# Perry Creek Contaminant Source Survey and Ambient Water Quality

## 2010 Summary Report

**Snohomish County**
**Surface Water Management**

**Prepared for the City of Bothell**
**Inter-local Agreement #9710070097**
**2010**

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# Introduction

In 1996, the Washington State Department of Ecology (Ecology) determined that several segments and tributaries of North Creek do not meet the extraordinary primary contact standard for fecal coliform bacteria, as established in Washington State Administrative Code (WAC 173-201A). Perry Creek is a tributary to North Creek and has also been found to exceed state standards. As required by section 303d of the Clean Water Act, Ecology acted upon their determinations and in 2006 developed a water quality clean-up plan or Total Maximum Daily Load Detailed Implementation (TMDL) Plan for the North Creek basin. In February 2007, Ecology issued the City of Bothell (City) a Phase II Municipal Stormwater Permit (permit). Appendix 2 of the permit required the City to implement actions aimed at reducing fecal coliform bacteria from their storm drainage systems. These actions included, but are not limited to implementation of an ambient water quality monitoring program to track fecal coliform bacteria trends and identify sources. This program and additional measures the City has taken are outlined in a their draft Bacteria Pollution Control Plan, found at http://www.ci.bothell.wa.us/Site/Content/Public%20Works/Surface%20Water%20Mgmt/Aug%202010%20Draft%20BPCP.pdf

The City of Bothell (City) and Snohomish County have a long standing inter-local agreement (ILA #9710070097), which allows the County to provide water quality services to the City. Under the inter-local agreement, the City requested a contaminant source survey (CSS) of the Perry Creek subbasin for fecal coliforms as well as the delivery of long term ambient water quality data collected from North Creek at station NCLD as previously annexed by the City. This report details the Perry Creek contaminant source survey. Results for North Creek monitoring station NCLD are found in Appendix A. The report satisfies the County's calendar year 2010 obligations for water quality services to the City.

## Applicable Water Quality Standards

In accordance with the federal Clean Water Act (CWA), Washington State Department of Ecology (Ecology) adopted water quality standards found in Washington State Administrative Code (WAC), Chapter 173-201A for fecal coliform bacteria. Water Quality Standards are implemented to reduce human health risks in waterbodies that are used to support designated uses, including water contact recreation and shellfish collection.

State water quality standards establish the use of extraordinary primary recreational contact for North Creek and subsequently, Perry Creek. The standards require that fecal coliform organism levels must not exceed a geometric mean value of 50 cfu /100 milliliters, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 cfu /100 milliliters (referred to as the 90$^{th}$ percentile standard). These standards are designed to protect water bodies that are primarily used for recreational purposes. Based upon water quality monitoring efforts for fecal coliform bacteria, the City determined that fecal coliform bacteria levels in Perry Creek at station SARU (Figure 1) exceeded fresh water quality standards for fecal coliform bacteria (Table 1).

**Table 1 SARU Seasonal Geomean Results for Fecal Coliforms in cfu /100mL**

| Season | # of samples | Fecal C. (Col/100ml) | 90th percentile |
|---|---|---|---|
| **2003 Dry Season** | 10 | 244 | 1114 |
| **2003-2004 Wet Season** | 9 | 97 | 190 |
| **2006 Dry Season** | 7 | 267 | 728 |
| **2006-2007 Wet Season** | 10 | 42 | 102 |
| **2007 Dry Season** | 3 | 169 | 397 |
| **2007-2008 Wet Season** | 6 | 163 | 410 |
| **2008 Dry Season** | 4 | 115 | 139 |
| **2008-2009 Wet Season** | 7 | 184 | 1682 |
| **2009 Dry Season** | 5 | 505 | 3980 |
| **2009-2010 Wet Season** | 7 | 78 | 215 |

Red denotes exceedances of WAC 173-201A

Often times, the sources of fecal coliform bacteria are non-point source in nature and difficult to identify through routine monitoring. Snohomish County's quality assurance project plan to identify trends and sources of fecal coliform bacteria was provided to the City for consideration. The City acknowledged the County's phased contaminant source survey approach and requested assistance in 2010 to identify potential sources of fecal coliform bacteria within the Perry Creek subbasin.

## Study Area

Perry Creek is located in the City of Bothell within the North Creek subbasin. North Creek discharges to the Sammamish River, which is tributary to Lake Washington. Land use within the basin is primarily urban or suburban with some pockets of rural and forested land. The basin is being rapidly developed for residential and commercial use. Urbanization and land development activities affect water quality in the basin through riparian corridor alteration, conversion of forests, inadequate retention/detention of stormwater from new and existing impervious surfaces, and poorly treated stormwater runoff (Svrjcek, 2003).

For the purpose of this contaminant source tracking work, Perry Creek was divided up into four segments (Figure 1).

*Segment 1*

Segment 1 of the Perry Creek drainage is located along 19$^{th}$ Drive SE, south of 228$^{th}$ Street SE. This segment originates from three large ponds located in the Green Acres Mobile Home Park and flows north along 19$^{th}$ Drive SE where it merges with the main stem east of 20$^{th}$ Avenue SE. This area is entirely characterized as residential land use, including urban low density single family housing, urban high density multiple family housing, and a large Mobile Home Park.

*Segment 2*

Segment 2 of the Perry Creek drainage flows parallel to Bothell-Everett Highway. This segment drains from a large wetland and is conveyed through the City's storm sewer through the Canyon Park Place Commercial Park to a detention pond where it merges with segment 3. This area is characterized as a mixture of residential and commercial land use, including urban low density single family housing, urban high density multiple family housing, and commercial.

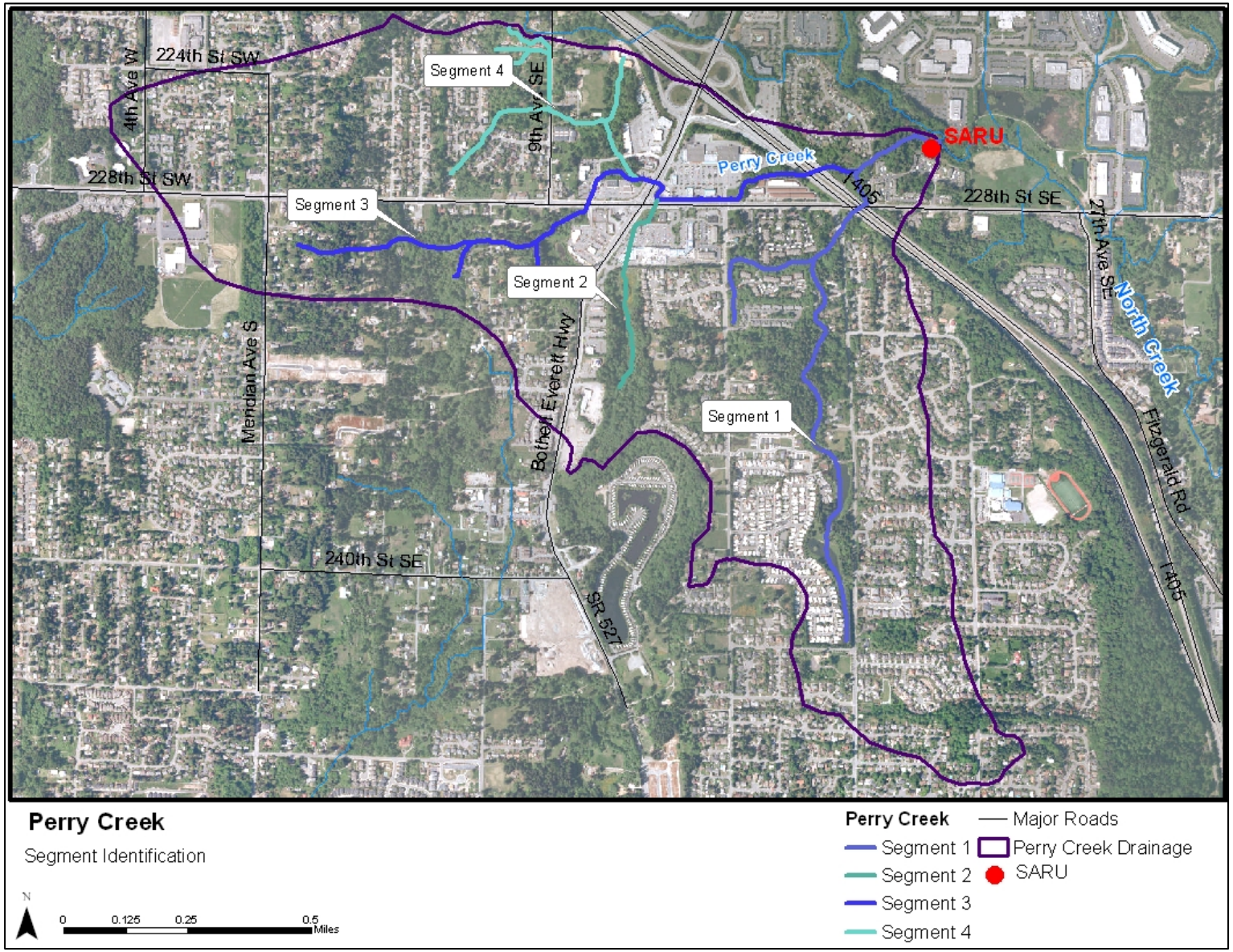
*Segment 3*

Segment 3 of the Perry Creek drainage is located along 228th Street SE. This segment appears to be seasonally groundwater fed and flows eastward where it merges with segment 1. This area is characterized as a mixture of residential and commercial land use, including urban low density single family housing, urban high density multiple family housing, and commercial.

*Segment 4*

Segment 4 of the Perry Creek drainage is located east of SR 527, along 9th Avenue SE. This segment drains from a wetland and merges with segment 2 in the Canyon Park Crossing Commercial Complex. This area is characterized as a mixture of residential and commercial land use, including urban low density single family housing, urban high density multiple family housing, and commercial.

**Figure 1 Perry Creek Drainage**



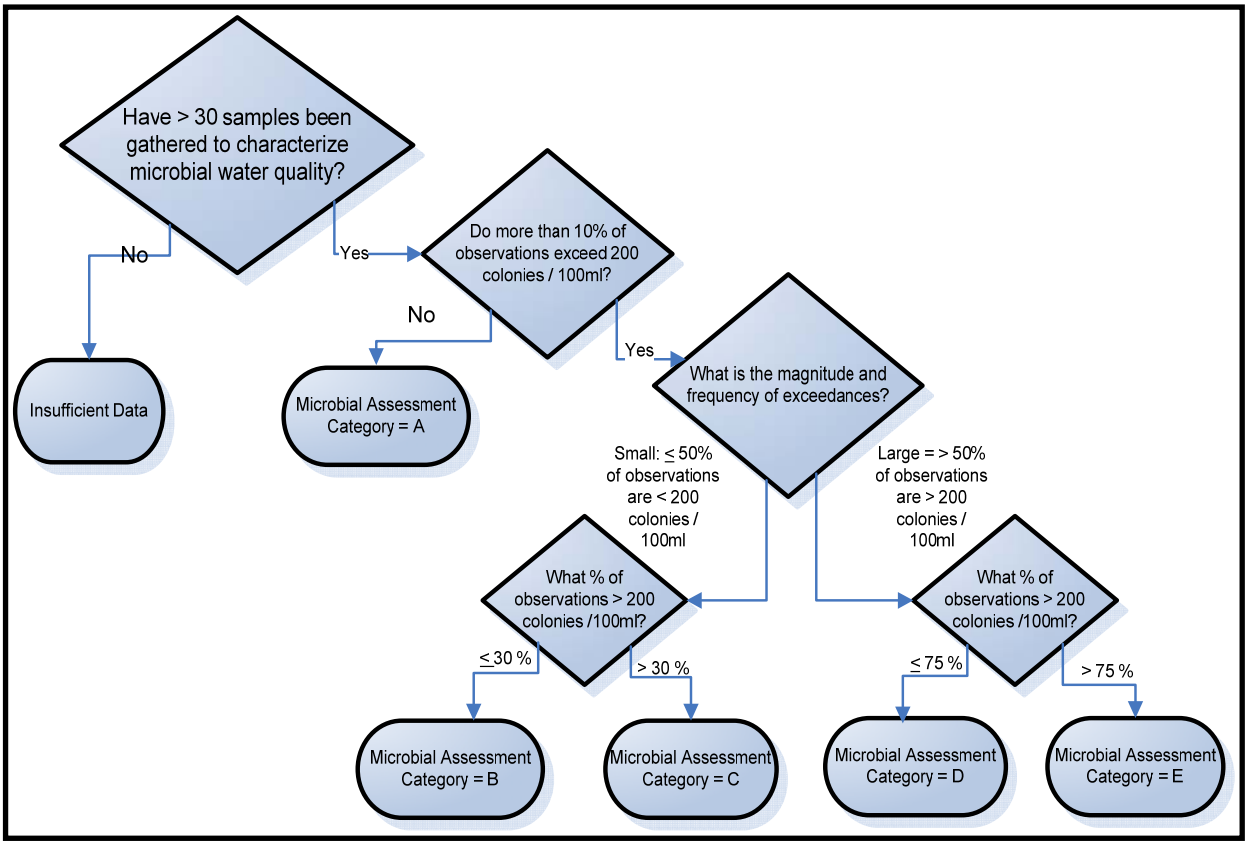
## Methods

There are many types of potential bacterial pollution sources including, but not limited to, direct discharges or deposits to streams of domesticated and wild animal feces, runoff from manure stockpiles or manure-fertilized land, unauthorized discharges or leaks from sanitary sewers, discharges from on-site sewage treatment systems and re-suspension of contaminated sediments. Some of these discharges may be conveyed by the City's municipal storm sewer system, and others may be discharged directly to the stream. The challenge is determining the primary source of fecal coliform bacteria within a given municipal storm sewer system, receiving waterbody or associated stream segment, and acting to remove sources such that water quality standards may be attained.

Snohomish County employs the use of a Decision Support Tool (PBS&J 2008), or phased approach, for monitoring and source identification of fecal coliform bacteria to determine the relative sources of contamination. The PBS&J (2008) protocol was modeled after similar approaches developed by the World Health Organization (WHO 2000, 2003), the National Research Council (NRC 2004) and Environmental Protection Agency (EPA 1983, 1984, 2004, 2007).

The phased approach starts by identifying monitoring sites having an adequate dataset of 30 or more data points and assigning each to a microbial water quality assessment (MWQA) category based upon exceedances of state water quality standards (Figure 2). Each site is ranked according to the frequency that the site exceeds a threshold of 200 colonies / 100ml of sample. This threshold is consistent with Washington State 90$^{th}$ percentile primary contact water quality standard for fecal coliform bacteria (WAC 173-201A), where not more than 10% of the samples obtained for calculation of a geometric mean are to exceed 200 colonies/100 ml of sample. The process of assigning a station to a MWQA category is displayed in the MWQA Decision Tree shown in Figure 2.  The MWQA category assigned will dictate the level of effort needed for CSS (Figure 3).

## Figure 2 Microbial Water Quality Assessment Decision Tree




Adapted from PBS&J 2008 – Decision tree for assigning monitoring locations to microbial water quality assessment categories based upon observed fecal coliform concentrations. MWQA categories A through E are based upon the percentage of samples at a given site that exceed 200 CFU /100ml, using exceedance frequency break points of 10%, 30%, 50%, and 75%.

## Figure 3 MWQA Ranking/Classification and Management Action Process

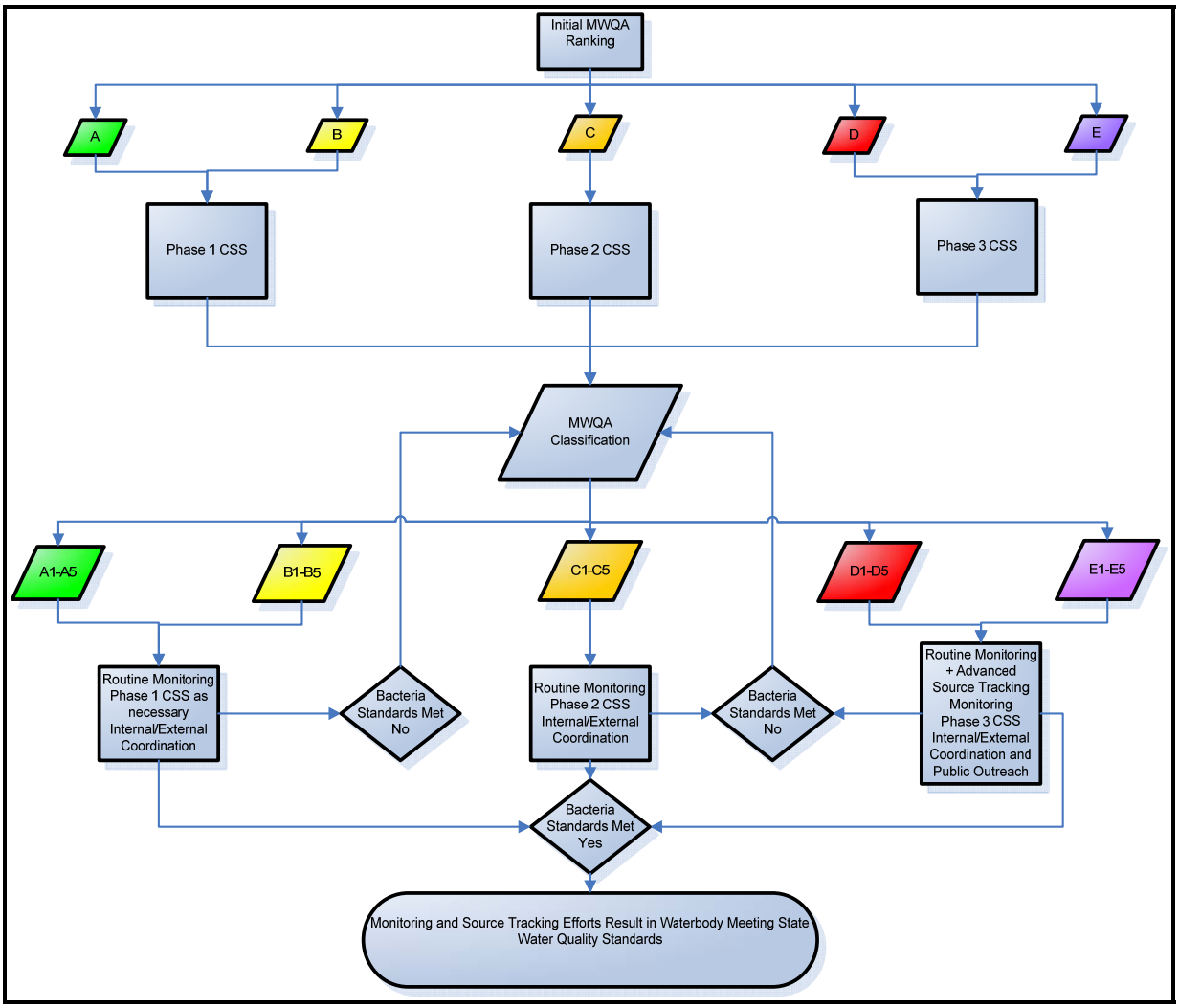


**Figure 4 Contaminant Source Survey (CSS) Phases, Modified from PBS&J (2008)**

- Phase 1 CSS : Basic Investigation includes basic (screening level) analysis using available bacteria data to identify patterns and trends that may be present.

- Phase 2 CSS: Intermediate Investigation includes all elements of Phase 1, plus GIS analysis and initial source tracking to determine likely sources of bacteria. GIS layers include, but aren't limited to, roads, streams, water quality complaints, permitted dairy facilities, dry weather outfall screening data, farm windshield survey data, sewer/septic data, parcel ownership, land use, and commercial animal handling facility inspection data. The order of activities conducted under a Phase 2 CSS is as follows:
    - GIS analysis of upstream areas
    - Field contaminant source survey – windshield survey and stream walk
    - Source tracking using advanced parameters if potential source is identified
    - Review of GIS analysis, source tracking data and observations to re classify a MWQA category and/or identify potential source
    - If source is identified, work with stakeholders to remove source

- Phase 3 CSS: Advanced Investigation: includes all elements of Phase 1 and 2 plus notification to the health district and use of microbial source tracking techniques where sources are unclear or in need of confirmation.

Contaminant source surveys (Figure 4) are based upon MWQA rankings assigned to an area using existing water quality data. They are conducted as a cross check for ranking the potential human health risk at monitoring stations where elevated fecal coliform bacteria are observed. The phased approach includes the use of geographical information systems analysis, local knowledge and field surveys to determine the potential for a human health risk (Britsch 2009).

Field surveys include a windshield survey and stream walk, where feasible, to look for the presence of specific sources of bacteria, including;

- Visual evidence of illicit connections or discharges in areas screened
- Visual evidence of failing septic drain fields
- Catchbasins silted greater than 40% in depth from invert of pipe
- Presence of small farms
- Presence of Dog Parks
- Presence and number of dogs
- Presence and number of birds

Notes are taken on field sheets and findings are summarized in the office. An example of a CSS field form is available in Appendix B.

Once contaminant source surveys are complete, sites are then re-ranked using the guidance found in Figure 5 and assigned a MWQA classification as shown in Figure 6. Sites ranking poorly require more immediate action and are monitored further using field surveys, GIS analysis and advanced source tracking tools to help identify sources of indicator bacteria pollution. Recommendations based upon these surveys and analysis results are provided to

established stakeholder workgroups as a means of taking follow up action, or are recommended for follow up by City staff.

### Figure 5 Contaminant Source Survey Rankings, Modified from PBS&J (2008)

1. Very Low: No visual evidence of potential sources of human pathogens, natural environment; no or minimal anthropogenic land uses; wildlife present (any density)

2. Low: Low density agricultural and residential sources, including pets, livestock (without direct access to surface waters), or permitted dairies/industrial facilities; residences on septic systems

3. Moderate: Urban stormwater sources (including pet waste) present; moderate numbers of manure or septic system related complaints or illicit connections identified; moderate-density livestock with little access to surface waters

4. High: Dense stormwater conveyance infrastructure; history of failing septic systems and high number of manure related complaints; concentrated commercial animal handling facilities without direct access to surface waters

5. Very High: Dense stormwater conveyance infrastructure; history of failing septic systems and high number of manure related complaints; high concentration of licensed pets, high concentration of commercial animal handling facilities with direct access to surface waters; evidence of confirmed illicit connections/discharges of manure or septage

### Figure 6 MWQA Classification Matrix, Adapted from PBS&J (2008)

| | | **MWQA Group (based on binomial assessment of frequency of 200 colonies / 100ml fecal coliform exceedances)** | | | | | Exceptional Circumstances e.g. sewer line break or point source discharge |
|---|---|---|---|---|---|---|---|
| | | A (≤ 10 %) | B (> 10% - 30%) | C (>30% - 50%) | D (>50% - 75%) | E (>75%) | |
| Contaminant source survey (CSS) assessment = Likelihood of fecal coliform contaminant posing human health risk | 1. Very low | A1 | B1 | C1[a] | D1[a] | E1[a] | **Immediate Action** |
| | 2. Low | A2[b] | B2 | C2 | D1[a] | E2[a] | |
| | 3. Moderate | A3[b] | B3 | C3 | D3 | E3 | |
| | 4. High | A4[b] | B4[b] | C4 | D4 | E4 | |
| | 5. Very High | A5[b] | B5[b] | C5[b] | D5 | E5 | |
| | Exceptional Circumstances e.g. sewer line break or point source discharge | **Immediate Action** | | | | | |

a) These outcomes imply that the CSS may be providing an overly optimistic rating of water quality, or the fecal coliform sources in the area may be relatively low risk or primarily environmental (e.g., wildlife, sediments, soils, vegetation, and the causes of the discrepancy should be verified.

b) These outcomes imply that the fecal coliform indicator may be providing overly optimistic MWQA ranking, or the CSS may be providing an overly negative assessment, and the causes of the discrepancy should be verified.

c) As explained by WHO (2003), exceptional circumstances involve acute situations known to be associated with higher public health risks, such as sewer line breaks or point source discharges which require immediate action.

## Findings

The City collected 68 fecal coliform samples at SARU from July 2003 through April 2010. Based upon the City's data set, it was found that 48% of sample results were greater than 200 colonies/100ml. This resulted in assigning SARU a MWQA category of C.

A MWQA ranking of C requires a Phase 2 contaminant source survey as displayed in the MWQA Ranking and Classification process (Figure 3) and explained in the Contaminant Source Survey Phases (Figure 4).

### Phase 1

The phase one analysis of water quality data for SARU found that seasonal geomeans for fecal coliform bacteria exceeded the State Water Quality Standards for every season sampled, with the exception of the 2006-2007 wet season (Table 1). The 2007 and 2008 dry season analyses where based upon only four samples each. State standards recommend a minimum of 5 samples per season for analysis of geometric means.

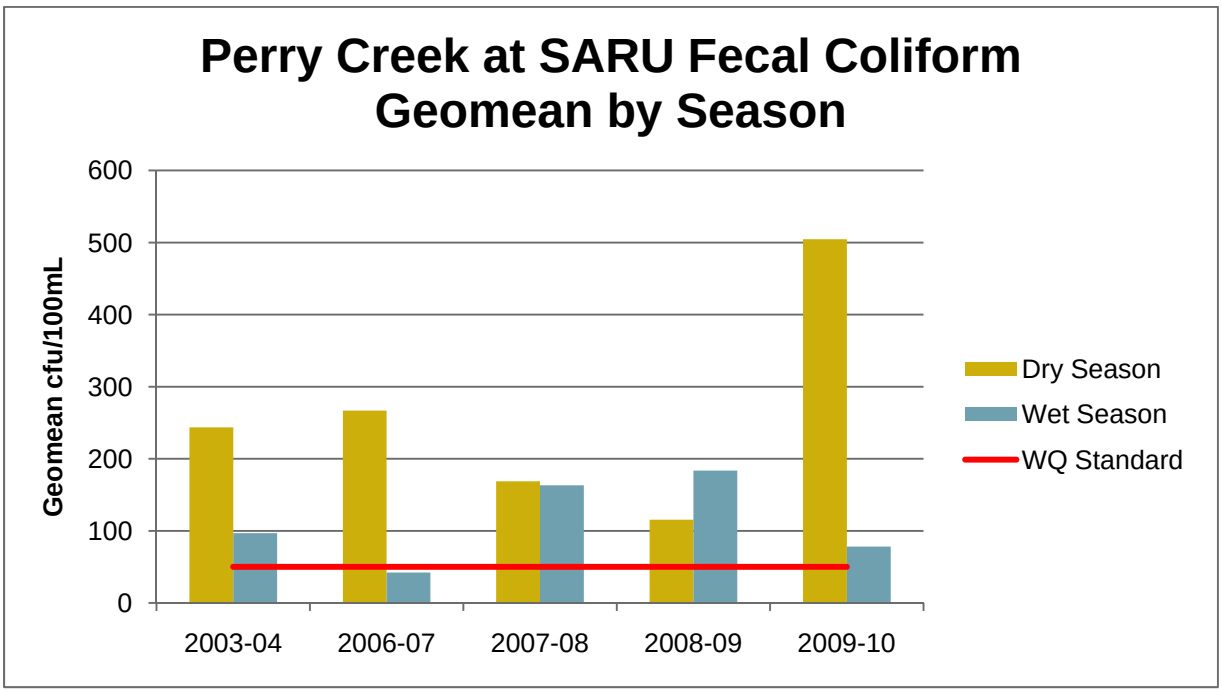
Determination of monthly ranges used for seasonal analysis was driven by the North Creek Fecal Coliform TMDL study (Glen 2001). In the TMDL, Ecology evaluated United States Geological Survey rain event records for a period of one year in the North Creek subbasin to assign months to the wet and dry seasons. Ecology's analysis of geometric means and 90$^{th}$ percentiles for fecal coliform bacteria data were based upon assigned seasons. To maintain consistency with Ecology methods, analysis of data for this report assigns June 1 – October 30$^{th}$ to the dry season and November 1$^{st}$ – May 30$^{th}$ to the wet season. This monthly range for seasons differs from the Cities historical analysis of fecal coliform data. The Cites analysis assigned June 1 – September 30$^{th}$ to the dry season and October 1 – May 30$^{th}$ to the wet season.

Analysis of seasonal data for comparison to the 90$^{th}$ percentile standard uses the "raw scores" approach, whereby a stream segment is listed as impaired when greater than 10% of the measurements exceeded numeric criteria. This approach is consistent with language in WAC 173-201A. A Microsoft Excel $^{TM}$ function =PERCENTILE (Cell range of data ,0.9) is used to derive the output. The output suggests that 90% of samples are lower than the result, but 10% of sample results are higher than the number generated. This approach was used by Ecology during the 1997 303(d) assessment of waterbodies. Ecology recognized in an overview of their water quality assessment process that use of the "raw scores" method for analysis of the 90$^{th}$ percentile results in an increased chance of type 1 and type 2 errors, where waterbodies are either listed as polluted when they should not be or not listed when in fact they should be. Analysis using the "raw scores" approach, as summarized in table 1, shows exceedences of the 90$^{th}$ percentile standard for all seasons across all years.

Figure 7 shows 5 years of seasonal geomeans for fecal coliform bacteria. All five dry seasons exhibit higher geometric means than water quality standards allow. Further investigation into the historic data for SARU revealed that the highest spikes of fecal coliform results were associated with dry season storm events. These analyses, indicating more dry season exceedences of standards, support the dry season contaminant source survey as detailed in this report.

Raw data collected by the City at station SARU is available in North Creek Sample Results 2009 Fecal Coliform Bacteria Total Maximum Daily Loads, Water Quality Monitoring Annual Summary Report (Loch 2010).

**Figure 7 SARU Seasonal Geomean Results for Fecal Coliforms in cfu /100mL**




Red line indicates extraordinary primary contact water quality geometric mean standard for fecal coliform bacteria 50CFU/100ml (WAC 173-201A)

## Phase 2

### GIS Analysis

A preliminary GIS analysis was done to determine likely sources of fecal coliform bacteria. The following GIS information was used in the analysis:

- City of Bothell drainage inventory
- Parks and other common areas
- Walking trails
- Land use zoning
- Septic data from the Snohomish County Health District
- Hydrology, including streams, wetlands, and water bodies

The septic parcel data was created from Snohomish Health District's Drainfield Awareness and Vital Education (DAVE) database. This dataset was only used as an estimate, and is not 100% accurate.

The GIS analysis of the Perry Creek drainage revealed the following;

- 4.5 stream miles
- 17.47 road miles
- 0.45 miles of trails
- 9 parks, mostly private areas within residential subdivisions
- 63 acres of wetlands
- 21.7 miles of storm sewer pipe
- 1219 storm sewer catchbasins
- 4 Bothell defined outfalls within area, all located on private property
- 667 parcels currently, or at one time, on septic

The preliminary GIS analysis identifies several areas where potential sources for fecal coliform bacteria may be found. Human sources can originate from potentially failing septics systems illicit connections within the City's 21 miles of storm sewers. Domestic pet waste found within parks or along walking trails and sidewalks can contribute pollutants. Sediment residing in storm drainage systems and receiving waters can harbor fecal coliform bacteria and be resuspended during storm events. Waste from wildlife that may reside within the stream buffers and 63 acres of wetlands can also contribute to bacteria problems.

### Field Survey

Field surveys were completed during July 2010. Field notes and maps are available in Appendix C.

Segment 1 of the Perry Creek drainage was surveyed on July 2, 2010. During this survey, staff walked approximately 0.5 stream miles and drove 2.25 road miles. This segment is comprised of newer residential subdivisions along the east side of 19th Drive, and a large mobile home park, larger wooded parcels and multi-family housing along the west side of the road. Segment 1 flows north across 228th Street SE and east behind the Salmon Run Apartments. Segment 1 is sewered, but it is unknown which parcels have connected to the sewer or have remained on septic.

Segment 1 appeared to be well vegetated with a few pockets of dense wooded areas. Evidence of responsible pet waste handling was observed at the Salmon Run Apartment complex as well as the Canyon Pointe Apartments (Photo 1). Pet waste remains were observed in front and side yards along 20th Avenue SE; it appeared to be an isolated area with a few houses contributing to the problem. A rope swing was observed at Perry Creek near the Canyon Pointe Apartments which may suggest that children play in the creek. Very few birds were observed in the area and none were observed on the water. Two-inch white plastic pipe was observed surrounding the Salmon Run Apartments and throughout the NGPA near the SARU sampling site (Photo 2). Follow-up with the apartment manager revealed that the pipe was previously used to irrigate the NGPA surrounding the complex during dry weather and is no longer in use. There was no visual evidence of illicit connections or discharges found during the segment 1 field survey.

A visit to the Green Acres Mobile Home Park was made on July 27, 2010. The park contains 318 units and residents are allowed one dog under 20 pounds per household. The grounds were well kept with no evidence of pet waste on the property. The Park handles its

Photo 1 Pet Waste Receptacle

Photo 2 Pipe in NGPA

own trash and recycling on site, the recycling area was well kept and covered. A car washing facility is available to the residents and it tight-lined to the sewer system. Ducks and resident geese were present on the three large ponds on the west side of the property (Photo 5). The landowner stated that the ponds are stormwater fed from the south side to the property where Stipek Park is located across the street, and often after large rain events, scum and algae will grow in the southern pond. The landowner maintains the grounds surrounding the ponds with seasonal mowing to keep blackberry and morning glory from taking over the area, but does not fertilize the area surrounding the ponds and does not treat the ponds for algae or milfoil. Segment 2 of Perry Creek was not included in the field survey due to time constrains and limited access through private property.

Segment 3 was screened on July 23rd, 2010. Approximately 1.25 road miles and 0.5 stream miles were screened. This portion of Perry Creek drainage starts just south of Northwest Mobile Home Estates and flows eastward through single family residential homes to a large wetland area behind a commercial development on the south west corner of 228th Street SE and Bothell-Everett Highway. The creek is then conveyed eastward through detention ponds and City storm sewer within a commercial area on 228th Street SE. The single family residential homes appeared to be older with mixed sewer and septic uses. A previous complaint of a failing septic system on the east side of the mobile home park along 2nd Ave SE was investigated further. Interviews with nearby homeowners revealed that the system historically failed on a regular basis

Photo 3 French Drain to Ditch

Photo 4 Firewood Business

*Photo 5 Waterfowl*

and sewage would pool on the property, but was never observed to flow towards the roadside ditch. The septic system was updated approximately three years ago and the responsible contractor is on-call if nearby residents observe the septic system being overloaded. There was no presence of sewage or other indicators of a failing septic system on the property at the time of the survey.

Segment 3 was dry from the mobile home park to 7th Avenue SE, where groundwater surfaced. Evidence of wood debris being stored near the creek from a firewood home business was observed along 7th Ave SE (Photo 4). A four inch white plastic pipe was found along 7th Avenue discharging to a City ditch, this appeared to be coming from a French drain from the property to the west (Photo 3). The pipe was discharging, but the water did not exhibit any visual indicators of an illicit discharge. There were no signs of pet waste within the area screened. Large amounts of birds waste was found on and around an open dumpster towards the back of the commercial complex next to the wetland area (Photo 6). No birds were observed in the area at the time of the survey. Organic scum was seen in Perry Creek just east of the Taco Time restaurant (Photo 8). It appeared to be natural and isolated to a small area near a large culvert where water flow was held up with debris. There was no visual evidence of illicit connections or discharges found in the areas screened.

Segment 4 of the Perry Creek drainage flows southward along 9th Ave SE and crosses the road to Cedar Grove Park and continues through a wetland area within a commercial development. Staff drove approximately 500 feet of road along 9th

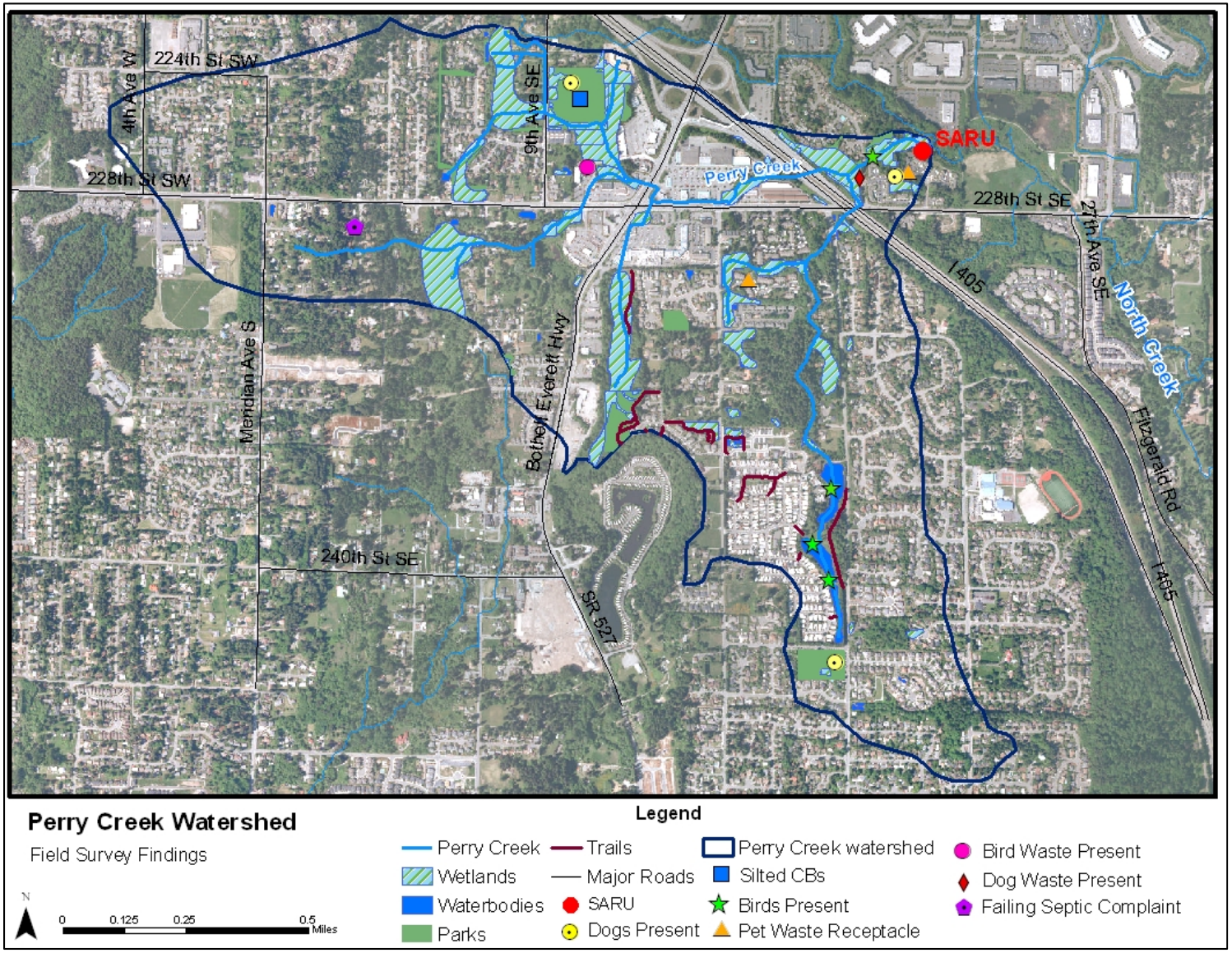
Photo 6 Bird Waste

Photo 7 Silted Catchbasin

Photo 8 Organic Scum

Avenue SE. Staff walked the portion of Perry Creek within the park and behind the commercial complex. This area is mixed residential, recreational, and commercial land use. The Park and commercial complex is sewered, but the older residential area may be mixed sewer and septic uses. Catchbasins within the park were screened. Two small type 1 catchbasins were filled with sediment and debris (Photo 7 & Figure 8). Three leashed dogs were observed in the park. A dog owner was interviewed and stated that her motivation for picking up dog waste was to keep the park clean for her children and would like to see dog waste receptacles posted within the park. No birds were observed near or on the creek at the time of the field survey. The commercial buildings east of the park were well maintained. There was olfactory and visual evidence of herbicide application within the commercial complex just outside of the creek buffer. There was no visual evidence of illicit connections or discharges in the area screened.

**Figure 8 Map of Perry Creek CSS Findings**



## Recommendations

The Perry Creek Source Contaminant Survey did not identify point source illicit discharges which would contribute fecal coliform bacteria to Perry Creek. Data review found that elevated dry weather fecal coliform spikes occurred during storm events. The field survey found that there are potential non-point sources for bacteria within the drainage area, including a potentially large population of wildlife within the wetland and forested areas of the Perry Creek drainage, pet waste, and potential nutrient loading from residential lawns and parks. These findings suggest that the City's long term monitoring station, SARU, should be re-ranked with a MWQA score of C2.

A MWQA ranking of C2 dictates that routine monitoring and source tracking for bacteria should continue at SARU (Figure 3). As part of the continued effort to eliminate sources of fecal coliform bacteria, the City might consider the following action items:

- Locate parcels within the drainage area that have not connected to the sewer system and coordinate with the Health District to document the status of their drain fields.
- Spatially track water quality complaints within the area to isolate potential hotspots within the drainage area.
- Focus education and outreach efforts for proper pet waste handling in areas where un-picked pet waste was observed.
- Consider providing education to either the operators of Canyon Pointe Apartments or the residents themselves about potential health risks associated with having direct contact with Perry Creek.
- Consider providing pet waste receptacles in City parks and along City walking trails.
- Review or development of a nutrient management plan for City parks, specifically Stipek Park to reduce alleviate nutrient loading to the Green Acres Ponds.
- Continue to implement an illicit discharge detection and elimination program to further isolate and remove sources of bacteria.
- Follow up on organic scum found in segment 3 in the commercial area to determine whether intermittent illicit discharges are a source.
- Continue scheduled operations and maintenance on the storm sewer as outlined in the City's stormwater management plan.
- Maintain silted catch basins within segment 4.

The completion of the listed action items may further reduce sources of fecal coliform bacteria within the Perry Creek Drainage and could result in a lower MWQA ranking in the future or attainment of water quality standards at SARU.

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# Appendix A Long Term Ambient Water Quality Monitoring

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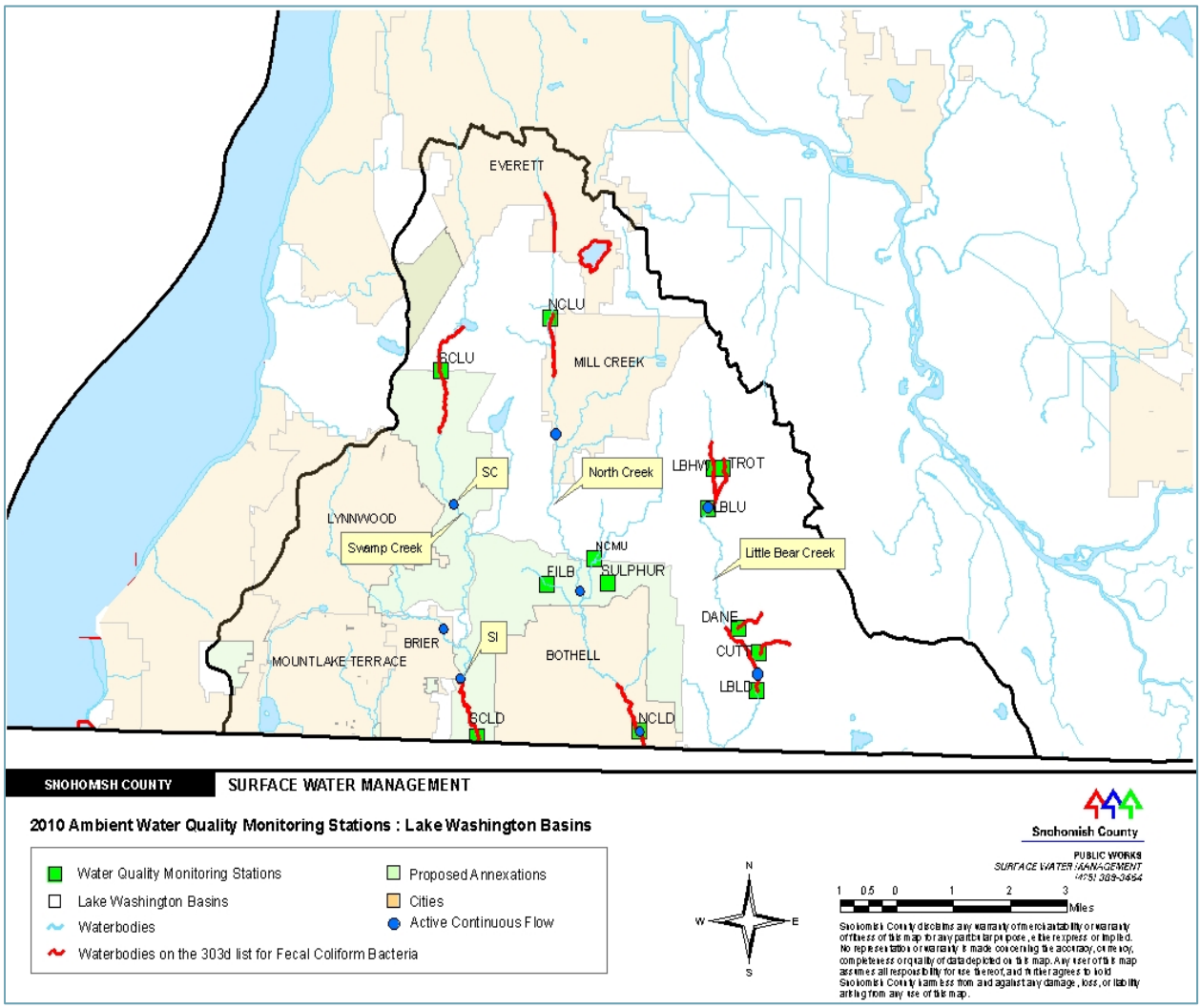
## Introduction

The City of Bothell (City) and Snohomish County (County) have a long standing inter-local agreement (ILA #9710070097), renewed annually, which allows Snohomish County to provide water quality services to the City. Snohomish County's quality assurance project plan to identify trends and sources of fecal coliform bacteria was provided to the City for consideration. The City acknowledged the monitoring approach and requested 2010 ambient water quality data collected from North Creek at station NCLD. The following data partially satisfies the County's obligation to the City under task 1 of water quality services for 2010.

## Background

Since 1992, Snohomish County Surface Water Management has implemented monthly ambient water quality monitoring program in streams and rivers across the County including at two stations on North Creek to assess status and trends of various parameters, including fecal coliform bacteria. These two stations are found approximately 1000 ft south of 132$^{nd}$ St. SE within McCollum Park (NCLU) and where North Creek crosses 240$^{th}$ St. SE (NCLD) at the County line Figure A-1.

Figure A-1 2010 Ambient Water Quality Monitoring Stations in the Lake Washington Basin




Based upon monthly fecal coliform data from May 1992 - 1998, a consistent pattern of bacterial pollution was observed in North Creek at each of Snohomish County's long term stations. During the dry summer months when stream flows are low and ambient water temperatures higher, bacteria levels rose beyond both the extraordinary primary contact geometric mean criterion of 50 cfu/100 mL and the 90th percentile criterion of 100 cfu/100 mL. During the wet season, when flow is increased and ambient water temperatures cooler, bacteria concentrations were shown to decrease at each site, but not enough to meet the 90$^{th}$ percentile criterion.

North Creek was included on Ecology's 1996 and 1998 303(d) lists because 44% of samples collected by Snohomish County between 1992 -1995 showed exceedences beyond the upper criteria at station NCLU, while 29% of samples collected between 1992 -1995 showed exceedences beyond the upper criteria at station NCLD (Thornburgh 1996). As required by section 303(d) of the CWA, Ecology acted upon the 303d listings and developed the North

Creek Fecal Coliform TMDL through a water quality technical study which consisted of using long-term monitoring data collected monthly by Snohomish County at stations NCLU and NCLD during the period of May 1992 – May 1998. The technical study titled North Creek Fecal Coliform Total Maximum Daily Load Submittal Report. Publication 02-10-020, may be obtained at http://www.ecy.wa.gov/pubs/0103020.pdf. Segments of North Creek assigned on the 303d list and geometric means/90th percentiles at NCLD are found in figure A-2 and table A-1.

Figure A-2 2004 Listed segments and the coverage area for the North Creek TMDL

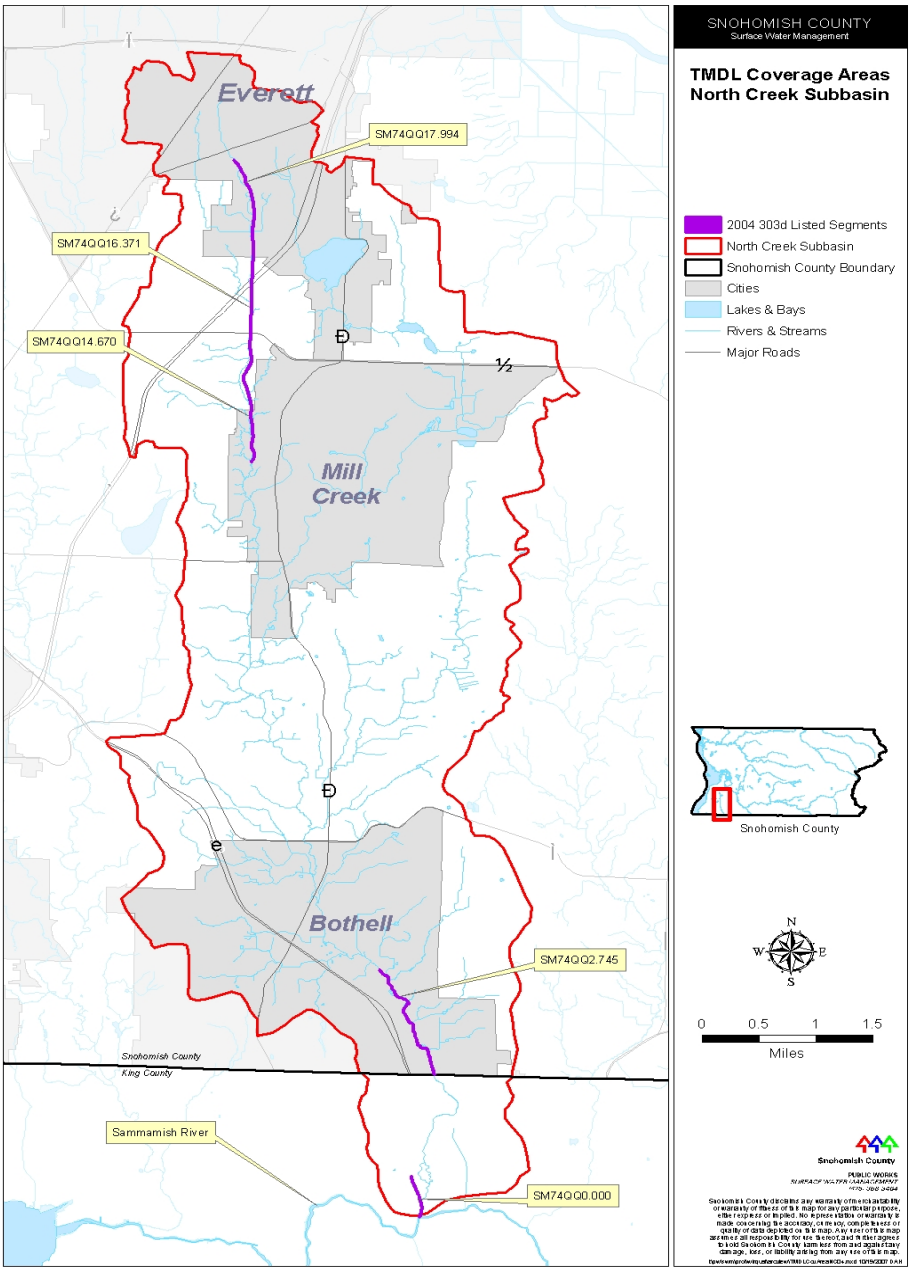


Table A-1 Fecal Coliform Bacteria Geometric means and 90th percentiles for Sample Site NCLD - North Creek (Glenn 2001)

| North Creek Stations | Seasonal Geometric Means | | 90th Percentile (where 10% of samples are higher than reported number) | |
|---|---|---|---|---|
| | Wet Season col/100ml | Dry Season col/100ml | Wet Season | Dry Season |
| NCLD (County line) | 111 | 292 | 1497 | 1532 |

The technical study was used as a basis for development, and EPA approval, of the North Creek Detailed Implementation Plan (DIP). Recommendations from the approved DIP were then used as a basis for current Phase 1 and Phase 2 Municipal Stormwater permit driven TMDL requirements. The best management practices found in the DIP and Municipal Stormwater Permits serve as surrogates for achievement of target percent reductions and geometric means found in table A-1. The approved North Creek DIP can be found at http://www.ecy.wa.gov/pubs/0310047.pdf.

## Methods

Consistent with the Snohomish County Fecal Coliform TMDL Quality Assurance Project Plan (QAPP), water quality monitoring for bacteria was continued monthly at NCLD for 2010. The QAPP describing the sampling design may be obtained from the Snohomish County website at http://www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SWM/Work_Areas/Water_Quality/Monitoring/default.htm

Sampling at NCLD was carried out for parameters identified in Table A-2.

Table A-2 Parameters Monitored at NCLD for January – December 2010

| Parameter | Instrument Used | Method |
|---|---|---|
| **Fecal Coliform** | NA | SM9222D |
| **Total Suspended Solids** | NA | SM2540B |
| **Temperature** | Hach Hydrolab - Skipper | SM2550B-F |
| **Dissolved Oxygen** | Hach Hydrolab - Skipper | SM4500OG |
| **pH** | Hach Hydrolab - Skipper | EPA150.1M |
| **Spec. Conductivity** | Hach Hydrolab - Skipper | EPA120.1M |
| **Turbidity** | Hach 2100P #1 | EPA180.1 |

## Data Verification and Usability

Data are verified for consistency with quality control requirements prior to synthesis or analysis. Verification of sample transportation and receiving showed that all samples met required hold times and temperatures for analysis. Chain of custody documents were verified to have been signed and dated correctly by all parties.

Verification of laboratory data showed that when applicable, laboratory duplicate precision and standard reference material percent recoveries for all samples were met. However, for sample events in March and May, laboratory method blanks for total suspended solids (TSS) were above detection limits. This results in qualifying the original sample results for TSS during March and May, as biased high by up to 25%.

Verification of field data showed that calibration standards used were within expiration dates, and that when applicable, pre monitoring calibrations and post monitoring calibration checks were within acceptable ranges. All field data are accepted without qualifiers.

## Results

Table A-3 North Creek at NCLD 2010 Results for Fecal Coliforms

| Sample Date | Sample Time | Weather | Water Color | Parameter | Sample Result (CFU/100mL) | Qualifier |
|---|---|---|---|---|---|---|
| *2010 Wet Season* | | | | | | |
| 1/14/2010 | 9:50 | Recent Rain | Tannic | Fecal Coliform | 46 | None |
| 3/2/2010 | 12:35 | Recent Rain | Clear | Fecal Coliform | 6 | None |
| 4/6/2010 | 13:05 | Recent Rain | Muddy | Fecal Coliform | 20 | None |
| 5/3/2010 | 14:00 | Recent Rain | Muddy | Fecal Coliform | 54 | None |
| 11/1/2010 | 14:00 | Rain | Muddy | Fecal Coliform | 860 | None |
| 12/2/2010 | 12:35 | Recent Rain | Tannic | Fecal Coliform | 2 | None |
| | | | | *Seasonal Geomean* | *28* | None |
| | | | | *90th Percentile* | *457* | None |
| *2010 Dry Season* | | | | | | |
| 6/1/2010 | 14:35 | Dry | Tannic | Fecal Coliform | 20 | None |
| 7/12/2010 | 13:45 | Rain | Muddy | Fecal Coliform | 170 | None |
| 8/18/2010 | 14:05 | Dry | Tannic | Fecal Coliform | 60 | None |
| 9/1/2010 | 13:10 | Recent Rain | Muddy | Fecal Coliform | 900 | None |
| 10/4/2010 | 14:25 | Dry | Tannic | Fecal Coliform | 36 | None |
| | | | | *Seasonal Geomean* | *92* | None |
| | | | | *90th Percentile* | *608* | None |

State water quality standards establish the use of extraordinary primary recreational contact for North Creek and subsequently, station NCLD. The standards require that fecal coliform organism levels must not exceed a geometric mean value of 50 cfu /100 milliliters, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 cfu /100 milliliters (referred to as the 90th percentile standard).

Determination of month ranges used for seasonal analysis of the geometric mean is driven by the North Creek Fecal Coliform TMDL study (Glen 2001). In the TMDL, Ecology evaluated United States Geological Survey rain event records for a period of one year in the North Creek subbasin to assign months to the wet and dry seasons.

Ecology's analysis of geometric means and 90th percentiles for fecal coliform bacteria data were based upon assigned seasons. To maintain consistency with Ecology methods, analysis of data for this report assigns June 1 – October 30th to the dry season and November 1st – May 30th to the wet season.

Analysis of seasonal data for comparison to the 90th percentile standard uses the "raw scores" approach, whereby a stream segment is listed as impaired when greater than 10% of the measurements exceeded numeric criteria. This approach is consistent with language in WAC 173-201A. A Microsoft Excel ™ function =PERCENTILE (Cell range of data ,0.9) is used to derive the output. The output suggests that 90% of samples are lower than the result, but 10% of sample results are higher than the number generated. This approach was used by Ecology during the 1997 assessment of waterbodies to place on the 303d list. Ecology recognized in an overview of their water quality assessment process that use of the "raw scores" method for analysis of the 90th percentile results in an increased chance of type 1 and type 2 errors, where waterbodies are either listed as polluted when they should not be or not listed when in fact they should be.

Analysis of data is used to support attainment of water quality standards and subsequent submittal of appropriate datasets to Ecology for evaluation and a potential change to the waterbody segment's listing category. The stream segment associated with site NCLD is currently listed as a TMDL category 4A. This category is used to define waterbodies that do not meet standards but have an approved TMDL in place which is expected to achieve standards. If a waterbody is meeting both the geometric mean and 90th percentile standard it is assigned to category 1, thereby removing that waterbody from the list of those polluted. In this case, monitoring at NCLD could cease and resources could be used to address other listing waterbodies.

Ecology uses Water Quality Program Policy 1-11 to describe methods of data analysis used for placing a waterbody on the 303d list, but the policy does not address the de-listing process. Current understanding of communication with Ken Koch of Ecology (personnel communication December 21, 2010) suggests that a minimum of 10 sample results, having 5 each obtained from the wet and dry seasons is sufficient for analysis of seasonal geometric means and a 90th percentile. This statement is consistent with methods for listing in Policy 1-11 and also methods for analysis in WAC 173-201A.

Given current guidance from Ecology, the volume of data gathered at NCLD in 2010 support analysis of seasonal geometric means and a 90th percentile for potential de-listing.

Results of analysis shown in table A-3, suggest attainment of the wet season geometric mean standard, but continued exceedence of the geometric mean standard for the dry season. Excursion of the dry season geometric mean and 90th percentile standards were driven by a September 1st storm event. The 90th percentile standard was exceeded for both the wet and dry seasons. Again, excursions of the 90th percentile standard were driven by storm events recorded on September 1st and November 1st. Visual observation of muddy water on both days is substantiated by both total suspended solids and insitu turbidity results. The November 1st storm resulted in the highest recorded turbidity and TSS results for the year (Tables A-4 and A-

5). Jolley et.al (2001) found strong correlation between total suspended solids in receiving waters and fecal coliform bacteria concentrations, concluding that bottom sediments resuspended by storm flow influence fecal coliform concentrations found in surface waters. Fecal coliform bacteria are unique stormwater pollutants in that they have the capability to regrow and die off. Skinner et. al. (2009) suggests that regrowth of both enterococci and fecal coliform bacteria occur in biofilm located in residential street gutters and storm drains in Newport Beach, California. This study and others suggest that the focus of remediation should be on best management practices which reduce bacterial biofilm in storm drainage systems.

Table A-4 North Creek at NCLD 2010 Results for Total Suspended Solids

| Sample Date | Sample Time | Weather | Water Color | Parameter | Sample Result (mg/L) | Qualifier |
|---|---|---|---|---|---|---|
| *2010 Wet Season* | | | | | | |
| 1/14/10 | 9:50 | Recent Rain | Tannic | Total Suspended Solids | 5 | None |
| 3/2/10 | 12:35 | Recent Rain | Clear | Total Suspended Solids | 6 *J* | J |
| 4/6/10 | 13:05 | Recent Rain | Muddy | Total Suspended Solids | 5 | None |
| 5/3/10 | 14:00 | Recent Rain | Muddy | Total Suspended Solids | 9 | J |
| 11/1/10 | 14:00 | Rain | Muddy | Total Suspended Solids | 51 | None |
| 12/2/10 | 12:35 | Recent Rain | Tannic | Total Suspended Solids | 3 | None |
| | | | | *Seasonal Average* | *13.1* | *J* |
| | | | | *Seasonal Median* | *5.* | *J* |
| | | | | *Seasonal Standard Deviation* | *18.6* | *J* |
| *2010 Dry Season* | | | | | | |
| 6/1/10 | 14:35 | Dry | Tannic | Total Suspended Solids | 9 | None |
| 7/12/10 | 13:45 | Rain | Muddy | Total Suspended Solids | 6 | None |
| 8/18/10 | 14:05 | Dry | Tannic | Total Suspended Solids | 4 | None |
| 9/1/10 | 13:10 | Rain | Muddy | Total Suspended Solids | 4 | None |
| 10/4/10 | 14:25 | Dry | Tannic | Total Suspended Solids | 2 | |
| | | | | *Seasonal Average* | *5* | *J* |
| | | | | *Seasonal Median* | *4* | *J* |
| | | | | *Seasonal Standard Deviation* | *2.64* | *J* |

*J indicates that the data point is biased and therefore an estimate.*

Table A-5 North Creek at NCLD 2010 Results for Insitu Data

| Sample Date | Time | Weather | Water Color | Dissolved Oxygen (mg/L) | pH | Conductivity us/cm | Temperature (°C) | Turbidity (NTU) | Qualifier |
|---|---|---|---|---|---|---|---|---|---|
| ***2010 Wet Season*** | | | | | | | | | |
| 1/14/10 | 9:50 | Recent Rain | Tannic | 11.19 | 7.1 | 98.0 | 7.64 | 3.93 | None |
| 3/2/10 | 12:35 | Recent Rain | Clear | 11.14 | 7.63 | 137.2 | 9.77 | 2.69 | None |
| 4/6/10 | 13:05 | Recent Rain | Muddy | 11.65 | 7.63 | 113.4 | 8.44 | 2.55 | None |
| 5/3/10 | 14:00 | Recent Rain | Muddy | 10.56 | 6.86 | 88.6 | 10.31 | 8.39 | None |
| 11/1/10 | 14:00 | Rain | Muddy | 10.44 | 7.37 | 99.2 | 10.97 | 25.8 | None |
| 12/2/10 | 12:35 | Recent Rain | Tannic | 12.06 | 7.56 | 130.4 | 6.0 | 2.24 | None |
| | | | *Seasonal Mean* | *11.17* | *7.35* | *111.13* | *8.85* | *7.6* | *None* |
| | | | *Seasonal Median* | *11.16* | *7.46* | *106.3* | *9.10* | *3.31* | *None* |
| | | | *Seasonal Standard Deviation* | *0.62* | *0.31* | *19.38* | *1.85* | *9.20* | *None* |
| ***2010 Dry Season*** | | | | | | | | | |
| 6/1/10 | 14:35 | Dry | Tannic | 10.05 | 7.51 | 123.3 | 13.53 | 4.59 | None |
| 7/12/10 | 13:45 | Rain | Muddy | 9.56 | 7.73 | 182.2 | 15.19 | 4.72 | None |
| 8/18/10 | 14:05 | Dry | Tannic | 9.74 | 7.75 | 188.5 | 17.13 | 3.09 | None |
| 9/1/10 | 13:10 | Rain | Muddy | 10.22 | 7.39 | 110.4 | 15.54 | 16.49 | None |
| 10/4/10 | 14:25 | Dry | Tannic | 9.86 | 7.56 | 168.3 | 13.5 | 2.53 | None |
| | | | *Seasonal Mean* | *9.88* | *7.73* | *154.5* | *14.97* | *6.28* | *None* |
| | | | *Seasonal Median* | *9.86* | *7.75* | *168.3* | *15.19* | *4.59* | *None* |
| | | | *Seasonal Standard Deviation* | *0.25* | *0.15* | *35.4* | *1.52* | *5.78* | *None* |

## References

Britsch, Steve. 2009. Snohomish County Fecal Coliform TMDL Quality Assurance Project Plan. Department of Public Works Surface Water Management Division, Everett, Washington.

Glen, Norm. 2001. North Creek Watershed Total Maximum Daily Load Evaluation for Fecal Coliform Bacteria. Washington State Department of Ecology Olympia, WA. Publication No. 01-03-020. http://www.ecy.wa.gov/pubs/0103020.pdf

Jolley. L.W., W.R. English, and J.W. Pike. 200. Should Sediment Reservoirs of Indicator Bacteria be Considered Nonpoint Sources. Department of Forestry and Natural Resources, Clemson Universtiy, Clemson, SC. Retrieved January 18, 2010, from http://www.docstoc.com/docs/32096329/Should-bottom-sediments-be-considered-a-non-point

Skinner, J.F., J. Guzman, and J. Kappeler. 2010. Regrowth of Enterococci and Fecal Coliform in Biofilm. Retrieved August 13, 2010 from http://www.stormh20.com/forms/print-7447.aspx

Thornburgh, K. 1996. The State of the Waters: Water Quality in Snohomish County's Rivers, Streams and Lakes, 1996 Assessment. Snohomish County Department of Public Works, Surface Water Management Division. Everett, Washington.

# Appendix B Contaminant Source Survey Field Form

*Intentionally left blank for duplex printing*

Survey Date (mm/dd/yyyy)_____ Segment#_____Personnel_____Road Miles Driven_____

Strm Miles Walked_____WRIA/Subbasin_____Stream Name Discharged to_____

Start Pt. End Pt. Weather (circle one): Dry Rain Recent Rain Event

**Phase 1 CSS : GIS Results**

Primary Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities_____

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water_____

Drainage System Mapped (Y/N)
# of historical sampling locations_____
Name of sampling location(s)_____

**PHASE 2 CSS – Field Windshield/Stream Walk Survey**

| | **Survey Metrics** *Answer if applicable* | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
|---|---|---|---|---|---|
| **Drainage Systems and Receiving Waters** | Stream in Segment Dry | | | | |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | | Location(s): # and reference on map | |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | | Location(s) # and reference on map | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | | | Location (s): # and reference on map | |

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics**<br>*Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics**<br>*Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N) | |
| | Concentrated number of birds present on surface waters | | | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | |

**Additional Notes and Diagrams:**

# Appendix C Perry Creek CSS Field Maps and Field Notes

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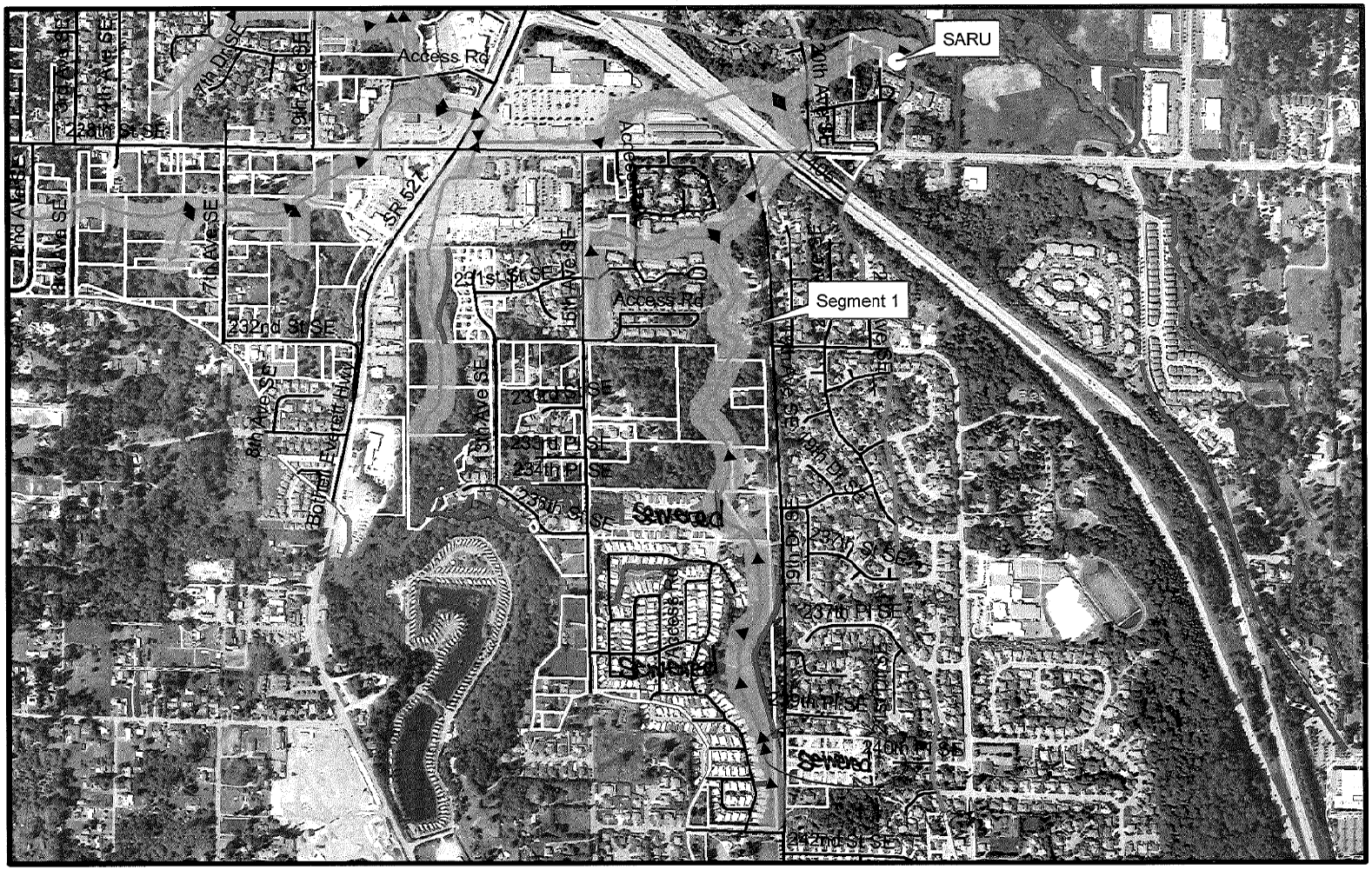


# Perry Creek Segment 1
# Area Map

Segment 1 Runs from the Mobile Home Park located on 242nd Street SE to Ambient station SARU

N

0 260 520 1,040 1,560 2,080 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Trails
- Easement
- Parks

**Perry Creek Segment 1**
**Map 1**

Park at Mobile Home office and access through trail.

N
0 70 140 280 420 560 Feet

Perry_Creek
100ft_Buffer_PerryCk
CB Type 1
CB Type 2
Ditches
Pipes
OutFalls
Septic_parcels
Streets
Trails
Easement
Parks

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy): 07/02/2010 Segment#: 1 – Map 1 Personnel: JLC / JB Road Miles Driven: 1

Strm Miles Walked: Ø WRIA/Subbasin: WRIA 8/ North Creek Stream Name Discharged to: Perry Creek

Start Pt. Green Acres Mobile Home Park End Pt. Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential X
Agricultural

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic X

Drainage System Mapped (Y/N) Yes
# of historical sampling locations None
Name of sampling location(s) NA

# permitted milk producing facilities 0 # of parcels on septic within 100ft of surface water ~~1 LOSS – mobile home park – need to verify~~ Sewered

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | view from road, access denied to property | N |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | N |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map<br>area sewered | N |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | N/A | | Location (s): # and reference on map<br>did not inspect CB in area | |

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**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N)<br>Stipek Park located S of Green Acres | N |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+)<br>no birds on pond - viewed from road | N |

**Additional Notes and Diagrams:**

*Access to Green Acres Mobile Home Park denied - owner out of town
- left message on 7/6 to gain access
- left message on 7/9 to gain access
- as of 7/14 - no response from landowner
- made appointment with landowner to "walk" property on 7/27 @ 9AM.

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SURFACE WATER MANAGEMENT
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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy) 07/27/10 Segment# 1 map 1 Personnel JLO/BB Road Miles Driven Q

Strm Miles Walked 0.25 WRIA/Subbasin 8/northcreek Stream Name Discharged to Perry Creek

Start Pt. End Pt. Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities Q

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water_____

Drainage System Mapped (Y/N) not mapped to lakes
# of historical sampling locations Q
Name of sampling location(s) Q

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | | |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map<br>sewered in 1968 | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | NA | | Location (s): # and reference on map<br>didn't pop any CBS | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N)<br>owners allowed 1 dog <20 lbs (maybe 100 dogs) | N |
| | Concentrated number of birds present on surface waters | | | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+)<br>ducks (resident) + canada geese (goose poop everywhere) | Y |

**Additional Notes and Diagrams:** 318 units

- all of the water (irrigation) from park dumps into 1st lake - land owner
- carwash tightlined to sewer
- trash + recycling facility (covered), owners own garbage truck (compactor) picking up trash, no leachate from compactor observed
- doesn't fertilize grassed area
- moves to lake to keep back blackberry + morning glory
- lots of algae present in 1st lake, mill foil in second, water discharging to creek is clear + comes from shaded small lake

**Perry Creek Segment 1**
**Map 2**

Continue through Mobile Home Park,
Creek runs through 2 properties owned by Robert E Warrick, zoned open space

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy): 07/02/2010 Segment#: 1 – Map 2 Personnel: JLO/SB Road Miles Driven: ~1.0

Strm Miles Walked: _____ WRIA/Subbasin: WRIA 8/ North Creek Stream Name Discharged to: Perry Creek

Start Pt. N of Green Acres on 19th End Pt. 232nd st cross section Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential X
Agricultural

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic X

Drainage System Mapped (Y/N) Yes
# of historical sampling locations None
Name of sampling location(s) NA

# permitted milk producing facilities 0 # of parcels on septic within 100ft of surface water 6 residential

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | NA | | could not see Creek from road | N |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | N |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map | N |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | NA | | Location (s): # and reference on map did not screen CB along 19th | N |

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**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N) | |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | |

**Additional Notes and Diagrams:**

**Perry Creek Segment 1**

**Map 3**

Creek runs through residential in close proximity to homes, no direct access from ROW or easement
Possible to access west fork of segment from street

N
0 70 140 280 420 560 Feet

Perry_Creek
100ft_Buffer_PerryCk
CB Type 1
CB Type 2
Ditches
Pipes
OutFalls
Septic_parcels
Streets
Trails
Easement
Parks

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy): 07/02/2010 Segment#: 1 – Map 3 Personnel: SB/KLO Road Miles Driven: 0.25

Strm Miles Walked: 0.25 WRIA/Subbasin: ___WRIA 8/ North Creek_____ Stream Name Discharged to:____Perry Creek_____

Start Pt. Canyon Pointe Apts End Pt. Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential X
Agricultural

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic X

Drainage System Mapped (Y/N) Yes
# of historical sampling locations ___None_____
Name of sampling location(s) _____NA_____

# permitted milk producing facilities___0__ # of parcels on septic within 100ft of surface water_____1 residential ? not confirmed

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | signs of play area for children – rope swings | Y |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | N |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map | N |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | ✓ | ✓ | Location (s): # and reference on map<br>Type 1 (private drainage) 100% silted – notified Apartment management | N |

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**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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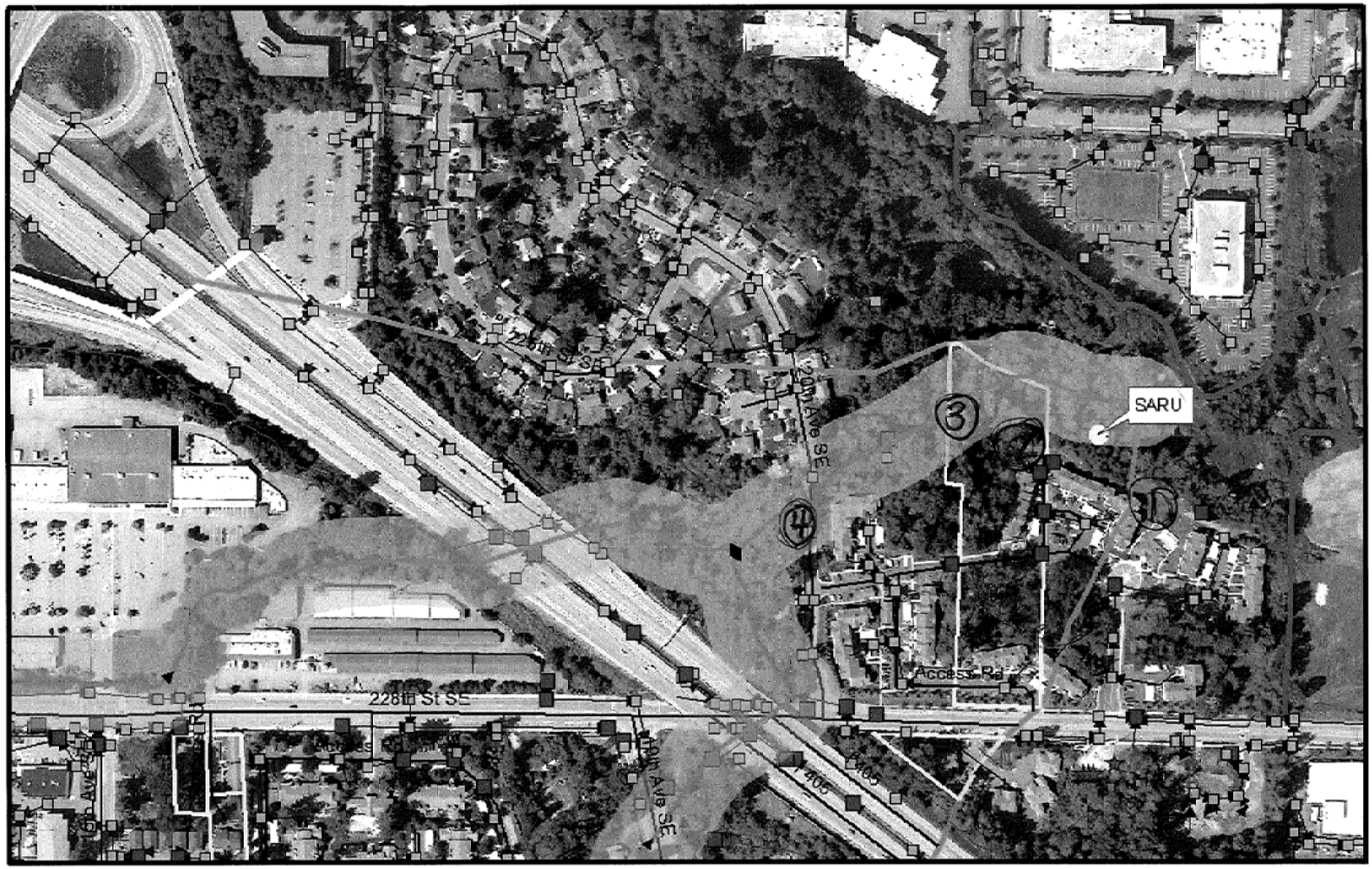
| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N) Pet waste recepticle present<br>Pet waste recepticle being used (Y/N) – Snoco signs posted on recepticle and posted on dumpster cage door | Y |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | N |

**Additional Notes and Diagrams:**

see map for locations
1. evidence of roof drains straight piped to trib, no flow from pipe
2. trib becomes boggy
3. 100% silted CB
4. Rope swings @ creek access trails from Apartments & private property
5. ditches dry
6. ditches dry
7. evidence of ground water fed springs on private property




**Perry Creek Segment 1**
**Map 4**

Creek runs through open area, may be able to access on 228th St SE

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy): _____ Segment#: 1 – Map 4 Personnel: JLD / SJB Road Miles Driven: —

Strm Miles Walked: 0.25 WRIA/Subbasin: WRIA 8/ North Creek Stream Name Discharged to: Perry Creek

Start Pt. SARU End Pt. 1405 Weather (circle one): (Dry) Rain Recent Rain Event

## Phase 1 CSS : GIS Results

| Primary Land Use (circle one): | Sewer/Septic (circle one): | Drainage System Mapped (Y/N) Yes |
|---|---|---|
| Commercial | 100% sewer | # of historical sampling locations 1 |
| Residential X | 100% Septic | Name of sampling location(s) SARU |
| Agricultural | Mix Sewer/Septic X | |

# permitted milk producing facilities 0 # of parcels on septic within 100ft of surface water ~~1 =need to verify~~ Sewered

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | | Y |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map – need to follow up on 2" PVC pipe ~~that~~ ran perimeter of Salmon Run Apartments | Y |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map area sewered | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | | ✓ | Location (s): # and reference on map | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N) recepticles in Salmon Run Apts (2)<br>Pet waste recepticle being used (Y/N) | Y |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+)<br>Photo of wetlands behind Apts | Y |

**Additional Notes and Diagrams:**

walk along 20th Ave SE and Grassed area behind apartments

1. signs of staining in grass from pet waste, no pet waste visable
2. PVC pipe runs thru NGPA - looks like irrigation
   - asked apartment management / will follow up
3. boggy area
4. Dog waste present next to creek along 20th

→ 7/9/2010 follow up w/ Salmon Run - maintenance says that it was to water the wetland / NGPA areas.

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy): Segment#: 1 – Map 4 Personnel: JLD / SB Road Miles Driven: —

Strm Miles Walked: 0.25 WRIA/Subbasin: WRIA 8/ North Creek Stream Name Discharged to: Perry Creek

Start Pt. SARU End Pt. 1405 Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

| Primary Land Use (circle one): | Sewer/Septic (circle one): | Drainage System Mapped (Y/N) Yes |
|---|---|---|
| Commercial | 100% sewer | # of historical sampling locations 1 |
| Residential X | 100% Septic | Name of sampling location(s) SARU |
| Agricultural | Mix Sewer/Septic X | |

# permitted milk producing facilities 0 # of parcels on septic within 100ft of surface water ~~1 = need to verify~~ sewered

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | | Y |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map – need to follow up on 24" PVC pipe that ran perimeter of Salmon Run Apartments | Y |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map Area sewered | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | | ✓ | Location (s): # and reference on map | |

**Perry Creek Segment 2 Area Map**

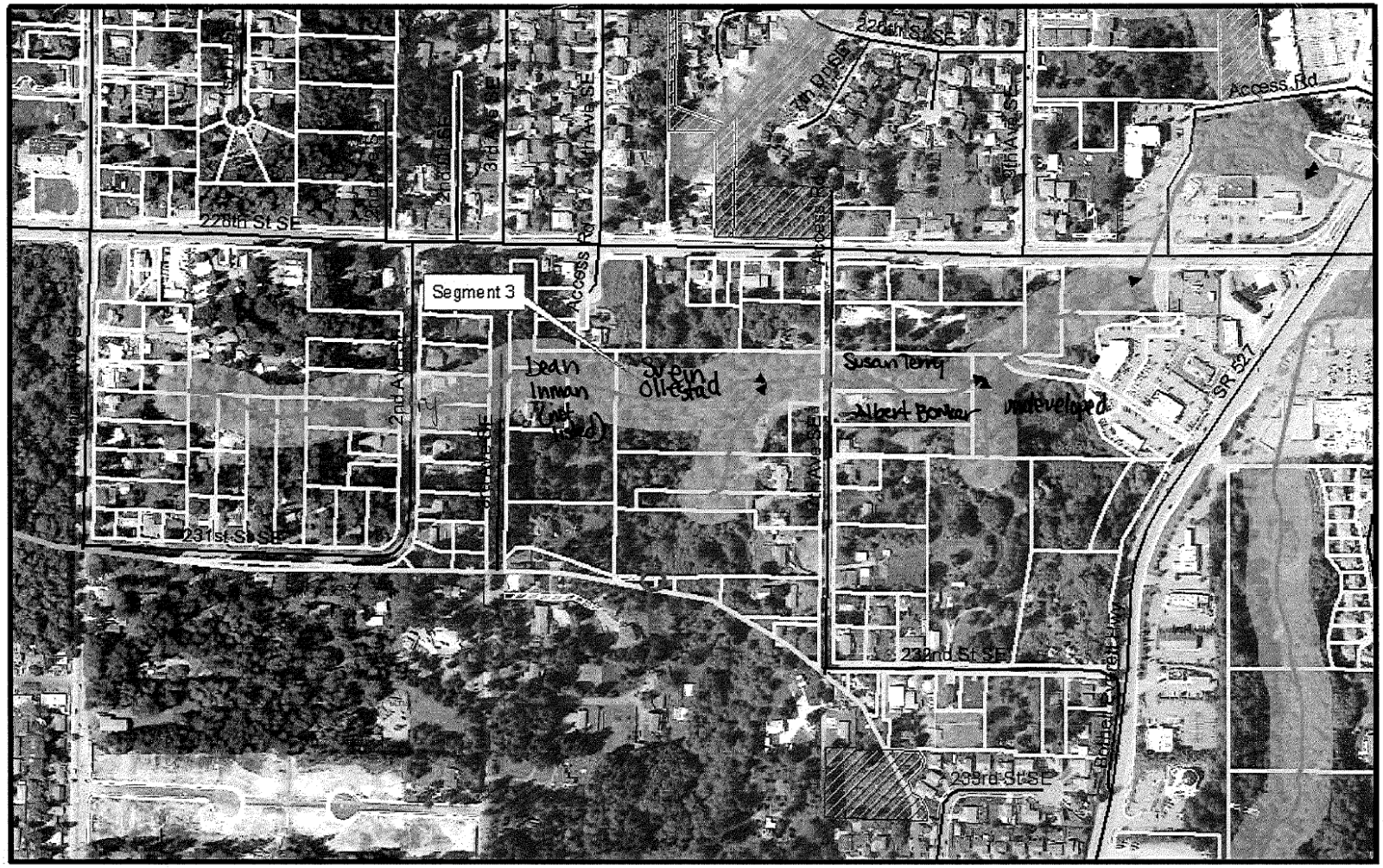
NOT field screened

Segment 2 Runs from the park off of 235 Street SE and runs north to 228th Street SE where it conveyed through City drainage.

N

0 187.5 375 750 1,125 1,500 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Trails
- Easement
- Parks

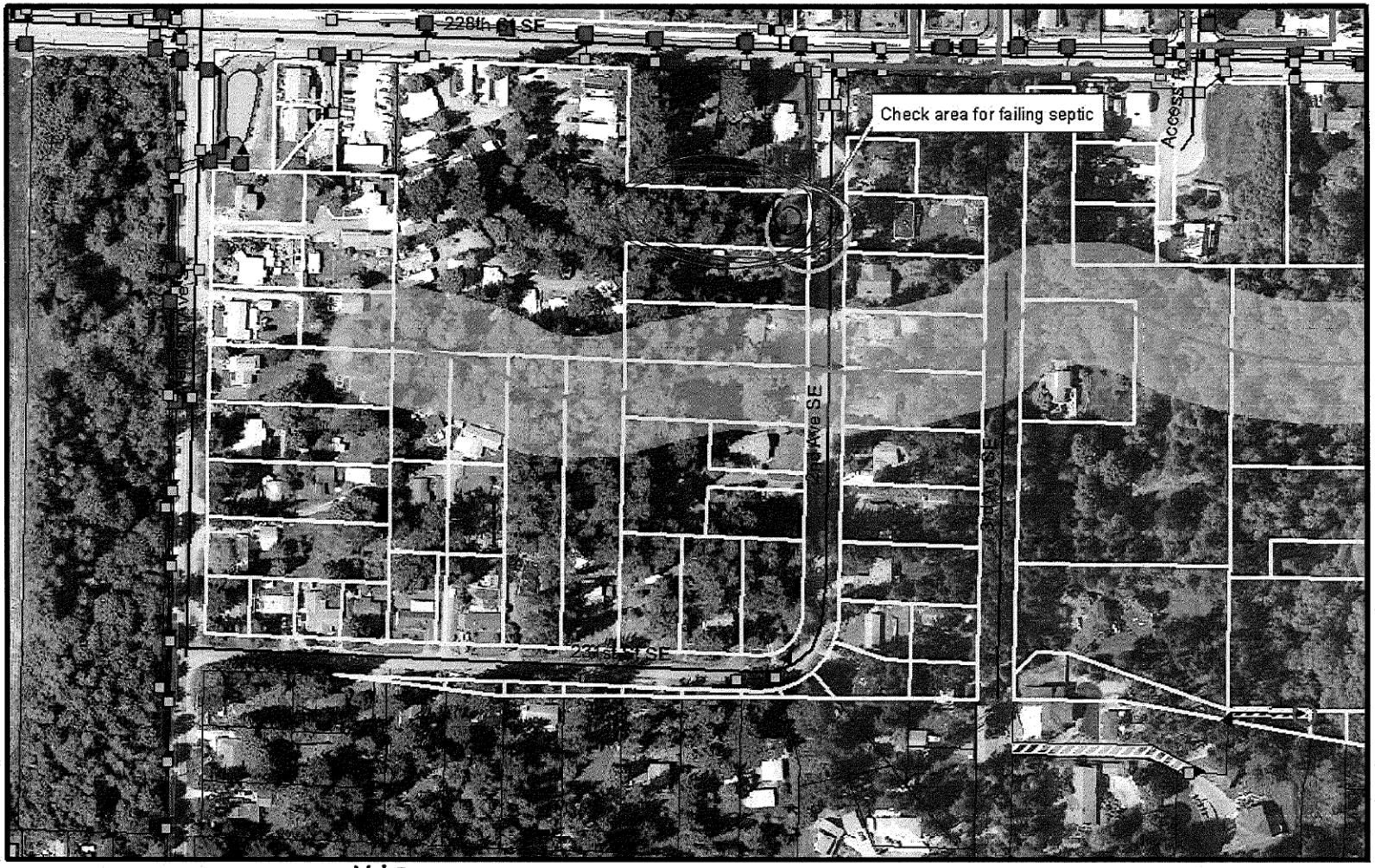



**Perry Creek Segment 3**
**Area Map**

Segment 3 Runs from the residential area west of 2nd Avenue SE East to 228th Street SE where it conveyed through City drainage.

N
0 135 270 540 810 1,080 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Trails
- Easement
- Parks




**Perry Creek Segment 3**
**Map 1**

Note: ① interviewed homeowners to the north of potentially failing septic

Creek runs through private property, likely a seasonal segment.

N
0 70 140 280 420 560 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Easement
- Parks
- sewer

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy) 7/23/10 Segment# 3 - map 1 Personnel SB/JLD Road Miles Driven 0.5

Strm Miles Walked 0.2 WRIA/Subbasin 8/ North Creek Stream Name Discharged to Perry Creek

Start Pt. End Pt. Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water 5

Drainage System Mapped (Y/N)
# of historical sampling locations NA
Name of sampling location(s) NA

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| Survey Metrics *Answer if applicable* | | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | ✓ | | Storm fed | |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map<br>see additional comment | |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map<br>see additional comment | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | NA | | Location (s): # and reference on map<br>area detached | |

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**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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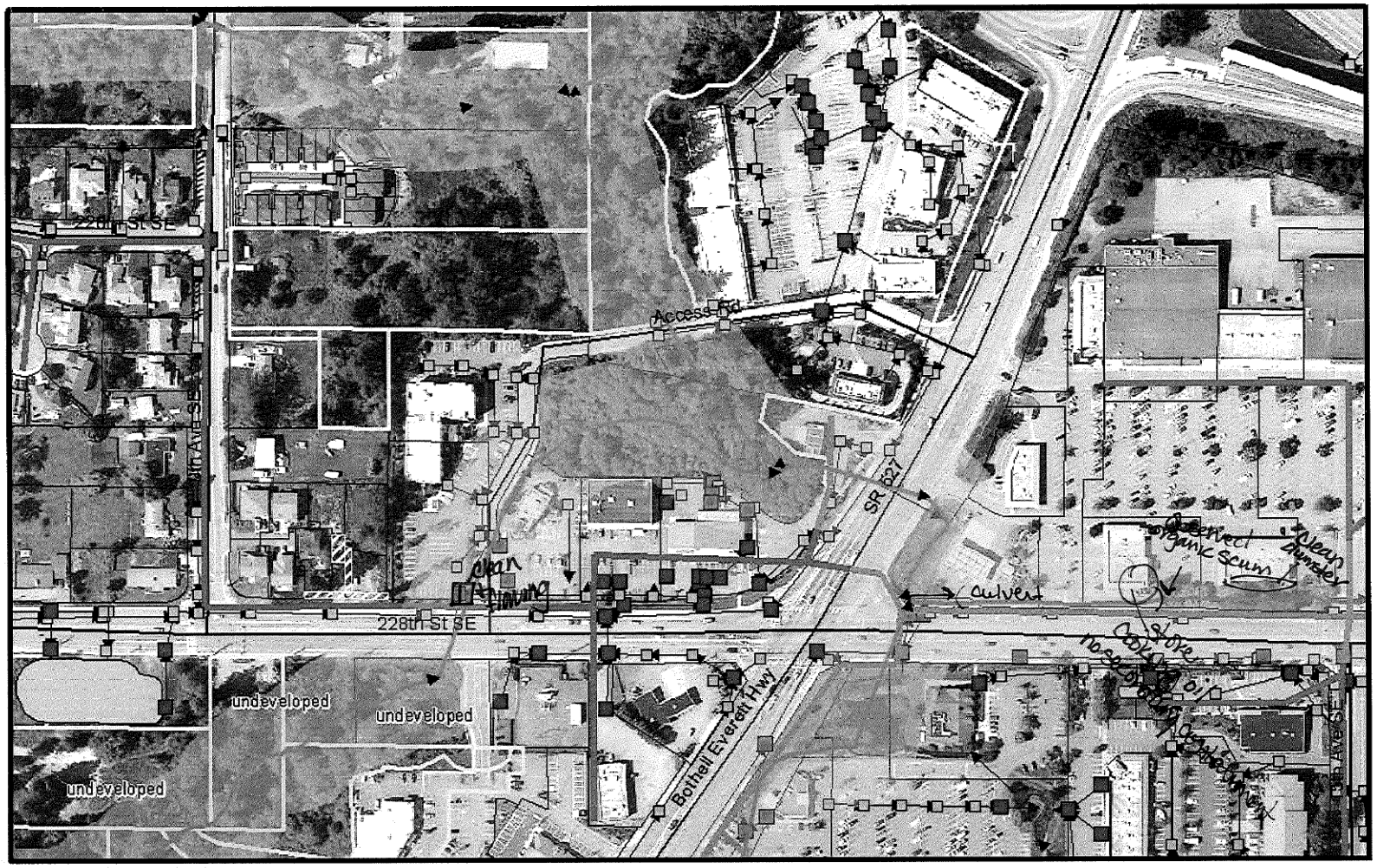
**Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0**

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N) NA<br>homeowners walk dogs in field near home they say they pick up their waste | |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) ~~# and reference~~ on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | |

**Additional Notes and Diagrams:** North West Mobile Estates

22808 2nd Ave SE 3 tiered system that switches between lines? Complaintan recalls puddles of sewage about 25ft from trees towards 2nd system was fixed 3 years ago, now will call when smells sewage & w/in 1-2 days problem is fixed.
never surfaces to road but still present on property

Evergreen on site
Brad R. Davis
877-397-7771
PO Box 1179
Lake Stevens WA 98258




**Perry Creek Segment 3**
**Map 3**

Creek runs through private property, likely a seasonal segment.

N
0 70 140 280 420 560 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Easement
- Parks
- sewer

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Survey Date (mm/dd/yyyy) 7/23/10 Segment# 3 map 3 Personnel SB/LLO Road Miles Driven 0.25

Strm Miles Walked 0.25 WRIA/Subbasin 8/north creek. Stream Name Discharged to Perry Creek Water Shed

Start Pt. SW corner of 527 + 228th End Pt. NE corner of 527 + 228th Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

~~Primary~~ Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities 0

~~Sewer/Septic~~ (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water 0

Drainage System Mapped (Y/N)
# of historical sampling locations NA
Name of sampling location(s) NA

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | flows through NGPA, piped to wetlands then piped to detention & ditch along 228th St SE going East | ✓ |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | | ✓ | Location (s): # and reference on map | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N) | |
| | Concentrated number of birds present on surface waters | | | Location(s) ~~# and~~ reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | |

**Additional Notes and Diagrams:**

Taco Time doesnt have 2nd containment for oils/grease.

**Perry Creek Segment 3**
**Map 2**

Creek runs through private property, likely a seasonal segment.

N
0 70 140 280 420 560 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Easement
- Parks
- sewer

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy) 7/23/2010 Segment# 3 (map 2) Personnel SB/JO Road Miles Driven 0.5

Strm Miles Walked 0 WRIA/Subbasin 8/North Creek Stream Name Discharged to Perry Creek

Start Pt. @ creek crossing 4th ave SE End Pt. commercial development Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities_____

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water ~3-4 possibly

Drainage System Mapped (Y/N)
# of historical sampling locations Ø
Name of sampling location(s) Ø

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | Picks up flow from groundwater & influence | ✓ |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map<br>4" white plastic pipe from french drain on 7th discharging groundwater to ditch | ✓ |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | N/A | | Location (s): # and reference on map | |

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## Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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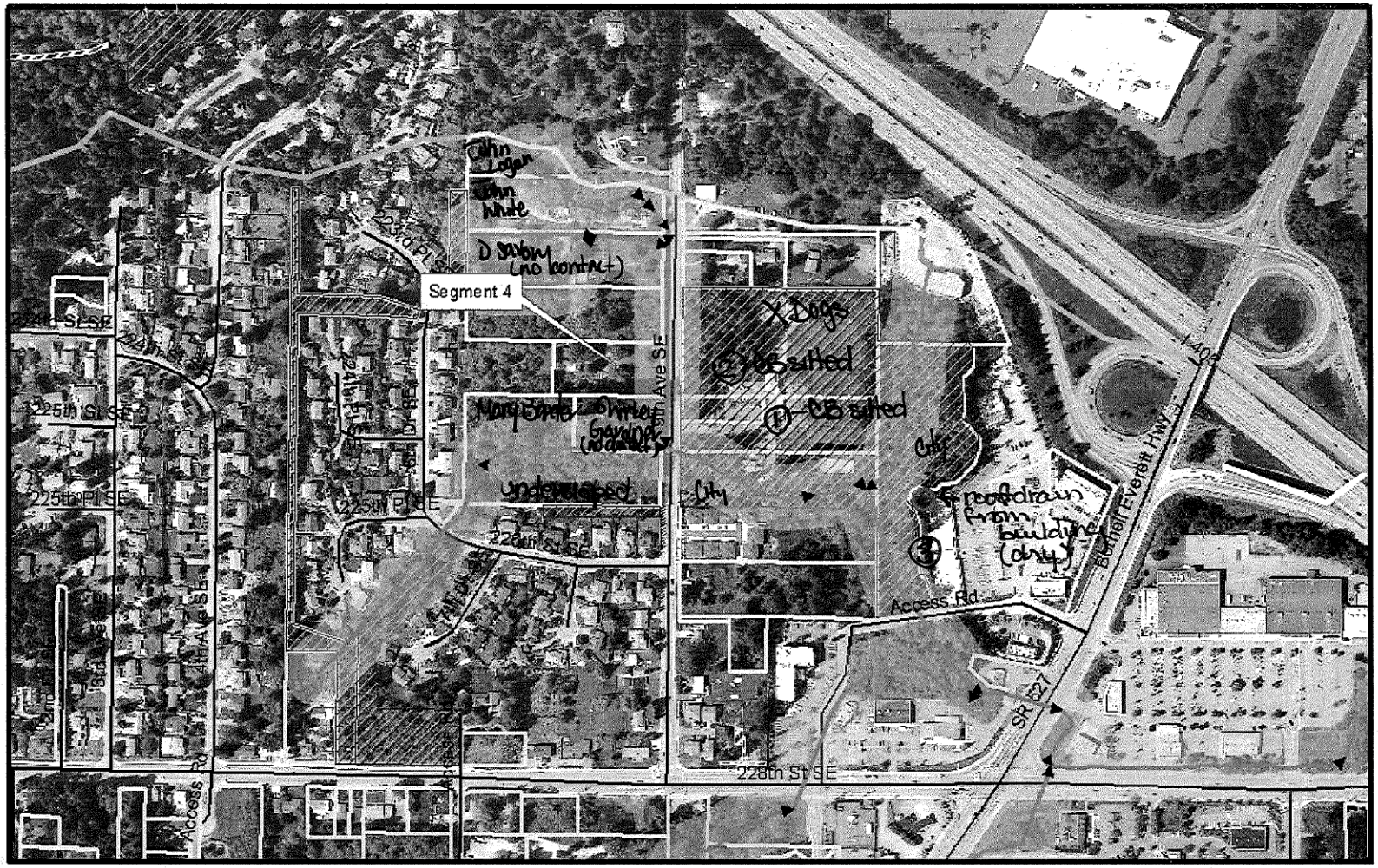
| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | ✓ | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N)<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N) NA | N |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+)<br>evidence of bird waste all around commercial dumpster near wetland area | N |

**Additional Notes and Diagrams:**

22811 7th Ave SE – lots of firewood + woodwaste @ + near creek




## Perry Creek Segment 4 Area Map

Segment 4 Runs from the residential areas southward to 228th where it conveyed through City drainage.

Notes: 1+2: CBs silted, need maintenance
3: herbicide recently applied behind commercial buildings

N

0 125 250 500 750 1,000 Feet

- Perry_Creek
- 100ft_Buffer_PerryCk
- CB Type 1
- CB Type 2
- Ditches
- Pipes
- OutFalls
- Septic_parcels
- Streets
- Trails
- Easement
- Parks

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# Phase 1 and 2 Bacteria Contaminant Source Survey Form – Draft Ver 1.0

Survey Date (mm/dd/yyyy) 7/23/10 Segment# 4 ~~mapped 1 Bay~~ Personnel SB/JLD Road Miles Driven 500 ft

Strm Miles Walked 0 WRIA/Subbasin _____ Stream Name Discharged to trib to Perry Creek

Start Pt. top of hill on 9th Ave SE End Pt. City Park Weather (circle one): Dry Rain Recent Rain Event

## Phase 1 CSS : GIS Results

Primary Land Use (circle one):
Commercial
Residential
Agricultural
Small Farm Present (Y/N)
# permitted milk producing facilities 0

Sewer/Septic (circle one):
100% sewer
100% Septic
Mix Sewer/Septic
# of parcels on septic within 100ft of surface water maybe 6

Drainage System Mapped (Y/N)
# of historical sampling locations NA
Name of sampling location(s) NA

## PHASE 2 CSS – Field Windshield/Stream Walk Survey

| | Survey Metrics *Answer if applicable* | Yes | No | Comments: | Photo (Y/N) |
|---|---|---|---|---|---|
| Drainage Systems and Receiving Waters | Stream in Segment Dry | | ✓ | segment runs along ditch on west side of 9th | |
| | Evidence of Illicit Connections to Storm Drainage or Receiving Waters (Refer to WQ Complaints – for potential notification to Ecology) | | ✓ | Location(s): # and reference on map | |
| | Evidence of potentially failing septic systems (odor, surfacing sewage, drainfield soggy) | | ✓ | Location(s) # and reference on map<br>unable to access homes w/ possible septic systems, no evidence from right of way | |
| | Type 1 CB's Inspected have >40% of sump filled with sediment | ✓ | | Location (s): # and reference on map<br>CBs marked on map are filled w/ sediment + debris to inverts of POT | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Farm and Livestock** | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |
| | Small farm present | | | Location(s) # farm and reference on map<br>Livestock visible within 50ft of stream or stormwater conveyance? (Y/N)<br>Type of livestock (horse, cow, etc.)<br># of livestock present (circle range) – (0 -9) (10 – 25) (26 – 50) (50+)<br>Roof runoff managed to limit overland flow and discharge? (Y/N)<br>Manure covered and contained? (Y/N)<br>Pasture overgrazed (grass less than 3 inches)? (Y/N)<br>Animal excluded from access to surface waters? (Y/N) | |

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| PHASE 2 CSS – Field Windshield/Stream Walk Survey | | | | | |
|---|---|---|---|---|---|
| **Survey Metrics** *Answer if applicable* | | **Yes** | **No** | **Comments:** | **Photo (Y/N)** |
| **Domestic and Wild Animals** | Dog Park(s) present | | | Location (s) # and reference on map<br>Park located within 50ft of surface water or stormwater conveyance (Y/N) City Park<br>Pet waste recepticle present (Y/N)<br>Pet waste recepticle being used (Y/N)<br>no sign of dog waste in park | |
| | Concentrated number of birds present on surface waters | | ✓ | Location(s) # and reference on map<br>Circle range (0 -9) (10 – 25) (26 – 50) (50+) | |

**Additional Notes and Diagrams:**

3 dogs in City Park - no Pet waste recepticles/signs or bags
spoke w/ dog owner, she packs out her dogs waste - would like to see dog waste recepticles in park

found that Business park had kept back of building to creek clean + tidy, observed strong herbicide odor (no vegetation growth directly behind buildings)

areas around creek are well vegetated - no easy access