORT
MARCH 2009**

WATER SAMPLING FOR THE EPCOR WASTEWATER TREATMENT PLANT OUTFALL IN SOOKE BAY

March 2009



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Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay



Sampling Date: March 16, 2009
Report Submission Date: March 25, 2009

Prepared for:

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EPCOR WATER SERVICES
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Prepared by:

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TABLE OF CONTENTS

INTRODUCTION.....	1
METHODOLOGY	3
TEST METHODS.....	6
RESULTS	7
CONCLUSION	12
REFERENCE.....	12

INTRODUCTION

The sampling site was located in Sooke Bay, which is located approximately 35 km east of Victoria on the southwest coast of Vancouver Island, British Columbia (Figures 1 & 2). In 2005, Epcor Water Services was contracted to construct a wastewater treatment facility and outfall to accommodate present and future population growth in the municipality of Sooke. The facility began operations in December 2005. To comply with the regulations outlined by the Ministry of Environment; discharge of effluent must be monitored to ensure that the guidelines outlined in the *Municipal Sewage Regulation* are adhered to.

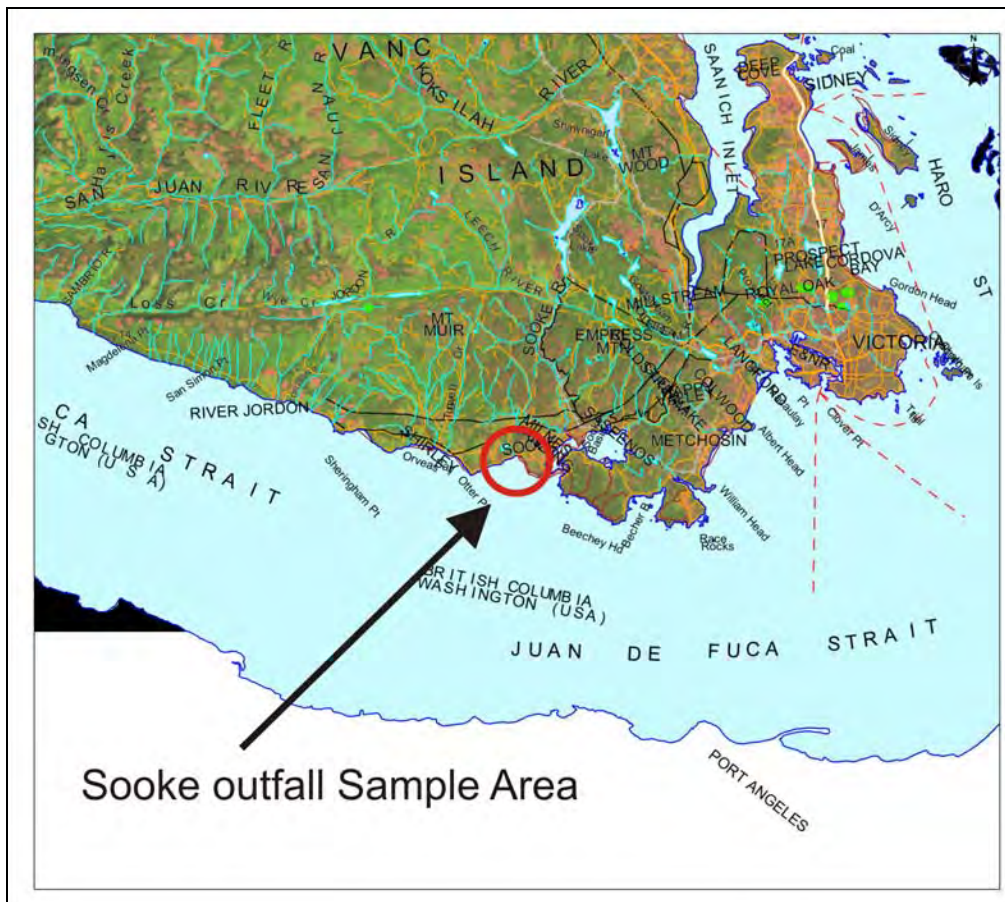


Figure 1: General Location of sample sites, Sooke Bay, British Columbia



Figure 2: Aerial view of Sooke Bay outlining location of wastewater outfall with reference to Sooke and the Epcor Office.

Effluent monitoring has consisted of water sampling on a pre-determined schedule at 4 index sites. In October 2005, a pre-operational baseline survey was conducted to establish index sites and record water chemistry parameters which future sampling efforts could be compared against. Pacificus Biological Services was contracted to perform regular marine water sampling on the receiving waters at the outfall. The latest phase of sampling took place on March 16, 2009. The water sampling involved measuring the following parameters within the receiving waters environment:

Parameter
Biological Oxygen Demand
Total Suspended Solids
pH
Ammonia
Conductivity
Dissolved Oxygen
Salinity
Temperature
Fecal Coliforms

METHODOLOGY

Four index sampling sites were determined by Epcor and provincial ministry staff (figure 3). The four index sites were sampled before wastewater discharge began in 2005, and subsequently at regular intervals. The site locations are as follows:

1. **Location of outfall diffuser** $48^{\circ} 21' 15''N$, $123^{\circ} 46' 21''W$
2. **100m North of outfall** $48^{\circ} 21' 17''N$, $123^{\circ} 46' 17''W$
(Initial dilution zone 100m from outfall diffuser, as required by Ministry of Sustainable Resource Management)
3. **100m South of outfall** $48^{\circ} 21' 13''N$, $123^{\circ} 46' 24''W$
(Initial dilution zone 100m from outfall diffuser, as required by Ministry of Sustainable Resource Management)
4. **300m towards shore** $48^{\circ} 21' 22''N$, $123^{\circ} 46' 11''W$
(300m away from the outfall diffuser towards shore, as required by Environment Canada)

The sample design calls for the acquisition of samples at each sample location to be at 2m (to avoid any freshwater floating on the surface) and at the pycnocline where a plume would be likely to trap. A pycnocline is a layer of rapid change in water density with depth. In oceans, changes in water density are mainly caused by changes in water temperature and salinity. A study completed by Komex Environmental and Water Resource Engineering Ltd. found that the water profile data found homogeneity of the water column in Sooke Bay, indicating that the water is fully-mixed (unstratified) throughout the year. The days immediately before sampling a strong storm was in the area, therefore the water column was predicted to be unstratified at the time of sampling. This assumption was verified in the field at the first sample site when comparisons in water chemistry parameters between deep waters and shallow waters were found to be similar. Therefore, at the time of sampling, the water column in Sooke Bay was not stratified, thus only surface samples (2m depth) were gathered.

A Pacificus biologist navigated to the sample sites using a handheld Garmin GPS (with pre-recorded sample site waypoints) and gathered water samples at the appropriate depths using an economy water sampler. Dissolved Oxygen, conductivity, salinity, pH

and temperature readings were taken and recorded in the field. A YSI Model 85 handheld multi parameter testing system was used to measure oxygen, conductivity, salinity and temperature.

Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia Nitrogen – N, and Fecal Coliform parameters were tested for by CanTest Laboratory in Victoria within 24 hours. Samples for each of these parameters were gathered and transported in sealed and sterilized sample jars. Sampling completed for the Receiving Waters Monitoring in Sooke Bay is in accordance to methodologies specified by the latest version of the *BC Field Sampling Manual for Continuous Monitoring, plus the collection of Air, Air-Emission, Water, Wastewater, Soil, Sediments and Biological Samples*.

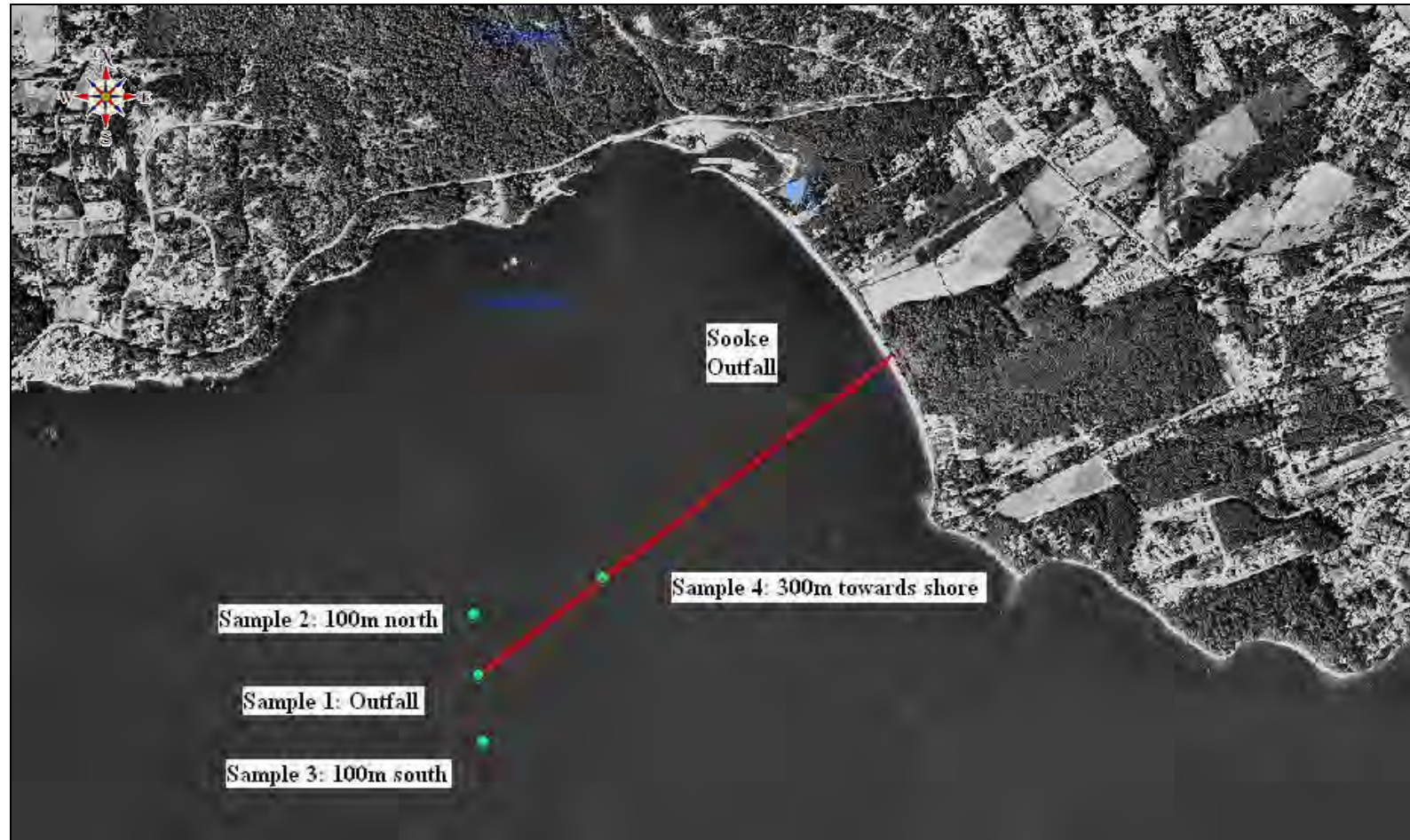


Figure 3: Sooke Bay receiving water-sampling locations (approximate).

TEST METHODS

Ammonia in Water

Analysis was performed based on Standard Methods for the Examination of Water and Wastewater, 19th Ed. (1995); Method 4500-NH3.

Conventional Parameters

Analyses performed at Cantest's Victoria facility follow procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual" and "Standard Methods for the Examination of Water and Wastewater".

Microbiological Parameters

Analyses were performed using procedures based on those described in "B.C. Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials (2003 Edition) and "Standard Methods for the Examination of Water and Wastewater", 20th Edition (1998). Analysis was performed at CANTEST Ltd. Victoria Laboratory.

The detection limits for BOD, Fecal Coliforms and TSS are as follows:

BOD	5 mg/L
Ammonia	0.002 mg/L
Fecal Coliforms	2 MPN/100mL
Total Suspended Solids	5 mg/L

Please contact CANTEST Ltd (1-800-865-8566) if more detailed information is required with respect to sampling methodologies and procedures.

All testing completed for the Receiving Waters Monitoring in Sooke Bay were carried out using methodologies specified by the latest version of the *BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediments, Biological Materials and Discrete Ambient Air Samples*.

RESULTS

Specific results for the March 16, 2009 sampling at each of the sites are listed in Table 1. Historic measures at each of the index sites are listed in Tables 2-4. The receiving waters surrounding the Sooke outfall contained acceptable levels of ammonia, BOD, fecal coliform, and total suspended solids. Photos 1 & 2 represents, in general, the areas designated for sites 1 through 4.



Photo 1: General location of sites 1-4, view towards shore.



Photo 2: General location of outfall, view towards ocean.

Table 2: Results from March 16, 2009 water sampling of Epcor Sooke wastewater outfall.

Sample #	Depth (m)	pH	Cond (µS/cm)	D.Oxygen	Salinity (ppt)	Temperature °C	Fecal Coliform (Col./ 100mL)	T.S.S (mg/L)	Total B.O.D. (mg/L)	Ammonia - N (mg/L)
100m North of Outfall	8 m	7.8	32.15	83.8%	31.6	7.0	1.0	9.0	<5	0.02
				8.44 mg/L						
	2 m	7.5	32.18	85.20%	31.6	7.0				
				8.39 mg/L						
100m South of Outfall	2 m	8.0	32.22	80.6%	31.6	7.0	1.0	10.0	<5	0.02
				7.95 mg/L						
Outfall	2 m	7.8	32.20	82.1%	31.6	7.0	1.0	6.0	<5	0.02
				8.12 mg/L						
300m towards shoreline from Outfall	2 m	7.8	32.34	81.2%	31.8	7.0	1.0	9.0	<5	0.02
				7.97 mg/L						

Wastewater Treatment Plant Outfall Receiving Waters Sampling in Sooke Bay

Table 2: Results from water sampling October 2005 (pre-operation) through September 2006.

Date	Sample #	Depth (m)	pH	Cond (mS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
October 2005	#1 Outfall	2	8.1	33.91	66%	30.7	9.9	2	<5.0	22	no data
		12	7.8	34.41	65.70%	31.6	9.6	2	<5.0	16	no data
	#2 100m north of outfall	2	8	33.7	66%	30.5	9.8	<2	<5.0	16	no data
		12	7.7	34.39	65.50%	31.8	9.6	<2	<5.0	15	no data
	#3 100m south of outfall	2	8.1	33.85	68%	30.6	9.9	5	<5.0	18	no data
		12	7.9	34.32	65.80%	31.7	9.5	<2	<5.0	22	no data
	#4 300m south of outfall	2	8	33.8	66%	30.5	9.9	<2	<5.0	17	no data
		12	7.6	34	66%	31.7	9.5	<2	<5.0	17	no data
	#5 Sook Harbour	2	8.1	34.2	67%	30.8	9.8	<2	no data	no data	no data
		12	7.8	34.5	66%	31.8	9.7	<2	<5.0	15	no data
April 2006	# 1 Outfall	2	8	32.98	9.75	30.4	9.4	<1	<5.0	38	<0.002
		9	7.9	33.04	9.22	30.7	9	<1	<5.0	23	0.042
	# 2 100m north of outfall	2	8.1	31.87	9.74	30.1	9.5	<1	<5.0	21	<0.002
		9	8	33.67	9.31	31.1	9.1	1	<5.0	32	0.056
	# 3 100m south of outfall	2	8.1	32.8	9.74	30.2	9.7	<1	<5.0	21	<0.002
		9	8.1	15.3	9.9	30.6	9.9	<1	<5.0	18	<0.002
	# 4 300m south of outfall	2	8.1	32.87	9.77	30.2	9.5	<1	<5.0	12	0.027
		9	8	18.95	9.87	30.9	9.2	<1	<5.0	43	<0.002
September 2006	# 1 Outfall	2	8.3	35.5	65.8	30.7	10.8	<1	<5.0	18	0.023
		12	7.9	35.29	63.5	31.7	10.5	45	<5.0	20	0.023
	# 2 100m north of outfall	2	7.9	35.56	66	30.6	10.8	4	<5.0	23	0.02
		12	7.8	35.34	60.7	31.8	10.5	39	<5.0	21	0.018
	# 3 100m south of outfall	2	7.8	35.48	63.1	30.5	10.7	104	<5.0	18	0.018
		12	7.8	35.39	60.1	31.2	10.5	36	<5.0	18	0.016
	# 4 300m south of outfall	2	7.8	35.59	63.6	31.1	10.9	56	<5.0	17	0.022
		12	7.8	35.38	59.4	31.8	10.5	52	<5.0	29	0.016

Wastewater Treatment Plant Outfall Receiving Waters Sampling in Sooke Bay

Table 3: Results from water sampling January 2007 through September 2007.

Date	Sample #	Depth (m)	pH	Cond (mS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
January 2007	# 1 Outfall	2	8.3	46.7	75.9	30	7.2	1	<5.0	<1	0.01
		12	7.9	31.4	75.6	30.4	7.3	2	<5.0	4	0.02 <.01
	# 2 100m north of outfall	2	8	31.52	75.8	30.9	7.1	<1	<5.0	4	<.01
		12	8	31.61	75.6	30.7	7.3	1	<5.0	5	<.01
	# 3 100m south of outfall	2	8	31.56	78.1	30.8	7.1	<1	<5.0	3	<.01
		12	8	31.59	79.2	30.7	7.3	1	<5.0	3	<.01
	# 4 300m south of outfall	2	8	31.62	76.9	30.3	7.2	2	<5.0	2	0.01
		12	7.9	31.58	79.3	30.4	7.4	2	<5.0	2	<.01
May 2007	# 1 Outfall	2	8.3	33.84	80.9	31.5	9	<2	<5.0	18	0.01
	# 2 100m north of outfall	2	8	33.63	77.3	31.5	8.9	<2	<5.0	11	0.05
	# 3 100m south of outfall	2	7.9	33.82	80.9	31.5	9	<2	<5.0	13	0.01
	# 4 300m south of outfall	2	8	33.8	83.6	31.6	9	<2	<5.0	24	0.01
September 2007	# 1 Outfall	2	7.9	34.24	52.6	32.1	8.8	<1	<5.0	8	0.04
	# 2 100m north of outfall	2	7.6	35	52.8	31.8	8.7	<1	<5.0	8	0.05
	# 3 100m south of outfall	2	7.8	34.36	52.7	32	8.8	<1	<5.0	9	0.04
	# 4 300m south of outfall	2	7.5	33.69	52.8	31.9	8.7	<1	<5.0	8	0.04

Wastewater Treatment Plant Outfall Receiving Waters Sampling in Sooke Bay

Table 4: Results from water sampling March 2008 through March 2009.

Date	Sample #	Depth (m)	pH	Cond (mS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
March 2008	# 1 Outfall	2	7.9	47.31	102.9	30.4	7.1	<1	<5.0	13	0.04
	# 2 100m north of outfall	2	7.7	46.14	115.4	30.6	7.4	<1	<5.0	16	0.03
	# 3 100m south of outfall	2	8	49.22	116.5	30.1	7.4	<1	<5.0	14	0.03
	# 4 300m south of outfall	2	7.7	50.11	109.6	30.1	7.5	<1	<5.0	20	0.05
October 2008	# 1 Outfall	2	8.3	34.4	50.4	32.3	8.9	<1	<5	<1	0.02
	# 2 100m north of outfall	2	8.3	34.4	50.1	32.3	8.9	1	<5	6	<0.01
	# 3 100m south of outfall	2	8.3	34.4	52.8	32.3	8.9	2	<5	2	<0.01
	# 4 300m south of outfall	2	8.3	34.38	56.1	32	9.1	1	<5	<1	0.01
March 2009	Outfall	2 m	7.8	32.20	82.1%	31.6	7.0	1.0	6.0	< 5	0.02
					8.12 mg/L						
	100m North of Outfall	8 m	7.8	32.15	83.8%	31.6	7.0	1.0	9.0	< 5	0.02
					8.44 mg/L						
	100m South of Outfall	2 m	8.0	32.22	85.20%	31.6	7.0	1.0	10.0	< 5	0.02
					8.39 mg/L						
	300m towards shoreline from Outfall	2 m	7.8	32.34	80.6%	31.8	7.0	1.0	9.0	< 5	0.02
					7.95 mg/L						
				81.2%							
				7.97 mg/L							

CONCLUSION

The March 2009 environmental monitoring of the Sooke outfall receiving waters is complete. All analyzed parameters were within acceptable ranges. Additional monitoring is recommended in 6 months time to ensure the plant is operating properly and the oceanic environment is not being negatively impacted.

REFERENCE:

Komex International Ltd. 2005. *Dilution Modelling Report District of Sooke Treated Wastewater Outfall (9)*.

**APPENDIX 3
OUTFALL MONITORING REPORT
OCTOBER 2009**

WATER SAMPLING FOR THE EPCOR WASTEWATER TREATMENT PLANT OUTFALL IN SOOKE BAY

October 2009



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Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay



Sampling Date: Oct 13, 2009
Report Submission Date: Nov 16, 2009

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TABLE OF CONTENTS

INTRODUCTION.....	1
METHODOLOGY	3
TEST METHODS.....	6
RESULTS	7
CONCLUSION	11
REFERENCE.....	11

INTRODUCTION

The sampling site was located in Sooke Bay, which is located approximately 35 km east of Victoria on the southwest coast of Vancouver Island, British Columbia (Figures 1 & 2). In 2005, Epcor Water Services was contracted to construct a wastewater treatment facility and outfall to accommodate present and future population growth in the municipality of Sooke. The facility began operations in December 2005. To comply with the regulations outlined by the Ministry of Environment; discharge of effluent must be monitored to ensure that the guidelines outlined in the *Municipal Sewage Regulation* are adhered to.

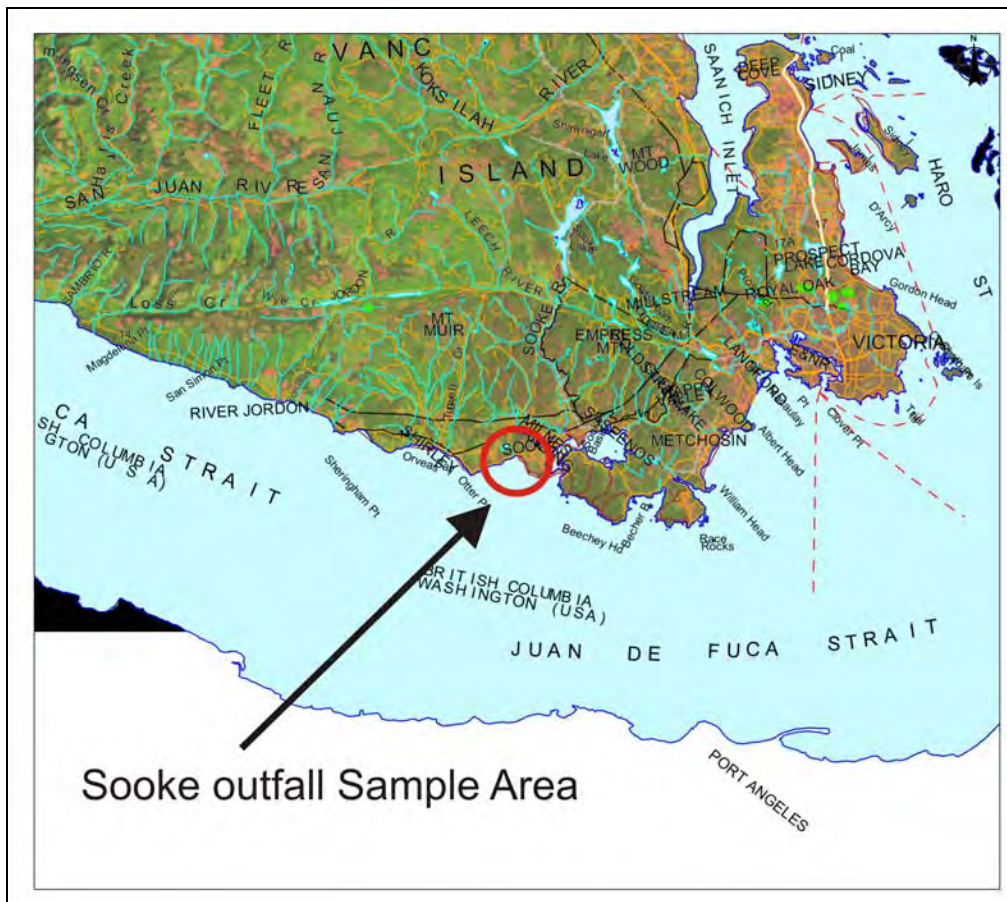


Figure 1: General Location of sample sites, Sooke Bay, British Columbia



Figure 2: Aerial view of Sooke Bay outlining location of wastewater outfall with reference to Sooke and the Epcor Office.

Effluent monitoring has consisted of water sampling on a pre-determined schedule of twice per year at 4 index sites. In October 2005, a pre-operational baseline survey was conducted to establish index sites and record water chemistry parameters which future sampling efforts could be compared against. Pacificus Biological Services was contracted to perform regular marine water sampling on the receiving waters at the outfall. The latest phase of sampling took place on October 13, 2009. The water sampling involved measuring the following parameters within the receiving waters environment:

Parameter
Biological Oxygen Demand
Total Suspended Solids
pH
Ammonia
Conductivity
Dissolved Oxygen
Salinity
Temperature
Fecal Coliforms

METHODOLOGY

Four index sampling sites were determined by Epcor and provincial ministry staff (figure 3). The four index sites were sampled before wastewater discharge began in 2005, and subsequently at regular intervals. The site locations are as follows:

1. **Location of outfall diffuser** $48^{\circ} 21' 15''N$, $123^{\circ} 46' 21''W$
2. **100m North of outfall** $48^{\circ} 21' 17''N$, $123^{\circ} 46' 17''W$
(Initial dilution zone 100m from outfall diffuser, as required by Ministry of Sustainable Resource Management)
3. **100m South of outfall** $48^{\circ} 21' 13''N$, $123^{\circ} 46' 24''W$
(Initial dilution zone 100m from outfall diffuser, as required by Ministry of Sustainable Resource Management)
4. **300m towards shore** $48^{\circ} 21' 22''N$, $123^{\circ} 46' 11''W$
(300m away from the outfall diffuser towards shore, as required by Environment Canada)

The sample design calls for the acquisition of samples at each sample location to be at 2m (to avoid any freshwater floating on the surface) and at the pycnocline where a plume would be likely to trap. A pycnocline is a layer of rapid change in water density with depth. In oceans, changes in water density are mainly caused by changes in water temperature and salinity. A study completed by Komex Environmental and Water Resource Engineering Ltd. found that the water profile data found homogeneity of the water column in Sooke Bay, indicating that the water is fully-mixed (unstratified) throughout the year. On the date that the latest phase of sampling occurred (Oct 13, 2009), the weather was windy with choppy seas. Therefore the water column was predicted to be unstratified at the time of sampling – similar to the previous sampling phase conducted in March 2009. Due to this assumption, only one set of samples were gathered from each site, at a depth of 2m.

A Pacificus biologist (Andrew Taylor) navigated to the sample sites using a handheld Garmin GPS (with pre-recorded sample site waypoints) and gathered water samples from a depth of 2m. Dissolved Oxygen, conductivity, salinity, pH and temperature readings were taken and recorded in the field. A YSI Model 85 handheld

multi parameter testing system was used to measure oxygen, conductivity, salinity and temperature. The pH measurements were acquired using a pH colorimeter test kit.

Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia Nitrogen – N, and Fecal Coliform parameters were tested for by CanTest Laboratory in Victoria within 24 hours. Samples for each of these parameters were gathered and transported in sealed and sterilized sample jars. Sampling completed for the Receiving Waters Monitoring in Sooke Bay is in accordance to methodologies specified by the latest version of the *BC Field Sampling Manual for Continuous Monitoring, plus the collection of Air, Air-Emission, Water, Wastewater, Soil, Sediments and Biological Samples*.

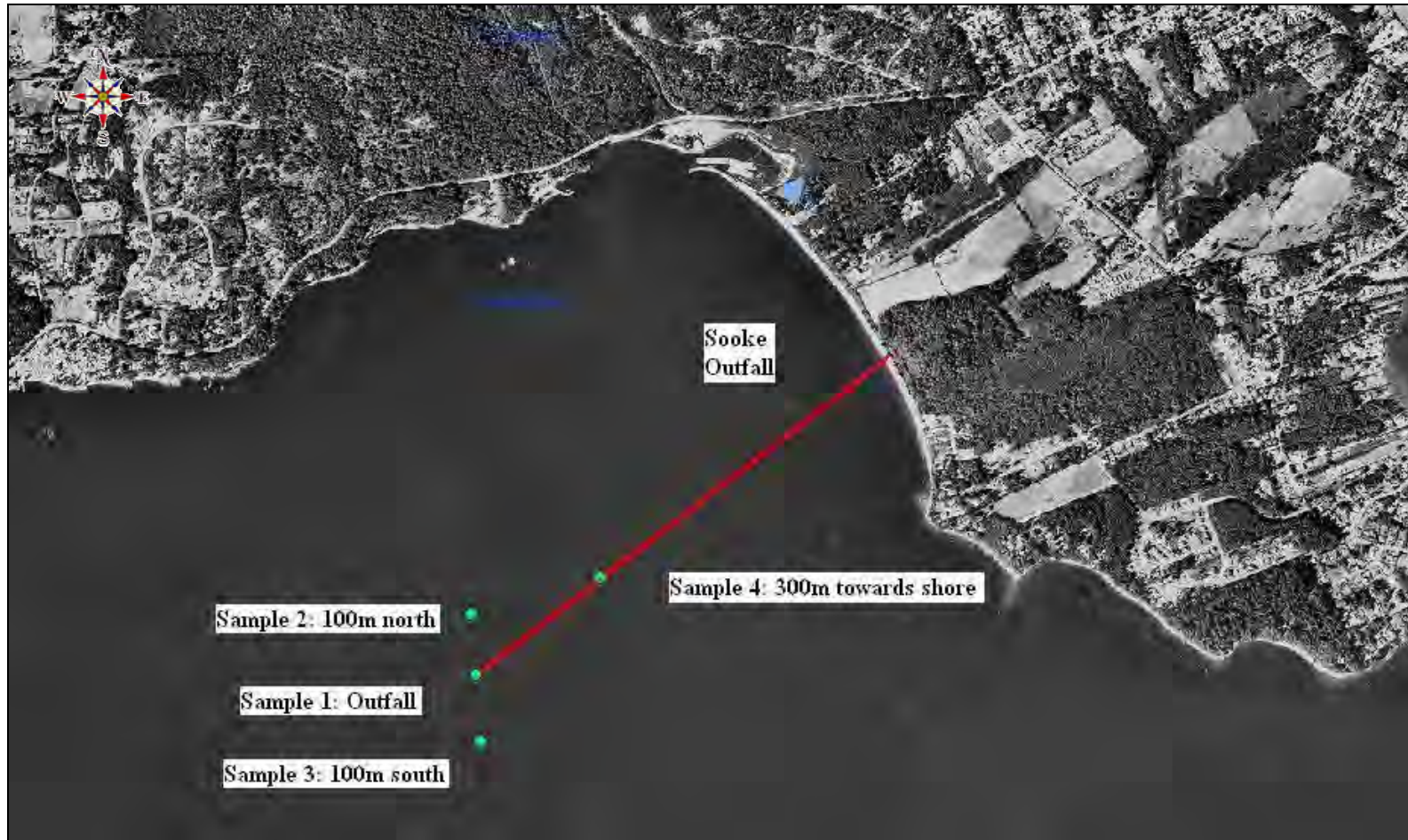


Figure 3: Sooke Bay receiving water-sampling locations (approximate).

TEST METHODS

Ammonia in Water

Analysis was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically at 590nm.

Conventional Parameters

Analyses performed at Cantest's Victoria facility follow procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual" and "Standard Methods for the Examination of Water and Wastewater".

Microbiological Parameters

Analyses were performed using procedures based on those described in "B.C. Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials (2005 Edition) and "Standard Methods for the Examination of Water and Wastewater", 21st Edition (1998). Analysis was performed at CANTEST Ltd. Victoria Laboratory.

The detection limits for BOD, Fecal Coliforms and TSS are as follows:

BOD	5 mg/L
Ammonia	0.01 mg/L
Fecal Coliforms	1 Col./100mL
Total Suspended Solids	1 mg/L

Please contact CANTEST Ltd (1-800-865-8566) or Pacificus Biological Services Ltd. if more detailed information is required with respect to sampling methodologies and procedures.

All testing completed for the Receiving Waters Monitoring in Sooke Bay were carried out using methodologies specified by the latest version of the *BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediments, Biological Materials and Discrete Ambient Air Samples*.

RESULTS

Specific results for the October 13, 2009 sampling at each of the sites are listed in Table 1. A comparison of historic measurements (from the baseline in October 2005 until the latest phase in October 2009) at each of the index sites are listed in Tables 2a & 2b. The receiving waters surrounding the Sooke outfall contained acceptable levels of ammonia, BOD, fecal coliform, and total suspended solids in the latest phase of sampling.

Table 1: Water sampling results from the Epcor Sooke outfall October 13, 2009.

Date	Sample #	Depth (m)	pH	Cond (mS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
October 13, 2009	# 1 Outfall	2	8.0	34.4	69.5	31.9	9.3	<1	<5	<1	0.06
	# 2 100m north of outfall	2	8.0	34.7	63.4	32.2	9.2	2	<5	<1	0.06
	# 3 100m south of outfall	2	8.0	34.7	63.5	32.1	9.3	<1	<5	5	0.05
	# 4 300m towards shoreline from outfall	2	8.0	34.7	63.5	32.2	9.2	<1	<5	<1	0.05

Wastewater Treatment Plant Outfall Receiving Waters Sampling in Sooke Bay

Table 2a: Historic data from Sooke Outfall water samples October 2005 – May 2007.

Date	Sample #	Depth (m)	pH	Cond (µS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L	
October 2005 BASELINE	#1 Outfall	2	8.1	33.91	66%	30.7	9.9	2	<5.0	22	no data	
		12	7.8	34.41	65.70%	31.6	9.6	2	<5.0	16	no data	
	#2 100m north of outfall	2	8	33.7	66%	30.5	9.8	<2	<5.0	16	no data	
		12	7.7	34.39	65.50%	31.8	9.6	<2	<5.0	15	no data	
	#3 100m south of outfall	2	8.1	33.85	68%	30.6	9.9	5	<5.0	18	no data	
		12	7.9	34.32	65.80%	31.7	9.5	<2	<5.0	22	no data	
	#4 300m south of outfall	2	8	33.8	66%	30.5	9.9	<2	<5.0	17	no data	
		12	7.6	34	66%	31.7	9.5	<2	<5.0	17	no data	
	#5 Sook Harbour	2	8.1	34.2	67%	30.8	9.8	<2	no data	no data	no data	
		12	7.8	34.5	66%	31.8	9.7	<2	<5.0	15	no data	
	April 2006	# 1 Outfall	2	8	32.98	9.75	30.4	9.4	<1	<5.0	38	<0.002
			9	7.9	33.04	9.22	30.7	9	<1	<5.0	23	0.042
# 2 100m north of outfall		2	8.1	31.87	9.74	30.1	9.5	<1	<5.0	21	<0.002	
		9	8	33.67	9.31	31.1	9.1	1	<5.0	32	0.056	
# 3 100m south of outfall		2	8.1	32.8	9.74	30.2	9.7	<1	<5.0	21	<0.002	
		9	8.1	15.3	9.9	30.6	9.9	<1	<5.0	18	<0.002	
# 4 300m south of outfall		2	8.1	32.87	9.77	30.2	9.5	<1	<5.0	12	0.027	
		9	8	18.95	9.87	30.9	9.2	<1	<5.0	43	<0.002	
September 2006	# 1 Outfall	2	8.3	35.5	65.8	30.7	10.8	<1	<5.0	18	0.023	
		12	7.9	35.29	63.5	31.7	10.5	45	<5.0	20	0.023	
	# 2 100m north of outfall	2	7.9	35.56	66	30.6	10.8	4	<5.0	23	0.02	
		12	7.8	35.34	60.7	31.8	10.5	39	<5.0	21	0.018	
	# 3 100m south of outfall	2	7.8	35.48	63.1	30.5	10.7	104	<5.0	18	0.018	
		12	7.8	35.39	60.1	31.2	10.5	36	<5.0	18	0.016	
	# 4 300m south of outfall	2	7.8	35.59	63.6	31.1	10.9	56	<5.0	17	0.022	
		12	7.8	35.38	59.4	31.8	10.5	52	<5.0	29	0.016	
January 2007	# 1 Outfall	2	8.3	46.7	75.9	30	7.2	1	<5.0	<1	0.01	
		12	7.9	31.4	75.6	30.4	7.3	2	<5.0	4	0.02 <.01	
	# 2 100m north of outfall	2	8	31.52	75.8	30.9	7.1	<1	<5.0	4	<.01	
		12	8	31.61	75.6	30.7	7.3	1	<5.0	5	<.01	
	# 3 100m south of outfall	2	8	31.56	78.1	30.8	7.1	<1	<5.0	3	<.01	
		12	8	31.59	79.2	30.7	7.3	1	<5.0	3	<.01	
	# 4 300m south of outfall	2	8	31.62	76.9	30.3	7.2	2	<5.0	2	0.01	
		12	7.9	31.58	79.3	30.4	7.4	2	<5.0	2	<.01	
May 2007	# 1 Outfall	2	8.3	33.84	80.9	31.5	9	<2	<5.0	18	0.01	
	# 2 100m north of outfall	2	8	33.63	77.3	31.5	8.9	<2	<5.0	11	0.05	
	# 3 100m south of outfall	2	7.9	33.82	80.9	31.5	9	<2	<5.0	13	0.01	
	# 4 300m south of outfall	2	8	33.8	83.6	31.6	9	<2	<5.0	24	0.01	

Wastewater Treatment Plant Outfall Receiving Waters Sampling in Sooke Bay

Table 3b: Historic data from Sooke Outfall water samples September 2007 – October 2009.

Date	Sample #	Depth (m)	pH	Cond (µmS/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
September 2007	# 1 Outfall	2	7.9	34.24	52.6	32.1	8.8	<1	<5.0	8	0.04
	# 2 100m north of outfall	2	7.6	35	52.8	31.8	8.7	<1	<5.0	8	0.05
	# 3 100m south of outfall	2	7.8	34.36	52.7	32	8.8	<1	<5.0	9	0.04
	# 4 300m south of outfall	2	7.5	33.69	52.8	31.9	8.7	<1	<5.0	8	0.04
March 2008	# 1 Outfall	2	7.9	47.31	102.9	30.4	7.1	<1	<5.0	13	0.04
	# 2 100m north of outfall	2	7.7	46.14	115.4	30.6	7.4	<1	<5.0	16	0.03
	# 3 100m south of outfall	2	8	49.22	116.5	30.1	7.4	<1	<5.0	14	0.03
	# 4 300m south of outfall	2	7.7	50.11	109.6	30.1	7.5	<1	<5.0	20	0.05
October 2008	# 1 Outfall	2	8.3	34.4	50.4	32.3	8.9	<1	<5	<1	0.02
	# 2 100m north of outfall	2	8.3	34.4	50.1	32.3	8.9	1	<5	6	<0.01
	# 3 100m south of outfall	2	8.3	34.4	52.8	32.3	8.9	2	<5	2	<0.01
	# 4 300m south of outfall	2	8.3	34.38	56.1	32	9.1	1	<5	<1	0.01
March 2009	Outfall	2 m	7.8	32.20	82.1%	31.6	7.0	1.0	6.0	< 5	0.02
					8.12 mg/L						
	100m North of Outfall	8 m	7.8	32.15	83.8%	31.6	7.0	1.0	9.0	< 5	0.02
		2 m	7.5	32.18	85.20%						
	100m South of Outfall	2 m	8.0	32.22	80.6%	31.6	7.0	1.0	10.0	< 5	0.02
					7.95 mg/L						
300m towards shoreline from Outfall	2 m	7.8	32.34	81.2%	31.8	7.0	1.0	9.0	< 5	0.02	
				7.97 mg/L							
October 2009	# 1 Outfall	2	8.0	34.4	69.5	31.9	9.3	<1	<5	<1	0.06
	# 2 100m north of outfall	2	8.0	34.7	63.4	32.2	9.2	2	<5	<1	0.06
	# 3 100m south of outfall	2	8.0	34.7	63.5	32.1	9.3	<1	<5	5	0.05
	# 4 300m towards shoreline from outfall	2	8.0	34.7	63.5	32.2	9.2	<1	<5	<1	0.05

CONCLUSION

The October 2009 environmental monitoring of the Sooke outfall receiving waters is complete. All analyzed parameters were within acceptable ranges. Additional monitoring is recommended in 6 months time to ensure the plant is operating properly and the oceanic environment is not being negatively impacted.

REFERENCE:

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Pacificus Biological Services Ltd. March 2009. *Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay*.