Appendix F
Water Quality

F.1 Purpose

This Appendix provides an overview of the water quality program, the regulations and requirements that guide the program, and the current status of the waterways.

F.2 Background

In 1972 the Federal Water Pollution Control Act Amendment was enacted to address the growing public awareness and concern for controlling water pollution. It was amended in 1977, and became commonly known as the Clean Water Act (CWA). The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States and gave the Environmental Protection Agency (EPA) the authority to implement pollution control programs. The CWA also set water quality standards for all contaminants in surface waters and made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also recognized the need for planning to address the critical problems posed by non-point source pollution. All states are required to be in compliance with the CWA.

In 1993, in response to the CWA, the City adopted Woodinville Municipal Code (WMC) Chapter 14.06 Water Quality Standards which adopts Chapter 9.12 of the King County Code, as modified by King County Ordinance No. 10636. This code prohibits the discharge of contaminants into surface water, stormwater, and ground water, and outlines preventive measures to restrict contaminants from entering such waters. In 2003, the City reinforced its commitment to protecting water quality by adopting City Ordinance 350, codified in WMC 1.07.030, by establishing discharge of contaminants into surface water, stormwater, or ground water as a civil violation.

Consistent with the adopted code, the City's water quality program aims to protect the health, safety and welfare of the residents and the integrity of the City's resources for the benefit of all by minimizing or eliminating water quality degradation; preserving and enhancing the suitability of waters for recreation, fishing, and other beneficial uses; and preserving and enhancing the aesthetic quality and biotic integrity of the water.

Any violations to the adopted water quality codes are enforced in accordance with the WMC. When a violation occurs, immediate corrective actions are required. Depending on the violation, monetary penalties may be levied.

As discussed in Chapter 2 – Regulatory Compliance, the City is also subject to the National Pollutant Discharge Elimination System (NPDES) program, which aims to protect water quality in accordance with the CWA.

F.3 Water Quality Pollution Sources

Point Sources

Point sources, as defined by the Clean Water Act, are discrete conveyances such as pipes or man-made ditches that discharge pollutants into waters of the United States. This includes not only discharges from municipal sewage plants and industrial facilities, but also collected storm drainage from larger urban areas, certain animal feedlots and fish farms, some types of ships, tank trucks, offshore oil platforms, and collected runoff from construction sites.

The City is required under the NPDES Phase II permit program to develop and implement a stormwater management program that is designed to reduce the discharge of pollutants from its municipal separate storm sewer system (MS4) to the maximum extent practicable and to protect water quality.

Non-Point Sources

Non-point source (NPS) pollution, unlike pollution from discrete point source conveyance systems, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and across the ground. As the runoff moves, it picks up and carries away natural and manmade pollutants, depositing them into lakes, rivers, wetlands, coastal waters, and underground sources of drinking water. Loadings of NPS pollutants enter water bodies via sheet flow rather than through a pipe, ditch or other point source conveyance system.

Agricultural activities, construction activities, urban runoff, and septic systems are typical sources of NPS pollution. Sediment, nutrients, pesticides, pathogens (bacteria and viruses), oil, grease, toxic chemicals, trash, fertilizers, animal wastes, and heavy metals are examples of NPS pollutants. These can be washed into the streams and water bodies if proper best management practices (BMPs) are not implemented.

A non-point pollution source can be difficult to determine. Potential sources include surface water runoff from agricultural lands, construction sites, urban areas, streets, and forest lands; underground sources such as leaking septic tanks; or discharges from vehicles and boats. Methods to control NPS pollution include public education to limit activities that produce pollution, monitoring of construction sites to ensure proper erosion control practices have been employed, and proper maintenance of municipal and private systems to prevent pollutants from accumulating in the storm system and being discharged downstream.

F.4 Water Quality Monitoring Program

Under the existing NPDES Phase II Permit, the City is required to prepare for future stormwater outfall and program effectiveness monitoring. It is likely that in the next permit term (beginning in 2012) the City will be required to implement these monitoring programs.

The monitoring requirements are similar to those already in place for Phase I permittees with the exception of BMP effectiveness monitoring. It is anticipated that these monitoring programs will involve substantial investment of staff time and resources for equipment purchase and installation, sample collection and lab analysis, data analysis, record keeping, and annual reporting.

While not required by state or federal regulations, the City's water quality program has been performing water quality monitoring over the past decade to allow better understanding of current conditions and to track changes in natural systems. The City currently utilizes City staff and community volunteers to collect data at water quality monitoring sites on several streams and lakes throughout the City. The samples are tested and the results are shared with both King and Snohomish counties.

Streams

Since 2000, the City has been monitoring Little Bear Creek, Woodin Creek, and Derby Creek, which are all tributaries of the Sammamish River. Temperature monitors have been placed at each of the creeks, and have been recording hourly temperature data since 2003. See Figure F.1 for the locations of the monitoring sites. King County has had a water quality monitoring program for the Sammamish River since 1979. The County also has been monitoring Little Bear Creek at the mouth and at a site in Snohomish County. Snohomish County has four monitoring sites on Little Bear Creek.

Sampling of the creeks is the responsibility of the City Public Works Department. A monthly water sample is taken at a designated site at each creek. In the past, sampling has been coordinated with Snohomish County; however the City no longer coordinates sampling with the County due to changes in way the County monitors and records data for Little Bear Creek associated with its NPDES permit. The water samples are then taken to North Creek Analytical Laboratory (NCA) where the samples are tested and analyzed. Since sampling is only performed once a month, the results are a snapshot of the water quality in the creeks. See Tables F-5 through F-7 at the end of this appendix for water quality results.

The water samples are analyzed for the following parameters:

- **Total Suspended Solids—**a measure of all solid particulates that are suspended in the water column. The most common type of particulate is sediment from the banks and streambed; other sources may include nearby disturbed lands, possibly due to agriculture or construction activities.
- **Fecal Coliform—**a portion of the coliform group which is present in the intestinal tract and feces of warm blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium. Broken sewer pipes, failed septic systems, wildlife droppings, pet waste, and pasture runoff are typical sources of fecal coliform.

City of Woodinville

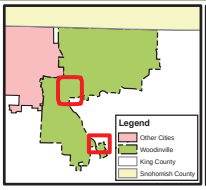
Figure F.1

Water Quality Monthly Sampling Sites

0 100 200 400 Feet

1 inch equals 400 feet

File Name: Water Quality Sampling Site Map.mxd



NO	DESIGN/REVISION	DATE	BY
1	Locations	02/08/08	BGS
2			
3			
4			
5			

City of Woodinville
17301 - 133rd Ave NE
Woodinville, WA 98072
www.woodinville.wa.us
425-489-2700

Disclaimer

Any use of or reliance upon the information contained in this document is at the user's sole risk. The City of Woodinville does not warrant the accuracy, currency, completeness or quality of said information. The City expressly disclaims any warranty of merchantability or fitness for any particular purpose with respect to such information. The City further disclaims all responsibility or liability for any damage, injury or loss resulting therefrom.

- **Nitrate, Nitrite, and Total Phosphorus—**commonly found in fertilizers. They are nutrients to algae and can lead to algae blooms. Algae blooms are a nuisance to residents and water resource users, and are a potential safety threat if blooms become dominated by species that can produce toxins.
- **Lead, Zinc, and Copper—**heavy metals that are not naturally found in large quantities. Common sources include runoff from parking lots and roads due to vehicular traffic. Copper can also be found in some fertilizers.

Table F-1 outlines the water quality criteria for each of the sampling parameters and the regulations that set each of the criteria. Water quality sampling results through 2009 are presented in Tables F-2 through F-4 for each of the monitored streams. Temperature data for 2009 is also included in the tables.

Table F-1
Water Quality Criteria

Parameter	Limits	Regulation
Fecal Coliform (CFU/ml)	Fecal coliform organisms shall not exceed a geometric mean value of 100 cfu (colony forming units)/100mL, with not more than 10% exceeding 200 cfu/100 mL	WAC 173-201A-200
Nitrate/Nitrite (mg/l)	10 mg/l	EPA Quality Criteria for Water 1986
Total Phosphorus (mg/l)	0.1 mg/l	National Water-Quality Assessment Program, USGS, Circular 1136, 1996
Total Suspended Solids (mg/l)	25 mg/l	US Army Corps of Engineers Fisheries Handbook 1991
Lead (mg/l)	Little Bear Creek: 0.001 Woodin Creek: 0.002 Derby Creek: 0.002 Based on average water hardness	WAC 173-201A-240
Zinc (mg/l)	Little Bear Creek: 0.07 Woodin Creek: 0.08 Derby Creek: 0.09 Based on average water hardness	WAC 173-201A-240
Copper (mg/l)	Little Bear Creek: 0.007 Woodin Creek: 0.009 Derby Creek: 0.011 Based on average water hardness	WAC 173-201A-240

Temperature (º F)	Shall not exceed 64º F due to human activities. When natural conditions exceed 64º F, no human-caused temperature increases will be allowed which will raise the 7-day average of the daily maximum temperatures (7-DAD Max) by more than 0.54º F.	WAC 173-201A-200

Table F-2 Little Bear Creek Water Quality Data			
Parameter	Maximum	Minimum	Average
Fecal Coliform (CFU/ml)	17,000	0.5	746.2
Nitrate/Nitrite (mg/l)	3.75	0.27	0.84
Total P (mg/l)	0.2800	0.0003	0.0654
Total Suspended Solids (mg/l)	52.0	0.5	6.8
Lead (mg/l)	0.0070	0.0005	0.0010
Zinc (mg/l)	0.3020	0.0005	0.0115
Copper (mg/l)	0.0646	0.0005	0.0021
Temperature (º F)	65.2	34.8	48.5

Average fecal coliform measurements in Little Bear Creek exceed the WAC standard. All other parameters are within their respective measurable limits.

Table F-3 Woodin Creek Water Quality Data			
Parameter	Maximum	Minimum	Average
Fecal Coliform (CFU/ml)	4,100	0.5	474.9
Nitrate/Nitrite (mg/l)	3.6	0.0	1.0
Total P (mg/l)	0.3700	0.0025	0.0667
Total Suspended Solids (mg/l)	120.0	0.5	9.5
Lead (mg/l)	0.0466	0.0005	0.0018
Zinc (mg/l)	0.1040	0.0005	0.0144
Copper (mg/l)	0.0187	0.0005	0.0021
Temperature (º F)	70.4	33.0	51.2

Average fecal coliform measurements in Woodin Creek exceed the WAC standard. All other parameters are within their respective measurable limits.

Table F-4 Derby Creek Water Quality Data			
Parameter	Maximum	Minimum	Average
Fecal Coliform (CFU/ml)	2,200	0.5	133.3
Nitrate/Nitrite (mg/l)	4.4	0.7	3.4
Total P (mg/l)	0.3400	0.0025	0.0570
Total Suspended Solids (mg/l)	120.0	0.5	5.0
Lead (mg/l)	0.0368	0.0005	0.0010
Zinc (mg/l)	0.0220	0.0005	0.0050
Copper (mg/l)	0.0646	0.0005	0.0017
Temperature (º F)	65.3	31.5	49.3

Average fecal coliform measurements in Derby Creek exceed the WAC standard. All other parameters are within their respective measurable limits.

Lake Leota

Lake Leota is located in the eastern part of the City. It is a part of the Bear Creek basin and the Cold Creek sub-basin, and is supplied by surface and ground water. Surface water drainage is collected mostly from developed properties and paved roadways.

Since 1994, the Lake Leota Community Club has participated in the King County Lake Stewardship Program. Lake Leota residents volunteer to collect data and water samples for the purpose of monitoring the condition of the lake. Data collected include temperature, Secchi depth, chlorophyll a, total phosphorous, total nitrogen, and phytoplankton. This data is given to King County for analysis, with the results summarized in an annual Lake Monitoring Report. A copy of the report is provided to the City annually. In 2005, the City amended the King County Surface Water Management Services Interlocal Agreement to include the lake stewardship program.

Currently the conditions in Lake Leota rank in the mid-range of mesotrophic on the trophic scale. Lake Leota has good water quality and moderate phytoplankton populations.

Bluegreen algae continues to be only a minor component of the community, which is dominated by golden algae.

The milfoil in the lake has continued to grow luxuriantly, and the community reports the plant has produced a wide band around the edge of the lake which is beginning to impact access to the open water. Milfoil has been identified as a species considered native to Washington, *Myriophyllum verticillatum*, based on DNA analyses by an academic expert on the genus *Myriophyllum*. However, its aggressive colonizing and spreading behavior is very unlike other known occurrences in the region. There is some question about whether or not the milfoil in Lake Leota may be a hybrid with another species.

The water has a light yellow color, reflecting the presence of large organic molecules. This indicates that water clarity may be slightly impacted by color in addition to algae and inorganic particles. The profile data also indicate that internal loading of phosphorus to the water column continues to be an important process occurring in the lake.

The average lake temperature ranges from approximately 40° F to 75° F annually.

F.5 Future Monitoring Requirements

Under the existing NPDES Phase II Permit discussed in Section 2.3 – Stormwater Management Requirements, the City is required to prepare for future stormwater outfall and program effectiveness monitoring. It is likely that in the next permit term (beginning in 2012), that the City will be required to implement these monitoring programs. These monitoring requirements are similar to those already in place for Phase I permittees with the exception of BMP effectiveness monitoring. It is anticipated that these monitoring programs will involve substantial investment of staff time and resources for equipment purchase and installation, sample collection and lab analysis, data analysis, record keeping, and annual reporting.

F.6 Recommendations

Based on the water quality monitoring data collected to date, the City's streams and lakes reflect common trends among urbanized systems. Elevated levels of fecal coliform could indicate point source pollutants (such as from a sewer line illicitly plumbed into a storm sewer line) or non-point source pollutants that are accumulating City-wide. The following recommendations aim to protect and improve water quality in the City's waterways.

In accordance with the NPDES Phase II permit, implement storm water public education and maintenance activities to reduce non-point source pollutants to the City's waterways.

Continue habitat restoration projects to improve shading on creeks. Higher quality vegetation on creek banks helps to lower water temperatures and filter pollutants in surface water runoff.

Continue the water quality monitoring program for Little Bear, Derby and Woodin Creeks.

Continue working with Ecology on development and implementation of detailed water quality improvement implementation plans for the TMDLs on Little Bear Creek and the Bear-Evans Watershed.

Continue King County Lake Stewardship Program for Lake Leota. Continue partnering with local residents to collect water quality data and look for long term solutions to algae production.

Continue storm system inventory. Begin mapping private systems on the banks of water bodies. Once completed, use the inventory to identify point sources of pollutants discharging to the stormwater system.

Evaluate basin areas for regional water quality facilities. Regional facilities could capture both point and non-point source pollutants before they are washed downstream into the natural channels.

Obtain grants to assist in the funding of the monitoring programs and CIP projects. Evaluate the need for water quality modeling to track long term trends and predict water quality impacts from proposed projects and activities.

City of Woodinville

Woodin Creek Water Quality Data

Table F-5

	Date	Fecal Coliforms (org/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
Year 2000	Oct	780.0	0.852	0.0849	19	0.00189	0.0158	0.00274	
	Nov	580.0	0.975	0.0025	63	0.00295	0.0230	0.00497	
Year 2001	Jan	0.5	1.170	0.0697	2	0.00050	0.0712	0.00176	
	Feb	23.0	1.130	0.0367	2	0.00108	0.0050	0.00120	
	Mar	310.0	0.941	0.0559	6		0.0050		
	Apr	55.0	1.120	0.0450	7	0.00050	0.0050	0.00151	
	May	27.0	0.668	0.0447	2	0.00050	0.0050	0.00106	
	June	0.5	0.634	0.0600	5	0.00050	0.0050	0.00124	
	July	200.0	0.540	0.0795	2	0.00050	0.0050	0.00149	
	Aug	0.5	0.351	0.1450	13	0.00402	0.0257	0.00512	
	Sept	2,800.0	0.769	0.0620	2	0.00050	0.0050	0.00050	
	Oct	1,200.0	0.807	0.0660	4	0.00050	0.0050	0.00184	
	Nov	0.5	0.764	0.0428	2	0.00050	0.0050	0.00120	
	Dec	580.0	0.578	0.0803	14	0.00405	0.0262	0.00356	
Year 2002	Jan	800.0	0.906	0.0529	6	0.00288	0.0227	0.00443	
	Feb	170.0	1.340	0.0416	2	0.00116	0.0136	0.00195	
	Mar	100.0	1.460	0.0316	2	0.00050	0.0050	0.00050	
	Apr	300.0	1.120	0.0357	2	0.00050	0.0116	0.00126	
	May	45.0	1.180	0.0387	2	0.00050	0.0050	0.00121	
	June	2,000.0	1.200	0.1130	11	0.00239	0.0262	0.00382	
	July	0.5	1.120	0.0740	2	0.00050	0.0050	0.00103	
	Aug	500.0	0.957	0.0646	2	0.00050	0.0050	0.00128	
	Sept	280.0	0.818	0.0519	4	0.00100	0.0100	0.00100	
	Oct	660.0	0.900	0.0468	4	0.00100	0.0100	0.00100	
	Nov	150.0	0.802	0.0456	2	0.00050	0.0050	0.00190	
	Dec	300.0	0.943	0.0405	2	0.00050	0.0050	0.00118	
Year 2003	Jan	430.0	1.230	0.0378	2	0.00050	0.0050	0.00050	
	Feb	160.0	1.130	0.0345	2	0.00050	0.0050	0.00050	
	Mar	55.0	1.160	0.0327	2	0.00050	0.0050	0.00050	
	Apr	140.0	0.879	0.0381	2	0.00050	0.0108	0.00200	
	May	91.0	0.922	0.0472	2	0.00050	0.0050	0.00050	
	June	350.0	0.926	0.0698	2	0.00050	0.0102	0.00050	
	July	220.0	0.731	0.1090	2	0.00050	0.0162	0.00160	
	Aug	200.0	0.815	0.0743	2	0.00050	0.0129	0.00110	
	Sept	56.8	0.828	0.3700	120	0.01450	0.0933	0.01410	
	Oct								
	Nov	82.8	0.849		2	0.00107	0.0130	0.00142	
	Dec	230.0	0.875	0.0289	2	0.00050	0.0050	0.00147	76.1
Year 2004	Jan	380.0	3.580	0.0488	9	0.00176	0.0205	0.00280	50.3
	Feb	81.0	1.460	0.0262	2	0.00050	0.0050	0.00050	78.1
	Mar	110.0	1.100	0.0348	2	0.00050	0.0126	0.00151	74.9
	Apr	240.0	0.673	0.0879	2	0.00050	0.00500	0.00117	76.6
	May	1,700.0	0.840	0.0507	2	0.00050	0.00500	0.00050	82.3
	June	640.0	0.747	0.0591	2	0.00050	0.00500	0.00050	74.6
	July	3,200.0	0.647	0.0622	9.5	0.00050	0.0114	0.00149	70.3
	Aug	940.0	0.543	0.0674	6.5	0.00050	0.00500	0.00050	79
	Sept	2,600.0	0.594	0.0025	2	0.00050	0.00500	0.00484	63.2
	Oct	4,100.0	0.653	0.0450	2	0.00050	0.00500	0.00050	71.6
	Nov	260.0	1.160	0.0329	2	0.00050	0.00500	0.00100	84.7
	Dec	46.0	1.670	0.0368	2	0.00050	0.0814	0.00132	69.7
Year 2005	Jan	20	1.150	0.0196	2	0.00050	0.013	0.0005	79.6
	Feb	55	1.160	0.01485	2	0.00050	0.01	0.0005	76
	Mar	63	0.893	0.0473	2	0.0005	0.005	0.0005	77.1
	Apr	420	1.050	0.0494	2	0.0005	0.005	0.0005	67.5
	May	140	1.070	0.0441	2	0.0005	0.01	0.001	75.2

City of Woodinville

Woodin Creek Water Quality Data

Table F-5

	Date	Fecal Coliforms (org/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
	June	340	0.882	0.0517	2	0.0005	0.005	0.00112	69.4
	July	400	0.952	0.058	2	0.0005	0.005	0.0005	76.5
	Aug	580	0.823	0.061	2	0.0005	0.0124	0.0005	80.6
	Sept	770	0.763	0.089	10	0.0005	0.005	0.0005	92
	Oct	260	0.771	0.033	2	0.0005	0.005	0.0005	79.8
	Nov	1200	0.220	0.141	50	0.0048	0.0322	0.0054	26.3
	Dec	170	1.250	0.031	2	0.0005	0.0101	0.00113	85.8
Year 2006	Jan	1100	0.498	0.111	84	0.00745	0.0471	0.00533	28.5
	Feb	71	1.950	0.034	2	0.00128	0.0328	0.00353	56.1
	Mar	77	1.260	0.005	2	0.0005	0.0163	0.00190	63.3
	Apr	460	1.080	0.005	2	0.0005	0.0118	0.00107	82.5
	May	170	0.995	0.0539	2	0.0005	0.005	0.00050	81.6
	June	380.0	1.270	0.0424	2.0	0.0005	0.0050	0.00132	83.8
	July	380.0	0.828	0.0630	34.0	0.0005	0.0050	0.00050	75.1
	Aug	900.0	0.831	0.0970	2.0	0.00164	0.0154	0.00235	84.3
	Sept	700	0.881	0.061	2	0.0005	0.0050	0.00050	77.2
	Oct	67	0.743	0.07	43	0.00183	0.017	0.00259	82.4
	Nov	990	0.378	0.28	2	0.00152	0.0228	0.00402	41.7
	Dec	400	1.130	0.065	2	0.0005	0.0106	0.00185	88.2
Year 2007	Jan	150	1.110	0.062	18	0.00266	0.0322	0.00286	81.1
	Feb	85	1.360	0.245	2	0.0005	0.0121	0.00136	85.6
	Mar	350	0.036	0.179	98	0.0466	0.104	0.01710	46.6
	Apr	81	1.150	0.068	2	0.0005	0.005	0.00050	92.6
	May	62	0.977	0.115	2	0.0005	0.0103	0.00107	73
	June	350	0.799	0.0780	4.0	0.0005	0.0123	0.00199	75.1
	July	1000	1.040	0.0930	2.0	0.0113	0.0050	0.00117	85.6
	Aug	790	0.915	0.1840	2.0	0.00050	0.0050	0.00050	91.0
	Sept	350	0.895	0.08	2	0.0005	0.0106	0.00050	96.2
	Oct	440	0.632	0.069	2	0.0005	0.0154	0.00246	57.5
	Nov	160	1.010	0.059	2	0.0005	0.005	0.00050	88.3
	Dec	31	1.170	0.037	2	0.0005	0.005	0.00050	85.3
Year 2008	Jan	160	0.713	0.061	10	0.00131	0.0258	0.00277	42
	Feb	97	0.976	0.045	5.5	0.0005	0.017	0.00178	72.7
	Mar	1300	1.210	0.039	2	0.0005	0.0245	0.00142	80.9
	Apr	17	1.250	0.0149	2	0.0005	0.0116	0.00133	85.5
	May	37	0.986	0.03	2	0.0005	0.005	0.00100	87.2
	June	280.0	1.040	0.0700	5.5	0.0005	0.0108	0.00157	83.8
	July	-	0.724	0.2480	110.0	0.0068	0.0742	0.01870	40.9
	Aug	88.0	0.878	0.0680	2.0	0.0005	0.005	0.00050	83.8
	Sept	146	0.785	0.058	2	0.0005	0.0050	0.00050	83.6
	Oct	170	0.947	0.051	10	0.0005	0.005	0.00128	84.6
	Nov	254	0.284	0.092	17	0.00282	0.0327	0.00559	26.7
	Dec	8	1.010	0.039	2	0.0005	0.005	0.00050	80.6
Year 2009	Jan	170	2.200	0.024	7	0.001	0.012	0.00200	49
	Feb	228	1.300	0.04	2	0.01	0.004	0.00050	98
	Mar	320	0.800	0.048	23	0.003	0.03	0.00050	53
	Apr	56	1.900	0.097	43	0.009	0.064	0.00800	37
	May	170	0.700	0.027	1	0.0005	0.006	0.00300	68
	June	990.0	1.000	0.0540	1.0	0.0030	0.0020	0.00050	84.0
	July	470.0	1.200	0.1200	10.0	0.0010	0.0060	0.00300	84.0
	Aug	340.0	1.000	0.0720	2.0	0.002	0.0005	0.00300	85.0
	Sept	2400	1.100	0.09	6	0.0005	0.0100	0.00600	69
	Oct	860	1.000	0.045	0.5	0.0005	0.002	0.00050	80
	Nov	80	0.880	0.042	1	0.002	0.0005	0.00100	85
	Dec	510	1.100	0.025	1	0.0005	0.002	0.00050	83

City of Woodinville
Little Bear Creek Water Quality Data
Table F-6

	Date	Fecal Coliforms (CFU/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
Year 1997	Sept	420.0	0.708	0.0536	2	0.00050	0.00902	0.00158	
	Oct	2,700.0	2.370	0.0025	12	0.00050	0.00569	0.00329	
	Nov	580.0	0.968	0.0268	2	0.00100	0.00250	0.00219	
	Dec	230.0	1.290	0.0156	2	0.00100	0.00460	0.00256	
Year 1998	Jan	220.0	1.420	0.0206	16	0.00302	0.01660	0.00729	
	Feb	630.0	1.350	0.0273	8	0.00145	0.00434	0.00216	
	Mar	260.0	1.130	0.0640	20	0.00290	0.00981	0.00243	
	Apr	1,100.0	0.724	0.1510	28	0.00386	0.02670	0.00371	
	May	250.0	2.230	0.1010	2	0.00050	0.00500	0.00050	
Year 2000	May	410.0	0.719	0.0439	4	0.00050	0.01410	0.00136	
	June	160.0	0.782	0.0569	5	0.00050	0.00500	0.00132	
	July	51.0	0.677	0.0662	2	0.00114	0.00500	0.00242	
	Aug	27.0	0.650	0.0754	4	0.00050	0.00500	0.00222	
	Sept	32.0	0.639	0.0507	2	0.00050	0.00500	0.00050	
	Oct	510.0	0.671	0.0912	6	0.00050	0.00500	0.00192	
	Nov	190.0	0.783	0.0025	2	0.00050	0.00500	0.00050	
	Dec	100.0	0.915	0.0596	2	0.00050	0.01420	0.00134	
Year 2001	Jan	800.0	1.140	0.0797	2	0.00050	0.00500	0.00148	
	Feb	200.0	1.170	0.0519	6	0.00139	0.00500	0.00111	
	Mar	310.0	0.941	0.0559	6		0.00500	0.06460	
	Apr	55.0	1.120	0.0450	7	0.00050	0.00500	0.00151	
	May	27.0	0.668	0.0447	2	0.00050	0.00500	0.00106	
	June	0.5	0.634	0.0600	4	0.00050	0.05070	0.00135	
	July	500.0	0.540	0.0795	2	0.00050	0.00500	0.00149	
	Aug	4,500.0	0.534	0.1480	17	0.00285	0.02020	0.00399	
	Sept	160.0	0.580	0.0691	2	0.00050	0.00500	0.00050	
	Oct	1,900.0	0.658	0.0730	5	0.00050	0.00500	0.00159	
	Nov	0.5	0.712	0.0541	2	0.00050	0.00500	0.00136	
	Dec	220.0	1.700	0.0456	10	0.00050	0.00500	0.00161	
Year 2002	Jan	300.0	1.130	0.1190	34	0.00306	0.01860	0.00451	
	Feb	2,800.0	1.160	0.0648	10	0.00159	0.00500	0.00185	
	Mar	150.0	0.936	0.0561	6	0.00102	0.01140	0.00188	
	Apr	600.0	0.771	0.0474	5	0.00050	0.00500	0.00119	
	May	130.0	0.774	0.0371	5	0.00050	0.00500	0.00129	
	June	540.0	0.705	0.0769	7	0.00050	0.01360	0.00389	
	July	280.0	0.682	0.0635	2	0.00050	0.00500	0.00050	
	Aug	200.0	0.621	0.1660	10	0.00476	0.04730	0.00500	
	Sept	300.0	0.899	0.2720	8	0.00100	0.01000	0.00100	
	Oct	200.0	0.840	0.0927	11	0.00100	0.01000	0.00130	
	Nov	140.0	0.722	0.0714	2	0.00050	0.00500	0.00103	
	Dec	130.0	0.764	0.0681	4	0.00050	0.00500	0.00050	
Year 2003	Jan	69.0	1.290	0.0511	2	0.00050	0.00500	0.00050	
	Feb	150.0	0.975	0.0499	2	0.00050	0.00500	0.00050	
	Mar	290.0	1.000	0.0556	2	0.00050	0.00500	0.00050	
	Apr	1,700.0	0.833	0.0876	2	0.00050	0.00500	0.00266	
	May	670.0	0.666	0.0530	2	0.00050	0.00500	0.00050	
	June	340.0	0.601	0.0580	2	0.00050	0.00500	0.00105	
	July	7,100.0	0.367	0.0567	2	0.00050	0.01090	0.00050	
	Aug	120.0	0.344	0.0499	2	0.00050	0.00500	0.00050	
	Sept	3,500.0	0.524	0.1450	8	0.00108	0.01290	0.00239	
	Oct	210.0	0.427	0.0630	2	0.00050	0.00500	0.00050	
	Nov	210.0	0.677	0.0003	2	0.00050	0.00500	0.00050	
	Dec	41.0	1.150	0.0313	2	0.00050	0.00500	0.00152	
Year 2004	Jan	260.0	1.570	0.0649	12	0.00156	0.01460	0.00263	34.3
	Feb	140.0	1.250	0.0386	4	0.00050	0.00500	0.00148	49.5
	Mar	230.0	0.921	0.0419	7	0.00050	0.00500	0.00130	45.1
	Apr	80.0	0.500	0.0476	2	0.00050	0.00500	0.00050	54.4
	May	500.0	0.611	0.0474	2	0.00050	0.00500	0.00050	68.6
	June	490.0	0.481	0.0508	2	0.00050	0.00500	0.00050	59.8
	July	140.0	0.420	0.0548	2	0.00050	0.00500	0.00050	60.1

City of Woodinville
Little Bear Creek Water Quality Data
Table F-6

	Date	Fecal Coliforms (CFU/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
	Aug	310.0	0.271	0.0540	2	0.00050	0.00500	0.00050	
	Sept	760.0	0.377	0.0523	2	0.00050	0.01120	0.00136	56.2
	Oct	420.0	0.450	0.0548	5	0.00050	0.00500	0.00050	63.3
	Nov	260.0	1.250	0.0456	5	0.00050	0.00500	0.00204	54.7
	Dec	210.0	1.620	0.0455	2	0.00050	0.00500	0.00140	42.7
Year 2005	Jan	82	3.750	0.0293	2	0.00050	0.00500	0.00166	56.8
	Feb	87	1.100	0.0376	2	0.00050	0.00500	0.001	53.8
	Mar	58	0.828	0.0601	2	0.0005	0.00500	0.0005	47.0
	Apr	65	0.842	0.051	2	0.0005	0.00500	0.0005	49.7
	May	1800	0.595	0.0436	2	0.001	0.01000	0.001	56.6
	June	1700	0.507	0.0528	2	0.0005	0.00500	0.00123	53.2
	July	140	0.530	0.053	2	0.0005	0.00050	0.0005	74.5
	Aug	120	0.368	0.042	2	0.0005	0.01030	0.0005	71.0
	Sept	360	0.363	0.048	2	0.0005	0.00500	0.0005	76.5
	Oct	240	0.573	0.034	2	0.0005	0.00500	0.0005	68.5
	Nov	900	0.401	0.112	32	0.00289	0.02780	0.00539	53.3
	Dec	180	1.260	0.039	2	0.0005	0.00500	0.00109	56.9
Year 2006	Jan	540	1.280	0.086	52	0.00386	0.03240	0.00481	47.3
	Feb	17000	1.540	0.0450	14	0.0010	0.0150	0.0023	32.6
	Mar	420	1.020	0.0050	2	0.0005	0.0147	0.0013	49.5
	Apr	110	0.757	0.0360	2	0.0005	0.0050	0.0012	57.1
	May	100	0.647	0.0786	2	0.0005	0.00500	0.0005	62.6
	June	2800	0.555	0.051	2	0.0005	0.00500	0.00102	57.3
	July	170	0.491	0.057	26	0.0005	0.01060	0.00176	63.6
	Aug	320	0.450	0.045	8	0.00307	0.02400	0.00294	73.9
	Sept	320	0.510	0.052	2	0.0005	0.00500	0.0005	66.2
	Oct	250	0.705	0.041	10	0.0005	0.00500	0.00118	65.9
	Nov	2300	0.480	0.28	6	0.00152	0.02280	0.00402	61.4
	Dec	51	1.080	0.089	2	0.0005	0.01220	0.00212	56
Year 2007	Jan	310	0.931	0.058	11	0.0005	0.01340	0.0015	26.8
	Feb	240	1.020	0.0750	2	0.0005	0.0050	0.0005	60.1
	Mar	330	0.664	0.0800	14	0.0032	0.0285	0.0030	54.7
	Apr	110	0.716	0.0760	2	0.0005	0.0050	0.0005	64.2
	May	51	0.599	0.202	2	0.0005	0.00500	0.0005	58.4
	June	2600	0.482	0.059	2	0.0005	0.00500	0.00127	62.9
	July	290	0.428	0.074	6	0.0005	0.02170	0.0005	74.7
	Aug	140	0.380	0.213	7	0.0005	0.00500	0.0005	75
	Sept	59	0.458	0.068	2	0.0005	0.00500	0.0005	72.6
	Oct	2700	0.498	0.067	9	0.0005	0.00500	0.00158	64.6
	Nov	38	0.655	0.075	2	0.0005	0.00500	0.0005	71.3
	Dec	65	1.080	0.045	4.5	0.0005	0.00500	0.00113	55.7
Year 2008	Jan	66	1.000	0.09	22	0.00143	0.02160	0.00291	46.5
	Feb	160	0.855	0.0590	14	0.0005	0.0165	0.0017	50.8
	Mar	70	0.821	0.0600	2	0.0005	0.0165	0.0019	70.5
	Apr	220	0.914	0.0590	4	0.0005	0.0050	0.0010	58.8
	May	73	0.659	0.049	2	0.0005	0.00500	0.0005	59
	June	11000	0.676	0.059	9	0.0005	0.00500	0.00182	49.6
	July	-	0.645	0.229	44	0.00325	0.06220	0.0101	55
	Aug	70	0.487	0.067	2	0.0005	0.00500	0.0005	69.6
	Sept	103	0.515	0.058	2	0.0005	0.00500	0.00103	66.9
	Oct	94	0.560	0.055	6	0.0005	0.00500	0.00133	67.5
	Nov	196	0.454	0.084	14	0.0018	0.02890	0.00361	50.6
	Dec	16	0.752	0.05	2	0.0005	0.00500	0.0005	60.7
Year 2009	Jan	36	1.800	0.047	22	0.0005	0.01700	0.0005	37.0
	Feb	56	1.200	0.0600	8	0.0070	0.0020	0.0030	65.0
	Mar	164	0.950	0.0480	16	0.0005	0.3020	0.0030	53.0
	Apr	146	3.000	0.0390	13	0.0010	0.0130	0.0020	46.0
	May	460	0.560	0.039	9	0.001	0.00900	0.0005	48
	June	250	0.530	0.064	1	0.002	0.00200	0.0005	71
	July	630	0.510	0.043	6	0.0005	0.00050	0.001	71
	Aug	370	0.450	0.049	20	0.004	0.00050	0.002	74
	Sept	540	0.470	0.041	9	0.0005	0.00200	0.004	72
	Oct	160	0.630	0.04	0.5	0.0005	0.00300	0.0005	68
	Nov	70	0.640	0.048	10.00	0.001	0.00300	0.002	63
	Dec	20	0.970	0.028	0.50	0.0005	0.00050	0.001	55

City of Woodinville
Derby Creek Water Quality Data
Table F-7

	Date	Fecal Coliforms (org/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
Year 2000	Oct	23.0	3.800	0.0464	2	0.0005	0.005	0.00050	
	Nov	7.2	3.780	0.0025	2	0.0005	0.005	0.00050	
Year 2001	Jan	1.0	3.830	0.0777	9	0.0005	0.005	0.00117	
	Feb	0.5	3.390	0.0398	2	0.0005	0.005	0.00050	
	Mar	310.0	0.941	0.0559	6	0.0368	0.005	0.06460	
	Apr	55.0	1.120	0.0450	7	0.0005	0.005	0.00151	
	May	27.0	0.668	0.0447	2	0.0005	0.005	0.00106	
	June	0.5	3.940	0.0498	2	0.0005	0.005	0.00125	
	July	300.0	3.550	0.0555	2	0.0005	0.005	0.00050	
	Aug	460.0	3.460	0.0691	2	0.0005	0.005	0.00105	
	Sept	300.0	3.690	0.0558	2	0.0005	0.005	0.00050	
	Oct	2.3	3.300	0.0549	35	0.0005	0.005	0.00050	
	Nov	0.5	3.350	0.0498	9	0.0005	0.005	0.00113	
	Dec	380.0	2.720	0.1010	34	0.0016	0.005	0.00281	
Year 2002	Jan	350.0	2.430	0.0509	8	0.0005	0.005	0.00309	
	Feb	180.0	2.990	0.0309	2	0.0005	0.005	0.00050	
	Mar	50.0	3.500	0.0324	2	0.0005	0.005	0.00050	
	Apr	55.0	3.370	0.0332	2	0.0005	0.005	0.00133	
	May	5.3	3.850	0.0344	2	0.0005	0.005	0.00112	
	June	58.0	3.660	0.0434	2	0.0005	0.005	0.00500	
	July	240.0	3.360	0.0389	2	0.0005	0.005	0.00500	
	Aug	20.0	3.390	0.0347	2	0.0005	0.005	0.00500	
	Sept	34.0	3.630	0.0389	4	0.0010	0.010	0.00100	
	Oct	52.0	0.975	0.0382	4	0.0010	0.010	0.00100	
	Nov	36.0	3.300	0.0492	2	0.0005	0.005	0.00500	
	Dec	38.0	3.990	0.0426	12	0.0005	0.005	0.00115	
Year 2003	Jan	5.0	3.100	0.0101	38	0.0005	0.0050	0.00050	
	Feb	33.0	3.420	0.0397	2	0.0005	0.0050	0.00050	
	Mar	12.0	3.650	0.0414	2	0.0005	0.0050	0.00050	
	Apr	0.5	3.240	0.0647	7	0.0011	0.0050	0.00564	
	May	64.0	3.740	0.0503	4	0.0005	0.0220	0.00050	
	June	200.0	3.760	0.0463	2	0.0005	0.0050	0.00050	
	July	120.0	3.540	0.0419	2	0.0005	0.0050	0.00050	
	Aug	41.0	3.860	0.0385	2	0.0005	0.0050	0.00050	
	Sept	97.5	3.910	0.0777	2	0.0005	0.0050	0.00050	
	Oct								
	Nov	75.0	3.880		2	0.0005	0.0050	0.00050	
	Dec	89.0	3.800	0.0326	2	0.0005	0.0050	0.00050	
Year 2004	Jan	130.0	3.580	0.0488	9	0.0005	0.0050	0.00172	50.3
	Feb	16.0	1.460	0.0262	2	0.0005	0.0050	0.00050	78.1
	Mar	60.0	3.120	0.0334	2	0.0005	0.0050	0.00050	79.9
	Apr	20.0	3.420	0.0487	2	0.0005	0.0050	0.00131	87.5
	May	30.0	3.750	0.0419	2	0.0005	0.0050	0.00050	100
	June	69.0	3.600	0.0464	2	0.0005	0.0050	0.00050	91.9
	July	260.0	3.640	0.0443	2	0.0005	0.0050	0.00050	94.1
	Aug	150.0	3.570	0.0407	2	0.0005	0.0050	0.00050	101
	Sept	760.0	3.520	0.0529	2	0.0005	0.0050	0.00050	89.1
	Oct	170	3.690	0.0373	2	0.0005	0.0050	0.00050	93.5
	Nov	43.0	3.600	0.0395	2	0.0005	0.0050	0.00050	107
	Dec	200.0	3.780	0.0472	2	0.0005	0.0050	0.00050	79.9
Year 2005	Jan	56	1.140	0.027	2	0.0005	0.0050	0.00050	90.1
	Feb	87	3.600	0.02815	2	0.0005	0.0050	0.00050	83.8
	Mar	70	4.030	0.0657	2	0.0005	0.005	0.00050	74.9
	Apr	280	3.390	0.0948	2	0.0005	0.005	0.00050	75.7
	May	430	3.580	0.0446	2	0.001	0.01	0.00100	90.4
	June	700	3.420	0.0595	2	0.001	0.01	0.00100	95.7
	July	28	1.270	0.056	2	0.0005	0.005	0.00153	87.7
	Aug	580	0.823	0.061	2	0.0005	0.005	0.00201	80.6

City of Woodinville
Derby Creek Water Quality Data
Table F-7

	Date	Fecal Coliforms (org/100ml)	Nitrate/Nitrite (mg/l)	Total P (mg/l)	Total Suspended Solids (mg/l)	Lead (mg/l)	Zinc (mg/l)	Copper (mg/l)	Hardness (mg/l)
	Sept	410	4.000	0.047	7.5	0.0005	0.005	0.00050	108
	Oct	79	3.840	0.005	2	0.0005	0.005	0.00050	101
	Nov	420	3.540	0.098	7.5	0.0005	0.005	0.00050	101
	Dec	12	3.780	0.049	2	0.0005	0.005	0.00050	100
Year 2006	Jan	490.0	3.400	0.1170	120	0.0032	0.0155	0.00430	66.4
	Feb	29	3.140	0.037	4	0.0005	0.005	0.00147	46.3
	Mar	20	3.100	0.005	2	0.0005	0.005	0.00050	85.4
	Apr	73	3.600	0.019	2	0.0005	0.005	0.00113	94.9
	May	9.0	3.7200	0.0503	2.0	0.0005	0.0050	0.00050	97.5
	June	110.0	3.3000	0.0500	2.0	0.0005	0.0050	0.00050	93.9
	July	2200	3.7600	0.0470	2.0	0.0005	0.0050	0.00203	102
	Aug	93	3.6200	0.0440	2.0	0.0005	0.0050	0.00050	100
	Sept	230	3.7400	0.0470	2.0	0.0005	0.0050	0.00050	93.8
	Oct	57	4.0400	0.0440	2.0	0.0005	0.0050	0.00050	97.3
	Nov	8	3.5600	0.2350	2.0	0.0005	0.0050	0.00050	102
	Dec	2	4.0000	0.1020	2.0	0.0005	0.0050	0.00103	99.5
Year 2007	Jan	5.0	3.600	0.0450	2	0.0005	0.0050	0.00050	57.2
	Feb	2	3.960	0.068	2	0.0005	0.005	0.00050	92.4
	Mar	18	3.600	0.055	2	0.0005	0.005	0.00110	91.3
	Apr	5	4.020	0.07	2	0.00122	0.005	0.00050	105
	May	10.0	3.7800	0.1090	2.0	0.0005	0.0050	0.00050	86.8
	June	64.0	3.0400	0.0680	2.0	0.0005	0.0050	0.00050	102.0
	July	31	3.6600	0.0580	4.0	0.0005	0.0050	0.00050	102
	Aug	54	3.6100	0.1580	5.0	0.0005	0.0050	0.00050	110
	Sept	270	3.4900	0.0800	2.0	0.0005	0.0050	0.00050	105
	Oct	55	3.5600	0.0590	5.0	0.0005	0.0050	0.00120	102
	Nov	9	3.8900	0.0720	2.0	0.0005	0.0050	0.00050	105
	Dec	12	3.6300	0.0460	2.0	0.0005	0.0050	0.00050	94.9
Year 2008	Jan	23.0	3.340	0.0460	2	0.0005	0.0050	0.00105	73.5
	Feb	3	3.360	0.05	2	0.0005	0.005	0.00050	89.4
	Mar	17	3.680	0.04	2	0.0005	0.005	0.00050	99.1
	Apr	6	3.260	0.194	4	0.0005	0.005	0.00050	101
	May	26.0	3.4600	0.3400	2.0	0.0005	0.0050	0.00050	101.0
	June	31.0	3.5600	0.0810	2.0	0.0005	0.0050	0.00050	103.0
	July	-	3.6800	0.0740	5.0	0.0005	0.0050	0.00101	95.4
	Aug	32	3.4300	0.0640	2.0	0.0005	0.0050	0.00050	97.6
	Sept	9	3.3300	0.0570	2.0	0.0005	0.0050	0.00050	98.8
	Oct	14	3.7000	0.0450	2.0	0.0005	0.0050	0.00050	102
	Nov	70	3.2000	0.0710	2.0	0.0005	0.0050	0.00216	95.1
	Dec	4	3.7600	0.0470	8.5	0.0005	0.0050	0.00050	97.7
Year 2009	Jan	38.0	3.900	0.0300	5	0.0005	0.0005	0.00050	54
	Feb	2	4.400	0.12	3	0.004	0.0005	0.00050	110
	Mar	32	3.000	0.037	4	0.0005	0.003	0.00300	80
	Apr	52	3.500	0.037	9	0.001	0.001	0.00200	84
	May	14.0	3.2000	0.0340	5.0	0.0005	0.0005	0.00050	87.0
	June	1,100.0	3.8000	0.0480	2.0	0.0005	0.0005	0.00050	98.0
	July	10	4.1000	0.0570	6.0	0.0005	0.0005	0.00300	98
	Aug	40	4.2000	0.0470	0.5	0.0010	0.0005	0.00600	110
	Sept	140	4.4000	0.0390	5.0	0.0005	0.0005	0.00400	110
	Oct	70	3.6000	0.0420	0.5	0.0005	0.0005	0.00050	93
	Nov	20	3.7000	0.0440	2.0	0.0020	0.0005	0.00050	100
	Dec	5	3.5000	0.0300	0.5	0.0010	0.0005	0.00200	85