WATER QUALITY MONITORING PLAN FOR GAGES SLOUGH AND THE SKAGIT RIVER WITHIN THE CITY OF BURLINGTON

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1.0 Introduction

Water Quality Monitoring Plan provides monitoring guidelines and procedures for the City of Burlington. The program is designed to assess current surface water quality and identify parameters of concern within the study area. This includes identification of potential point and non-point sources of water contamination in Gages Slough and at discharge points to the Skagit River.

This plan specifies the number, location, and frequency of monitoring efforts as well as the parameters to be analyzed in each sample collected. Chain of custody procedures and data reduction as well as analysis procedures are also included. It is our understanding that City staff will be responsible for the collection of samples and laboratory analysis. Sheldon & Associates will conduct the data analysis and prepare an annual.

1.1 Background Information

Gages Slough is a channelized water body, historically formed by floodwater from the Skagit River. Though linear in shape, the slough is not an active stream system with a gradient of < 1% and flow is not present within the slough throughout the year. The slough is no longer in the active floodplain of the Skagit River due to extensive diking. Residence time in the slough is > 15 days which qualifies it as a lake under the WDOE water quality standards.

Currently there is no on-going monitoring being conducted for Gages Slough. In 1998, water quality samples were collected from April through June and then again in December. Sampling was performed at 14 locations along the slough with varying results (see Technical Report). Sampling included measures of pH, dissolved oxygen, total suspended solids, conductivity, turbidity, and nitrogen and phosphorus. Results from this study indicate that some areas along the slough are in violation of water quality standards and are at levels above those observed in other highly urbanized wetlands in the Puget Sounds lowlands. Specifically several sites reported high fecal coliform and nutrient levels. This existing data will be used in the water quality assessment, however, these data are limited and their analytical accuracy is not documented. Furthermore, the 1998 study did not include testing of stormwater and lacks information for metals and petroleum products as well as pesticide concentrations. Therefore, further sampling over a greater seasonal

variability and at different site locations, including a minimum of two precipitation events, in needed to characterize existing surface and storm water conditions within Gages Slough.

In addition to water quality, water quantity was also monitored in 1998 at five staff gages installed within the slough. These sites will also be monitored during this study. This supplementary information will be used to account for sources of variability in water quality results that may be associated with changing water volumes and weather patterns. Accounting for most of the major sources of variability increases the likelihood of identifying the effect of a particular land use or management practice on water quality.

1.2 Monitoring Program Objectives

There are three primary objectives of this monitoring program. First, the program is designed to characterize general surface water quality conditions in the portion of Gages Slough within the City of Burlington. The data gathered during the first year of this effort will be used to assess current conditions. Information gathered over the next five to ten years will be used to assess future trends in slough quality. Second, the program is designed to assess stormwater quality from outfalls discharging directly to both the slough and the Skagit River. The third objective is to identify existing point and non-point sources of pollution to Gages Slough and the Skagit River.

To these ends, both comparison and compliance monitoring will be conducted. Comparison monitoring will be conducted by collecting samples in key wetland habitats within the slough and comparing them to other highly urbanized wetland systems in Puget Sound. Compliance monitoring will be conducted by collecting samples from specific stormwater outfalls and within the slough comparing them to water quality criteria established by the Washington State Department of Ecology (Ecology) in the Washington Administrative Code [WAC] 173-201A.

1.3 Regulatory Agency Involvement

The state's surface water quality standards set limits on pollution in lakes, rivers and marine waters in order to protect water quality. In 1998, Gages Slough was placed on the Washington Department of Ecology's 303(d) list for violations of the fecal coliform standard.

The Clean Water Act requires that the water quality standards protect beneficial uses, such as swimming, fishing, aquatic life habitat, and agricultural and drinking water supplies. The state has issued (June 25, 2003) final revisions to the Surface Water Quality Standards (Chapter 173-201A WAC). The updated standards must be approved by the federal Environmental Protection Agency and federal fish agencies before they take effect.

The Puget Sound Water Quality Management Plan (PSWQMP) serves as the federally approved Comprehensive Conservation and Management Plan (CCMP) for Puget Sound under Section 320 of the federal Clean Water Act. This management plan guides the efforts of federal and state agencies as well as tribal and local governments including Snohomish County. The plan contains a program for Stormwater and Combined Sewer Overflows. The state completed a Stormwater Management Manual for Western Washington in August 2001. The latter is a revision of the 1992 Stormwater Program Guidance Manual for the Puget Sound Basin. Furthermore, the listing of salmon under the Environmental Species Act (ESA) requires that streams and wetlands be protected. All local governments with salmon habitats are encouraged to develop storm water management plans. Those seeking 4(d) rule exemptions will be required to meet National Marine Fisheries Service (NMFS) stormwater requirements.

Under the Federal Clean Water Act, The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Under these regulations, local governments in the Puget Sound Basin and those subject to the federal National Pollutant Discharge Elimination System (NPDES) Storm Water Program are required to have storm water management programs.

Currently the NPDES storm water permit program (Phase I) applies to only six local governments (Seattle, Tacoma, and the unincorporated areas of Snohomish, King, Pierce and Clark counties) and to Washington State Department of Transportation (WSDOT) facilities within the legal boundaries of those jurisdictions. Industrial facilities that were owned or operated by municipalities with a population of less than 100,000 were previously exempted from the requirement to obtain a stormwater discharge permit. In December 1999, new NPDES rules (Phase II) were published and extended coverage to operators of regulated small municipal separate storm sewer systems serving less than 100,000.

The City of Burlington, as part of incorporated Skagit County, is a regulated municipality under

the Federal NPDES Phase II Rule. This rule requires that the City submit an application for a stormwater permit by March 2003. Additional permit requirements are pending. DOE is currently beginning a process to update and reissue the NPDES and state waste discharge baseline general permit for stormwater discharges. Permit conditions include a requirement to have a Stormwater Pollution Prevention Plan (SWPP) and Best Management Practices (BMPs) implemented to eliminate or minimize the potential to contaminate stormwater.

1.4 Potential sources of contamination

There are two primary categories of contamination: point and non-point source pollution. Point source pollution is the release of contaminants through the outlet of a single conduit, such as a pipe or ditch. Discharges into streams, lakes and rivers by wastewater treatment plants, paper mills, and other industrial facilities are classified as point sources of pollution. Runoff from a feedlot pen or overflows from a hog lagoon to a stream or lake are examples of agricultural point sources of contamination. Because point source pollution is usually concentrated, it is the most significant contamination source, but it is also the easiest to resolve. For example, runoff ponds or catch basins can be constructed to contain point sources.

Non-point source pollution does not originate from one location. Diffuse runoff from land and atmospheric-deposited pollutants not attributed to a single point of origin are considered non-point sources. Agricultural examples include runoff from agricultural land and water erosion from cropped fields. Controlling non-point source pollution tends to be very difficult and usually requires a change in land management practices.

Urbanization also increases the variety and amount of pollutants transported to receiving waters. Sediment from development and new construction; oil, grease, and toxic chemicals from automobiles; nutrients and pesticides from turf management and gardening; viruses and bacteria from failing septic systems; road salts; and heavy metals are examples of pollutants generated in urban areas. Sediments and solids constitute the largest volume of pollutant loads to receiving waters in urban areas.

2.0 WATER QUALITY MONITORING PLAN DESIGN

This plan shall form the basis for water quality monitoring efforts to be performed by the City of Burlington. Procedures and protocols outlined in the plan were developed in consultation with the City.

2.1 Sampling Parameters

This program is designed to identify pollutants entering Gages Slough and the Skagit River from both point and non-point sources contained in outfall discharge and storm and surface water. Physical, chemical and biological parameters will be measured (Table 1). Although most of these pollutants are transported in surface runoff, some may enter water bodies through atmospheric deposition, from direct application, or from sub-surface or shallow groundwater flow.

Physical parameters to be measured include temperature, total dissolved solids, total suspended solids, dissolved oxygen, and pH. Chemical parameters include nutrients such as nitrogen and phosphorus which are essential components of plant and animal diets; metals such as copper, lead, and zinc; total petroleum hydrocarbons associated with roadways and vehicles; and pesticides (e.g. insecticides) used to protect crops and gardens.

Biological parameters include microorganisms such as fecal coliform from human sewage or animal manure. These disease-causing microorganisms have the potential to affect human and livestock health and generally enter surface waters in runoff containing animal or human wastes. Municipal discharges of sewage can also deliver bacteria and other organisms to surface waters. Field and laboratory testing will be performed on the water samples collected. Parameters selected will characterize general water quality conditions. Field-testing using *in situ* methods will be performed for temperature, dissolved oxygen, and pH during each sampling effort using a hand-held YSI meter and probe.

Surface and stormwater water samples will be collected by directly filling pre-labeled bottles containing the Environmental Protection Agency (EPA) recommended preservative for each parameter to be tested. Where possible, samples will be collected at a depth of approximately one foot.

Edge Analytical, an EPA accredited laboratory, will perform the sample testing using EPA approved methods (Table 1). All laboratory costs shall be the responsibility of the City.

2.2 Sampling Locations

A total of nine water quality stations will be established at locations within the City of Burlington (Figure 1). These locations have been selected because they meet the study objectives of characterizing existing surface and stormwater conditions as well as identifying existing point and non-point source pollution to Gages Slough and the Skagit River. Stations will be located in the following areas:

1. Gages Slough at the N.E. corner of the City's property boundary
2. Gages Slough at intersection of Skagit and Rio Vista Roads
3. Gages Slough at Gilkey Road under Burlington Northern trestle
4. Gages Slough off Goldenrod Road downstream of I-5
5. Gages Slough at Pulver Road Pump Station
6. Joe Leary ditch
7. City of Burlington Wastewater treatment plant storm drain
8. Storm drain at Cascade Mall Drive
9. Whitmarsh Road pump station discharge to Skagit River

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Table 1. Parameters and EPA methods for analysis of water quality samples.

Analyte	Sampling type	Units	Method Number	Method Reference	Instrument Detection Limit
Hardness (as CACO3)	Stormwater	mg/L	130.2	EPA	1.0
pH	Storm & Surface water	mg/L			
Ammonia Nitrogen	Surface water	mg/L	350.1	EPA	0.005
Total Nitrogen (TKN)	Surface water	mg/L	351.3	EPA	0.25
Nitrate + Nitrite	Surface water	mg/L	353.2	EPA	0.010
Total Phosphorus	Surface water	mg/L	365.2	EPA	0.005
Total Petroleum Hydrocarbon	Stormwater	mg/L	418.1	EPA	1.0
Total Dissolved Solids	Surface water	mg/L	160.1	EPA	1.0
Total Suspended Solids	Storm & Surface water	mg/L	160.2	EPA	1.0
Fecal Coliform Bacteria	Storm & Surface water	mg/L	200.7	EPA	0.002
Dissolved Copper	Stormwater	µg/L	200.7	EPA	0.002
Dissolved Lead	Stormwater	µg/L	239.2	EPA	0.001
Dissolved Zinc	Stormwater	µg/L	200.7	EPA	0.002
Carbamates	Stormwater	µg/L			
Organoclorines	Stormwater	µg/L			
Dissolved Oxygen	Surface water	mg/L	grab		

Figure 1. Surface and stormwater monitoring locations within the City of Burlington.

2.3 Sampling frequency

The frequency and location of water quality sampling will vary depending on the specific objective being addressed (Table 2). At the initiation of each monitoring year, samples will be tested for the complete list of analytes at all locations. Subsequently, to characterize general water quality throughout the year, samples of both physical and biological analytes as well as nutrients will be collected bi-monthly at each sampling location. For consistency these samples will be collected at 60-day intervals in January, March, May, July, September, and November. Following the analysis of the first year of data, the frequency and location of the sampling protocol may be altered.

2.4 Stormwater Sampling

Stormwater will be sampled twice annually following Ecology sampling guidance (Ecology 2002). Stormwater shall be sampled once during a spring storm and once during a fall storm. In each case there must be a minimum of at least 24-hours of no measurable precipitation prior to the sampling effort. The storm to be sampled must have an intensity of at least 0.1inches of rainfall (depth) in a 24-hour period (Ecology 2002). Three stormwater sites have been selected for this protocol (Figure 1). In addition, sites 1 and 5 will also be sampled during the stormwater sampling to provide information about into and outflow conditions from the City Limits.

In addition to the parameters tested bi-monthly in surface water samples, trace metals and pesticides concentration will be analyzed in stormwater samples (Table 1). The concentration of copper, lead, and zinc as well as organochlorine and carbamate pesticides will be evaluated from filtered storm water samples using the Washington State Water Quality Standards for Surface Waters (Washington Administrative Code [WAC] 173-201A).

Table 2. City of Burlington surface and stormwater sampling schedule.

Month	Parameters	Locations
January	All	All
March	Surface Water	1,2,3,4,5,6
Spring Storm	Stormwater	1,5,7,8,9
May	Surface Water	1,2,3,4,5,6
July	Surface Water	1,2,3,4,5,6
September	Surface Water	1,2,3,4,5,6
Fall Storm	Stormwater	1,5,7,8,9
November	Surface Water	1,2,3,4,5,6

3.0 QUALITY CONTROL AND QUALITY ASSURANCE

Many factors can introduce error into a monitoring program. Therefore, a quality control (QC) program will be implemented to check the quality of the data being collected. Quality assurance (QA) is an integrated system of management procedures and activities used to evaluate data quality and verify that the QC program is operating within acceptable limits (USEPA 1997). Such a program is essential for the collection of scientifically sound water quality data.

This QC/QA program specifies methods and procedures for the testing laboratory. Specifically, analysis will incorporates the collection and analysis of blank and spiked samples. Laboratory method detection limits for the selected water quality attributes have been identified to ensure the method detection limit is higher than the level required by the monitoring program. Laboratory water samples will be preserved, stored at 4°C during transport, and delivered to the laboratory within 24 hours following collection.

4.0 REFERENCES

How to do stormwater sampling; a guide for industrial facilities. 2002. Washington State Department of Ecology. Publication #02-10-071. Olympia, WA.