

**Table 3: Miller and Walker Creeks Water Quality/Quantity Parameters Monitored to Date**

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
<b>Quantity</b>								
Flow	X	X	Miller at S.W. 175 <sup>th</sup> Pl. (gage 42a)	1988 – present	Continuous	King County (funded by Port of Seattle) for all except Miller at Lake Reba (Taylor Associates)		
			Miller Creek Detention Facility (gage 42b)	1989-present				
			Miller at SR509/Port boundary above Des Moines Memorial Drive (gage 42j)	2006-present				
			Miller at Lake Reba	2006-present				
			Walker at 13 <sup>th</sup> Ave. S.W. (gage 42e)	1992-1996; 2000-present				
			Walker below SR509 (gage 42k)	2006-present				

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
<b>Biological</b>								
Acute and sublethal toxicity sampling						Port of Seattle		
Benthic Index of Biotic Integrity (B-IBI)	X		Miller: one location south of S. 160 <sup>th</sup> St.	2003-2006	N/A	Port of Seattle	2006 Low Flow Biological Monitoring Data Report for Miller, Des Moines, and Walker Creeks (2007)	Walker BIBI was not conducted as the habitat east of SR 509 is not suitable
Benthic Index of Biotic Integrity (B-IBI)	X		Miller: above SR518 Miller: below S. 156 <sup>th</sup> St. Miller: near 8 <sup>th</sup> Ave. S.	2004-2006	N/A	Port of Seattle	Comprehensive Receiving Water Study (2008)	
Benthic Index of Biotic Integrity (B-IBI)	X	X	Miller: south of S.W. 175 <sup>th</sup> Pl. and at confluence with Walker (Normandy Park Community Club) Walker: south of 13 <sup>th</sup> Ave. S.W. (Swim Club)	Miller: 2005, 2006 Walker: 2008	N/A	Andy Batcho, Tony Cassarino, and Jim Pitts		
Fish use	X	X	Miller: one location south of 160 <sup>th</sup>	2003-2006	Electrofishing and video	Port of Seattle	2006 Low Flow Biological Monitoring Data Report for Miller, Des Moines, and Walker Creeks (2007)	Walker Creek location had no fish use due to unsuitable habitat (small size and depth)

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
Fish use	X	X	Mouth to upper limits of potential fish use	May 2003	Electrofishing	Wild Fish Conservancy (formerly Washington Trout)	On-line	
Physical habitat features	X	X	Miller: one location south of 160 <sup>th</sup> Walker: one location east of SR509	2003-2006	N/A	Port of Seattle	2006 Low Flow Biological Monitoring Data Report for Miller, Des Moines, and Walker Creeks (2007)	Includes pool-riffle, bank condition, wood structure/frequency info
Physical habitat features using U.S. Forest Service methodology	X		Miller from S.W. 175 <sup>th</sup> Pl. to the mouth	1993 and 2008	N/A	Trout Unlimited	Data available in spreadsheets; contact is Andy Batcho	Includes riffle-to-pool ratio, pool quality index (width of pool, depth of pool, amount of overhanging vegetation), large woody debris, substrate type, habitat 100 feet on either side of the stream, habitat types including riffles, runs, pools/glides, and

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
								channel width and depth
<b>Conventional</b>								
Biochemical oxygen demand (BOD)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Chemical oxygen demand (COD)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	???	???	Port of Seattle	???	BOD can be used as an indicator for COD if a high correlation is proven
Dissolved oxygen, pH, temperature – water, conductivity	X		Miller above Lake Reba Miller below Lake Reba Lake Reba	2005-2007	Grab and continuous monitoring	Port of Seattle	Comprehensive Receiving Water Study (2008)	NEED TO CONFIRM THIS IS NOT DUPLICATIVE OF LISTING BELOW
BOD, COD, dissolved oxygen, TSS, hardness, temperature – water, pH, total and dissolved copper, total and dissolved lead, total and	X		Miller above Lake Reba Miller below Lake Reba Lake Reba	2005-2007	Grab (first flush) and event mean concentration (storm event composite samples)	Port of Seattle	Comprehensive Receiving Water Study (2008)	Samples taken during storm events on monthly basis when conditions allowed (year-round event-based sampling)

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
dissolved zinc, diesel, motor oil								
Dissolved oxygen, hardness, temperature – water, turbidity, pH, phosphorous, nitrate, CO <sub>2</sub> , silica	X	X	Miller at SR 509/Des Moines Memorial Drive Miller at First Ave. S. Miller at Kludt house (S.W. 175 <sup>th</sup> Pl.) Miller at The Cove  Walker at Ambaum Blvd. Walker at The Cove	November 2004 – August 2005	Grab - monthly	City of Normandy Park (RCAA)	Data in spreadsheet	See December 5, 2005 memo from Greg Wingard commenting on this sampling approach
Dissolved oxygen (DO)	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Ammonia-Nitrogen (NH <sub>3</sub> _N)	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Dissolved oxygen	X	X	Miller at S.W. 175 <sup>th</sup> Pl. (gage 42a) Miller at Lake Reba (Miller Creek Detention Facility) (gage 42b) Miller at SR509/Port boundary above Des Moines Memorial Drive (gage 42j) Walker at 13 <sup>th</sup> Ave.	2000-present  (except gages 42j and 42k: 2006-present)	Grab, 8-10 times per year when flow data are retrieved	King County	On line	Collection has been inconsistent; data are missing for months at a time

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
			S.W. (gage 42e) Walker below SR509 (gage 42k)					
Dissolved oxygen	X		Miller at Southwest Suburban Sewer District plant	2004-present	Grab, weekly	Southwest Suburban Sewer District	Data in spreadsheet	
Conductivity	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Conductivity	X	X	Miller at S.W. 175 <sup>th</sup> Pl. (gage 42a) Miller at Lake Reba (Miller Creek Detention Facility) (gage 42b) Miller at SR509/Port boundary above Des Moines Memorial Drive (gage 42j) Walker at 13 <sup>th</sup> Ave. S.W. (gage 42e) Walker below SR509 (gage 42k)	2000-present  (except gages 42j and 42k: 2006-present)	Grab, 8-10 times per year when flow data are retrieved	King County	On line	Collection has been inconsistent; data are missing for months at a time
Fecal coliform	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	Standard exceeded three times in 2006; four times in 2004
Fecal coliform	X		Miller at Southwest	2004-	Grab, weekly	Southwest	Data in	

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
			Suburban Sewer District plant	present		Suburban Sewer District	spreadsheet	
Nitrate+Nitrite-Nitrogen (NO <sub>2</sub> -NO <sub>3</sub> )	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Nitrogen, total persulf (TPN)	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
pH	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
pH	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	Standard exceeded one time in 2006
pH	X		Miller at Southwest Suburban Sewer District plant	2004-present	Grab, weekly	Southwest Suburban Sewer District	Data in spreadsheet	
Phosphorous, total (TP_P_ICP)	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Phosphorous, Sol Reactive (OP_DIS)	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Rain gage	n/a	n/a	Lake Reba	1990-present	Continuous	?		
Suspended	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab -	WA Dept. of	On line	

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
solids (SUSSOL)					monthly	Ecology		
Temperature, air	X	X	Miller at S.W. 175 <sup>th</sup> Pl. (gage 42a) Miller at Lake Reba (Miller Creek Detention Facility) (gage 42b) Walker at 13 <sup>th</sup> Ave. S.W. (gage 42e)	2000-present	Grab, during data collection	King County	On line	Collection has been inconsistent; data are missing for months at a time
Temperature, water	X		Miller at Southwest Suburban Sewer District plant	2004-present	Grab, weekly	Southwest Suburban Sewer District	Data in spreadsheet	
Temperature, water	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Continuous (also grab – monthly)	WA Dept. of Ecology	On line	
Temperature, water	X	X	Miller at S.W. 175 <sup>th</sup> Pl. (gage 42a) Walker at 13 <sup>th</sup> Ave. S.W. (gage 42e)	2000-present	Continuous	King County	On line	
Temperature – water, turbidity	X	X	Miller at SR 509/Des Moines Memorial Drive Miller at First Ave. S. Miller at Kludt house (S.W. 175 <sup>th</sup> Pl.)	November 2004 – November 2005	Grab - monthly	City of Normandy Park (RCAA)	Data in spreadsheet	

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
			Miller at The Cove Walker at Ambaum Walker at The Cove					
Total Petroleum Hydrocarbons (TPH)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Total Suspended Solids (TSS)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Turbidity	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - monthly	WA Dept. of Ecology	On line	
Turbidity	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
<b>Metals</b>								
Hardness	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Hardness	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - bi-monthly	WA Dept. of Ecology	On line	
Copper, total recoverable	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - bi-monthly	WA Dept. of Ecology	On line	
Copper, dissolved	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab - bi-monthly	WA Dept. of Ecology	On line	

Parameter	Miller Creek	Walker Creek	Where monitored	When monitored	Continuous or grab sample	Who	Name of report if applicable	Notes
Copper (Cu)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Lead (Pb)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Lead, total recoverable	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab – bi-monthly	WA Dept. of Ecology	On line	
Lead, dissolved	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab – bi-monthly	WA Dept. of Ecology	On line	
Zinc (Zn)	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	1994 - present	Grab and/or flow-weighted composite	Port of Seattle	Monthly discharge monitoring reports	During 2002-2006, about 25 samples per year
Zinc, total recoverable	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab – bi-monthly	WA Dept. of Ecology	On line	
Zinc, dissolved	X		Miller at S.W. 175 <sup>th</sup> Pl.	2004, 2006	Grab – bi-monthly	WA Dept. of Ecology	On line	
Priority pollutants	X		Outfall to Lake Reba (SDN1, SDN2, SDN3, SDN4)	~1998 - present	Grab and/or flowweighted composite	Port of Seattle	On line	1 to 2 times every 5 years

### Other data collected/monitoring

- Department of Ecology in 2004 and 2006 sampled for the following metals at Miller Creek at S.W. 175<sup>th</sup> St.: silver, dissolved; silver, total recoverable; arsenic, dissolved; arsenic, total recoverable; cadmium, total recoverable; cadmium, dissolved; chromium, total recoverable; chromium, dissolved; mercury, total; nickel, total recoverable; nickel, dissolved

- Lake monitoring includes monitoring:
  - Lake Reba during 2005-2007 as part of the Comprehensive Receiving Water and Stormwater Runoff Study, 2008. Parameters studied included temperature, DO, conductivity, pH, turbidity, TSS, aquatic macrophytes, and elevation
  - Lake Burien by volunteers in 1994, 1998, and 2000-2004 included phosphorous, nitrogen, chlorophyll, and temperature (<http://www.metrokc.gov/dnrp/wlr/water-resources/small-lakes/data/LakePage.aspx?SiteID=43>)
- During Environmental Science Center classes at the Normandy Park Community Club, students collect data on temperature, dissolved oxygen, pH, nitrates, phosphates, and turbidity from Miller Creek. Data were collected on several days in October-December from 2005 to present. Further information is available from Joy Neubauer of the Environmental Science Center.

## Reports with relevant information

1. Department of Ecology sampling results for 2004 and 2006 available on-line at: <http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=2006&tab=notes&scrolly=272&wria=09&sta=09D070&docextension=.xls&docextension=.xls>; had substantial exceedances for FC and one for pH; Water Quality Index is 26 (poor)
2. Wild Fish Conservancy (formerly Washington Trout) stream typing survey, encompassing stream parameters, habitat conditions, and fish presence May 2003 available on-line at: <http://www.washingtontrout.org/kcpuget/index.shtml>
3. Annual Stormwater Monitoring Report Seattle-Tacoma International Airport for the Period July 1, 2006 through June 30, 2007, Port of Seattle, October 1, 2007
4. Sublethal Toxicity Testing of Ambient Samples Downstream of Stormwater Outfalls near the Seattle-Tacoma International Airport (2004 to 2007), prepared by Nautilus Environmental for Port of Seattle, February 1, 2008
5. Acute Toxicity Testing of Stormwater Samples from the Seattle-Tacoma International Airport, prepared by Nautilus Environmental for Port of Seattle, January 28, 2008
6. 2006 Low Flow Biological Monitoring Data Report for Miller, Des Moines, and Walker Creeks, prepared by Parametrix for Port of Seattle, April 2007
7. 2006-2007 Construction Stormwater Annual Report, Port of Seattle, October 1, 2007
8. Comprehensive Receiving Water and Stormwater Runoff Study, prepared by CH2M Hill for Port of Seattle, April 2008
9. Comprehensive Receiving Water and Stormwater Runoff Study – Effects of Airport Ground Surface Deicing Biochemical Oxygen Demand on Receiving Water Dissolved Oxygen, prepared by Taylor Associates, Inc. for Port of Seattle, April 2008
10. Derivation of Site-Specific Water Quality Objectives and Effluent Limits for Copper in Stormwater, prepared by Nautilus Environmental for Port of Seattle, April 2008
11. Derivation of Site-Specific Water Quality Objectives and Preliminary Effluent Limits for Zinc in Stormwater, prepared by Nautilus Environmental for Port of Seattle, April 2008
12. Seattle-Tacoma International Airport Phase I Groundwater Study Report, Draft February 15, 2005

Other reports with possibly relevant information and summaries of selected data also included in table above (excerpted from Miller and Walker Creek Basin Plan – Executive Proposed: Appendix F)

**Summary Report of Preliminary Data Collected for the Site- Specific Water Quality Assessment (SSA) Study.**

Seattle-Tacoma International Airport, June 2002

In-stream concentrations of dissolved Zinc (Zn) and Copper (Cu) were measured at various locations in Miller and Walker Creeks. Up to four baseflow samples and up to five stormflow samples were analyzed at each sampling location.

Miller Creek sampling locations included:

1. outfall from Lake Reba Stormwater Facility;
2. below the mixing zone from the Lake Reba Stormwater Facility outfall;
3. Miller Creek at 8<sup>th</sup> Street (below current & future drainages to Miller Creek); and
4. upstream of Lake Reba Stormwater Facility (background to airport discharges to Lake Reba Stormwater Facility); only one stormwater sample analyzed.

Walker Creek sampling locations include:

1. near the 176<sup>th</sup> Street overpass; and
2. at the 171<sup>st</sup> Street overpass.

Several samples were collected during each event. In total, eleven baseflow and 19 storm events/locations were analyzed. There were no exceedances of Washington State Surface Water Quality Standards.

**Dissolved Oxygen (DO)/Deicing Reports** prepared for the Port of Seattle:

Dissolved Oxygen Deicing Study, August 1999

1. Examining the Effects of Runway Deicing on Dissolved Oxygen in Receiving Waters: Results of the 1999-2000 Winter Season, Volume 1, November 2000.
2. Examining the Effects of Runway Deicing on Dissolved Oxygen in Receiving Waters: Results of the 1999-2000 Winter Season, Volume 2, January 2001.

The Port conducted two seasons of monitoring the effects of deicers on DO. The reports showed that the DO levels in Lake Reba Stormwater Facility fluctuated during storm events, but could not conclude that the fluctuations were a result of deicing operations.

**Master Plan Update for Improvements at the Seattle-Tacoma International Airport, Biological Assessment**, June 2000. Includes habitat assessments in Miller and Walker Creeks.

**Fact Sheet for NPDES Permit WA-002465-1**; Facility Name: Sea-Tac International Airport; Washington Department of Ecology (Ecology).

This *Fact Sheet* was prepared by Ecology as background information to develop/issue the Port's revised NPDES permit. The report summarizes monitoring data that has been submitted as a requirement of the NPDES permit, and describes drainage infrastructure stormwater BMPs.

### **King County Stormwater Sampling**

King County sampled stormwater at 17 locations within the Miller and Walker Creek Basins during four storm events between 1991 and 1993. These samples were analyzed for conventional water quality parameters, bacteria, and total metals.

- **Metals (Copper and Zinc):** During the time that the samples were taken, the Washington Surface Water Standards for toxic metals were based on total metal concentration. This standard has subsequently changed to being based on the dissolved fraction. Results, using total metal standards in effect at the time, showed exceedances in most samples, with particularly high metal concentrations at locations in Miller Creek north of SR518, adjacent to SR509 at S 136<sup>th</sup> Street, and at Ambaum Pond.
- **Turbidity, total suspended solids (TSS), and bacteria (fecal coliform):** Turbidity and TSS were relatively low for stormwater. Fecal coliform bacteria exceeded the surface water standard (100 colonies per 100 ml) in all instances.

### • **King County Sediment Sampling**

Sediment samples were taken at eight locations throughout the basin. Samples were analyzed for semivolatile organics, oil and grease, total petroleum hydrocarbons, pesticides/herbicides, PCBs, and metals. Results for all constituents were low and did not indicate problems.

### **Southwest Suburban Sewer District**

Southwest Suburban routinely monitors instream water quality adjacent to the treatment plant located on Miller Creek. Routine monitoring includes analysis for Dissolved Oxygen (DO), temperature, pH, and Fecal Coliform bacteria. Fecal Coliform bacteria counts exceed the standard consistently, even at baseflow, and are the highest during storm events. DO and temperature have exceeded the standards during summer months. pH is within an acceptable range.

### **USGS Pesticide Sampling**

United States Geologic Service (USGS). USGS studied several urban streams in the Puget Sound region for the presence of

pesticides. Miller Creek was one of the urban streams sampled. Three stormwater samples were tested for the presence of pesticides in 1998.

Six pesticides were detected in Miller Creek: Atrazine, Metolachlor, Prometon, Carbaryl, Diazinon, and Malathion. Both Carbaryl and Diazinon exceeded the recommended chronic toxicity criteria. Atrazine and Malathion did not exceed the recommended toxicity criteria. No aquatic toxicity criteria were available for Metolachlor or Prometon. The effects of pesticides in very low concentrations to aquatic organisms is not well understood. Several studies have indicated that low levels of pesticides may have sub-lethal behavioral effects. It is also speculated that low levels of pesticides may contribute to prespawn mortality observed in coho utilizing the streams.

Toxicity (bioassay) testing was not performed for Miller Creek. However, toxicity testing was performed for Lyon Creek, a tributary to Lake Washington located in southern Snohomish County and Lake Forest Park; it showed chronic toxicity to *Ceriodaphnia dubia* and *Selenastrum capricornutum*. The toxicity could not be directly attributed to the pesticides. Lyon Creek had similar pesticide concentrations to those detected in Miller Creek.

Whereas most of the pesticides detected are available for residential use, Atrazine has little or no retail sales in King County according to a 1997 survey of pesticide sales. This indicates that this Atrazine may be applied in non-residential uses such as rights-of-way areas.

#### **DOE Water Quality Monitoring Station 09D070**

The Department of Ecology sampled near the mouth of Miller Creek in 2004 (and again in 2006). This non-storm event sampling indicated exceedances above the standard for Fecal Coliform bacteria. Based on this data, Miller Creek was listed as water quality impaired for Fecal Coliform. Metal concentrations did not exceed the standards.