ADDENDUM TO MULTIPURPOSE WATER STORAGE SCREENING ASSESSMENT
WRIA 30
Prepared for: WRIA 30 Planning Unit

Project No. 020070-002-08 • November 25, 2003
Project funded through Ecology Grant No. G0300156

Contents

1 Introduction 1

2 September 2003 Field Data Collection 2

2.1 Swale Creek Subbasin 3

2.2 Little Klickitat Subbasin 4

2.3 Analytical Data Quality Assurance Review 5

3 Conclusions Regarding Water Storage Opportunities in Swale Creek 6

4 Conclusions Regarding Water Storage Opportunities in Little Klickitat Subbasin 8

Limitations 9

References 10

List of Tables

1 – Stream Discharge Point Measurements, April and September 2003

2 – Water Quality Data, April and September 2003

List of Figures

1 – Swale Creek Subbasin, September 2003 Field Data Collection

2 – Little Klickitat Subbasin, September 2003 Field Data Collection

List of Appendices

Appendix A – Laboratory Certificates of Analysis, North Creek Analytical Inc.

1 Introduction

This report provides an addendum to the Multipurpose Water Storage Screening Assessment Report for WRIA 30, dated June 20, 2003 (Aspect Consulting 2003). This addendum presents late-season field data collected in September 2003 that supplement the early-season data collected for this project in April 2003.

The overriding objective of this water storage screening assessment is to identify water storage opportunities that could potentially meet multiple water needs in the Little Klickitat and Swale Creek subbasins of WRIA 30 – the two subbasins identified as priorities based on the Phase 2 Level 1 water quantity assessment for WRIA 30. The water storage screening assessment does not define water need priorities for those subbasins, or for the larger WRIA 30 watershed. Rather, it identifies a range of prospective storage opportunities in the two subbasins based on the subbasin physical characteristics as currently understood, irrespective of water needs. Because watershed hydrology, geology, topography, fish distribution and habitat, land ownership, and other factors may limit the number of feasible opportunities for water storage in any watershed, a screening-level identification of those opportunities is a useful first step in the process of water storage planning at the watershed scale. Priority water needs, as subsequently identified by the WRIA 30 Planning Unit, that could potentially be addressed through water storage, can then be matched up with feasible storage opportunities.

As noted in the Phase 2 Level 1 Watershed Assessment, few hydrologic data exist for the Swale Creek and Little Klickitat subbasins. Therefore, a focus of this water storage screening assessment is field data collection to improve understanding of potential sources of excess water potentially available for storage, and the interaction between groundwater and stream flows in these subbasins. The potential benefits afforded by water storage in WRIA 30 can likely be realized predominantly during the dry summer months, therefore, dry season hydrologic conditions are of greatest interest. Consequently, data would optimally be collected both during the peak dry season or late-season (e.g., September 2003), in addition to the early-season timeframe (e.g., April 2003).

Both early-season and late-season data collection efforts were included in the scope of work for the WRIA 30 water storage grant (Washington State Department of Ecology [Ecology] Grant G0300156). However, given the initial need to complete work under this grant within the 2001-2003 Biennium (i.e., by June 30, 2003), the grant was partially funded to only include the early-season data collection (completed in April 2003). Those data were included as part of the June 2003 Multipurpose Water Storage Screening Assessment Report (Aspect Consulting 2003). The WRIA 30 Planning Unit subsequently applied for and was granted additional funding for Grant G0300156 under the budget for the 2003-2005 Biennium.

This water storage screening assessment addendum was prepared by Aspect Consulting LLC, under subcontract to Watershed Professionals Network (WPN). This assessment was funded under Grant number G0300156 obtained by the WRIA 30 Planning Unit from the Washington State Department of Ecology (Ecology) under the Watershed Planning Act. Klickitat County is lead agency for the WRIA 30 Planning Unit.

Following this introductory section, Section 2 describes the September 2003 field data collected, while Sections 3 and 4 present insights gained from the dry-season data relative to prospective water storage opportunities for the Swale Creek and Little Klickitat Subbasins respectively. This addendum is intended for use in conjunction with Aspect Consulting (2003), and the reader is referred to that report for additional detail regarding prospective water storage opportunities for each subbasin, as well as pertinent background information.

2 September 2003 Field Data Collection

Field data were collected to gain preliminary understanding of the relative availability of excess water in different streams, and to improve understanding of groundwater-stream interactions, in the priority subbasins. In order to address seasonal variations, the preliminary screening assessment at the end of the wet season in April 2003 was followed by a dry season assessment in September 2003. The September field effort included observation of spring discharge locations as well as a quantification of spring and stream discharges as a basis for comparison with April observations. The same field data collection methods were used for the April and September observations and are presented in more detail in Aspect Consulting (2003). Summaries of the field data collection methods are presented below.

Stream Gaging. Stream gaging was a primary focus of the September 2003 data collection, with the objective of understanding the relative magnitude of flows between different drainages, to document potential gaining or losing reaches of the creeks, and to compare these observations with the April 2003 data set. Stream gaging provides a single point-in-time measurement of stream discharge that supplements the scant available gaging data from these subbasins. A total of 22 stream discharge point measurements were collected from 10 streams spread across the Little Klickitat subbasin during the week of September 22-26, 2003 (Table 1). Swale Creek was dry or stagnant upstream (east) of Harms Road, at river mile (RM) 12.2. Downstream of Harms Road, flows in Swale Canyon were not measured because flows were small; instead Swale Canyon flows were estimated visually, which is suitably accurate for the purposes of this assessment.

Water Quality Sampling. In addition to the stream gaging, water samples were collected at selected surface water and spring locations for chemical analysis. The objective of collecting the water quality data is to provide an additional line of evidence (geochemical) to evaluate the relative contribution to instream flows from snowmelt or surface runoff versus groundwater discharge. This information is most useful by comparing the September 2003 data with data collected during April 2003 since the relative contribution of groundwater versus snowmelt should change seasonally, and might be reflected in water quality. September stream flows are expected to be derived solely from groundwater discharge (baseflow).

The April 2003 data collection was completed toward the end of the spring runoff period. In addition, 2003 had below average snowpack, and meltwater runoff from Simcoe Mountains snowpack peaked earlier than usual. Consequently, local instream flows in April 2003 were lower than typical for April. Regardless, the September data combined with the April data do provide useful information to evaluate potential water flows in a relative sense between various stream drainages within the subbasins and between the end of the wet and the peak of the dry seasons.

The surface water samples were collected using the techniques described in Aspect Consulting (2003) and analyzed at North Creek Analytical in Bothell, Washington, for 9 parameters. The parameters analyzed were major cations (calcium, magnesium, sodium, potassium), major anions (bicarbonate, sulfate, chloride), dissolved iron and manganese, and bicarbonate alkalinity. Water hardness was calculated from the calcium and magnesium concentrations. Field parameters - temperature, pH, and electrical conductance - were also measured in the field at each location where stream gaging was performed, whether or not a water sample was also collected for full laboratory analysis. A total of 14 water samples were submitted for laboratory analysis, and water quality field parameters were measured at 32 locations, in September 2003 (Table 2).

The field data collection efforts are described for each subbasin in the next two sections.

2.1 Swale Creek Subbasin

A dry season field reconnaissance of the Swale Creek subbasin was completed on September 22 and 23, 2003. The first day included a reconnaissance of the upper and central subbasin – from the headwater tributaries east of Highway 97, through the Centerville valley, down to Harms Road just west of Warwick. The second day involved a reconnaissance of Swale Canyon, from Harms Road to the creek mouth at Wahkiacus. The reconnaissance effort included visual estimates of stream flows in tributaries, observation of channel conditions, water quality parameter measurements (pH, temperature, and conductance), and observation and sampling of spring discharge. Field observations and measurements are recorded on Figure 1 (oversize plate).

Several small tributaries were observed entering Swale Canyon, with individual flows estimated visually from dry to perhaps 0.5 cfs. On Figure 1, the discharge measurement locations are shown as triangles, and the visual qualitative flow estimates are shown as circles. For the qualitative flow estimates, the term “minor flow” indicates flow that likely fell in the range of 0.1 to 0.5 cfs, and the term “trickle” was used for flows likely less than 0.1 cfs.

In addition, water quality samples were collected from Swale Creek at one of the three April sampling locations (Swale-1) which had sufficient flow. Water quality samples were also collected from two spring locations that had sufficient discrete flow to allow sample collection. Water sample Spr-1-Swale was collected from a small spring emanating from the Wanapum Basalt on the north side of Swale Creek (at RM 9.4). This spring was the first one observed west of Harms Road that had sufficient flow for water sample collection and was also sampled during the April 2003 field season. Visual reconnaissance above the spring in April 2003 confirmed it was not fed by higher elevation surface runoff; the fact that it continues to flow in September confirms this.

Further down Swale Canyon (at RM ~3.5), water sample Spr-3-Swale was collected from a small spring emanating from the Grande Ronde Basalt on the east side of the canyon. These spring sample locations are shown on Figure 1. The spring at RM 3.4 sampled in April 2003 (Spr-2-Swale) was not observed in September 2003.

The water quality data – laboratory and field parameter – collected from the Swale Creek subbasin in April and September 2003 are presented in Table 2.

2.2 Little Klickitat Subbasin

A dry season field reconnaissance of the Little Klickitat subbasin was conducted September 22-26, 2003. During this time, we collected stream/spring discharge and water quality field parameter measurements at 22 locations, and 11 water quality samples for full laboratory analysis (2 samples of spring discharge and 9 samples from streams).

Stream gaging was performed at the following locations:

- Two locations on Blockhouse Creek (RM 3.9 and 4.3);
- Two locations on Bloodgood Creek (at RM 0.4, and at Bloodgood Springs where the spring discharge enters the culvert under Pine Forest Road);
- Four locations on Bowman Creek (RM 0.5, 3.6, 12.8, and 16.8);
- Two locations on Butler Creek (RM 0.1 and 3.7);
- One location at RM 2.1 on Devil's Canyon, a tributary joining Mill Creek at RM 11;
- One location on a tributary (Brimstone Creek) joining Dry Creek at RM 2.0;
- Four locations on Mill Creek (RM 4.0, 8.4, 12.7, and 14.5);
- Two locations on the West Prong Little Klickitat River (RM 0.06 and 4.7);
- One location on Spring Creek (RM 0.7); and
- Three locations on Little Klickitat River (RM 0.15, 9.0, 17.5).

The data collection locations, with discharge and field parameter measurements, are depicted on Figure 2. The stream gaging data and water quality data are presented in Tables 1 and 2, respectively.

In addition to sampling stream surface water at 9 locations (see Table 2), water quality samples were also collected from Presher Spring (T6N R15E section 34) and Bloodgood Spring (T4N R16E section 8), both of which discharge from the Simcoe Volcanics. The water sample from Bloodgood Spring was collected as a grab sample from the overflow from the two vaults within the City of Goldendale's spring collection system. The measured discharge from Bloodgood Spring was 6.4 cfs at the point where the discharge enters a culvert under Pine Forest Road. The Presher Spring discharge was estimated at 50 gpm (0.1 cfs) at the time of the September 2003 observation. No discharge was observed from Shelton Spring (T6N R14E section 35), which emanates from the Wanapum Basalt.

2.3 Analytical Data Quality Assurance Review

A quality assurance review of the laboratory's analytical data packages was performed to ensure that the data were of suitable quality for their intended use. The laboratory certificates of analysis are included in Appendix A.

The quality assurance review included evaluation of sample custody, holding times, method blank analysis, laboratory control sample (blank spike) and matrix spike/matrix spike duplicate recoveries and precision, and post-digestion spike recoveries. The results of the quality assurance review are as follow:

1. Sample custody and holding times were acceptable.
2. No method blank contamination was detected.
3. Laboratory control sample (LCS) recoveries were within control limits.
4. Matrix spike (MS), matrix spike duplicate (MSD), and post-digestion spike recoveries were within control limits.
5. The relative percent differences (RPDs) for MS/MSD sample pairs were within control limits.

Based on the quality assurance review, the analytical data are determined to be of acceptable quality for their intended use. No data were qualified based on the QA reviews.

3 Conclusions Regarding Water Storage Opportunities in Swale Creek

This section presents updated conclusions regarding the hydrologic conceptual model and prospective options for water storage for the Swale Creek subbasin based on the observations from the September 2003 field data collection.

- Above Swale Canyon, stagnant water was present in several locations along Swale Creek, but no flow was observed. In particular, stagnant pools were observed at Hoctor Road, Highway 97, and Uecker Road. These pools were isolated, with dry reaches both upstream and downstream.
- As Swale Creek entered Swale Canyon, pooled water was observed more frequently. Large pools were present immediately west of Harms Road and again about 1.5 miles downstream. As Swale Creek neared the bend to the north, another long pool of water was observed. Flow in Swale Canyon began at the confluence with Stacker Canyon (approximately at the bend to the North at RM 9.2) which provided approximately 0.5 cfs to Swale Creek. Downstream of this point, Swale Creek would interchange back and forth from flowing, to pooled, to dry (on the surface) multiple times. Flow was typically observed in bedrock constrained reaches of Swale Creek and was not present in alluvial reaches. As a rough estimate, 40 percent of Swale Canyon had flowing water, 20 percent had pooled water, and the remainder was dry.
- The springs observed emanating from the east wall of the Canyon (Spr-1-Swale and Spr-3-Swale) did not contribute much flow to the creek, consistent with April observations. Discharge at the downstream end of Swale Canyon was approximately equal to the input from Stacker Canyon, further indicating limited input from groundwater discharge.
- The groundwater level in a shallow well completed in the alluvial aquifer east of Warwick and located near Swale Creek (adjacent to Matson Road) was 7.3 feet below ground surface (bgs). This is lower than observed in April (2 feet bgs), but was not as low as anticipated.
- Juvenile fish were observed in most pools located in Swale Canyon. In particular, a large number of juveniles were present in a stagnant pool under a railroad bridge trestle at RM 4.6.
- Water temperatures in Swale Canyon ranged from 13 to 19.5º C and generally increased as the water traveled downstream. The stagnant pool above Stacker Canyon was warmer (17º C) than the water flowing from Stacker Canyon (15º C). The measured increase in temperature down the canyon also reflects the difference in time of day of the measurement; the warmest temperatures were measured later in the day.
- Water quality in Swale Creek and the spring discharging from the Grande Ronde Basalt (Spr-3-Swale) continued to have the highest conductance, hardness, and

dissolved cation and anion concentrations observed. The September 2003 water hardness at the mouth of Swale Creek (Swale-1) was more than double that measured in April 2003. The spring discharging from the Wanapum Basalt (Spr-1-Swale), by contrast, had water quality concentrations similar to those observed in the Little Klickitat subbasin.

The September 2003 data collection provides additional information to document dry-season hydrology. In general, the observations do not change the previously presented conclusions regarding the viability of enhanced recharge, aquifer storage and recovery, on-channel impoundment, or off-channel impoundment water storage projects.

The apparent presence of some, albeit small, year round flow through Swale Canyon and the observation of juvenile fish in multiple locations there indicates that there may be a habitat and fisheries benefit to providing additional water through the canyon during the dry season. This goal should be considered when evaluating future multipurpose storage projects in the Swale Creek subbasin.

4 Conclusions Regarding Water Storage Opportunities in Little Klickitat Subbasin

This section presents updated conclusions regarding the hydrologic conceptual model and prospective options for water storage for the Little Klickitat subbasin based on the observations from the September 2003 field data collection.

- Flow in the Little Klickitat River near the confluence with the Klickitat River (Little Klick-3) was 30.6 cfs. Most of this flow originated in the western portion of the subbasin. The highest flows were observed in Spring, Mill and Bowman Creeks, and Bloodgood Springs. These four sources account for 83 percent (25 cfs) of the flow in the Little Klickitat, but only 45 percent of the total subbasin area. These four creeks are located primarily in the Simcoe Volcanics, and are presumably sustained throughout the dry season by groundwater discharge.

- Comparing flow measurements from the Little Klickitat River with the sum of measured flows in the individual tributaries yields some interesting results. For example, the total flow from West Prong and Butler Creeks was 2.1 cfs and the flow in the Little Klickitat River approximately ¾ mile downstream (at Little Klick-1) was 1.4 cfs. The difference indicates that this is a losing reach of the Little Klickitat with some flow infiltrating into the alluvium present in that area. Gaging error may also contribute to the observed difference.

- Further downstream, the observed flow at Little Klick-2 was 6.6 cfs which is less than the sum of Little Klick-1, Bloodgood Creek, and Cozy Nook Creek flows which add to 8 cfs. Again the difference indicates that the Little Klickitat River continues to lose water to the extensive reach of alluvium between the Little Klick-1 and Little Klick-2 stations (near Goldendale).

- Finally, the observed flow at Little Klick-3 (RM 0.3) was 30.6 cfs and the total flow from the tributaries and Little Klick-2 was 29.1 cfs. This close agreement indicates that this lower reach of the Little Klickitat (incised into Wanapum Basalt) is neither losing nor strongly gaining.

- Canyon Creek and the East Prong of the Little Klickitat were dry at all locations observed. Canyon Creek may begin flowing (from groundwater discharge) as it enters its canyon towards the confluence with Bowman Creek. The increase in stream flow between Bowman Creek stations 1 and 2 suggest that this reach of Canyon Creek was flowing.

- Idlewild and Dry Creek were dry at their confluences with the East Prong of the Little Klickitat, but were observed flowing (< 0.1 cfs) in upstream reaches. Dry Creek's flow came from Brimstone Creek. Flow observed in the upper reaches infiltrated upon reaching the alluvial reaches near the confluence with the East Prong.

- Water quality in the Little Klickitat subbasin was generally consistent throughout the subbasin and between spring and surface water samples. The data were consistent with April 2003 data.

As with the Swale Creek subbasin, in general, the observations from the September 2003 data collection provide additional information that may be useful in the design or evaluation of potential storage projects, but do not substantively change the previously presented general conclusions regarding the viability of enhanced recharge, aquifer storage and recovery, on-channel impoundment, or off-channel impoundment water storage projects.

The most significant observation related to water storage in this subbasin is the degree of control that the alluvial reaches have on the presence or absence of surface flow in the late summer/early fall. Each of the creeks that were observed to be dry or losing water had significant alluvial reaches. Figure 6 in Aspect Consulting (2003) is a geologic map showing the extent of alluvium in this subbasin. When planning a water storage project upstream of an alluvial reach, care should be taken to understand the extent and properties of the alluvium and the amount of water that may infiltrate into it if released back into the stream. Alternatively, the alluvium also may hold opportunities for enhanced recharge as outlined in Aspect Consulting (2003).

Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of the WRIA 30 Planning Unit for specific application to the referenced project. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

V:\020070 WRIA 30\Addendum to Water Storage Report.doc

References

Aspect Consulting, 2003. Multipurpose Water Storage Screening Assessment Report WRIA 30. Prepared for WRIA 30 Planning Unit. June 20, 2003.

Table 1 - Stream Discharge Point Measurements, April and September 2003

	Location	Discharge in cfs Apr 2003	Sep 2003
Swale Creek Subbasin			
Swale Ck Surface Water			
Swale-3	Swale Ck at Hwy 97 (RM 24.2)	0.6	no flow
Swale-2	Swale Ck at Harms Road (RM 12.2)	1	no flow
Swale-1	Swale Ck Nr Mouth (RM 0.3)	5.1	est 0.25
Little Klickitat Subbasin			
Springs from Simcoe Volcanics			
Bloodgood Springs	Bloodgood Spr (T4N R16E S8; RM 2.4)	7.8	6.4
Surface Waters			
Block-1	Blockhouse Ck at RM 3.9	9.4	3.6
Block-2	Blockhouse Ck at RM 4.3	4.6	0.8
Bloodgood-2	Bloodgood Ck at N. Mill St. (RM 0.4)	8.5	6.4
Bowman-1	Bowman Ck at RM 0.5	35	4.8
Bowman-2	Bowman Ck at RM 3.6	22.7	1.8
Bowman-3	Bowman Ck at RM 12.8	20.8	1.6
Bowman-4	Bowman Ck at RM 16.8	16.3	0.3
Butler-1	Butler Ck at RM 3.7	21.2	0.5
Butler-2	Butler Ck at RM 0.1	19	0.2
Canyon-1	Canyon Ck at RM 5.0	3.9	dry
Canyon-2	Canyon Ck at RM 8.6	1.5	dry
Devil-1	Devils Canyon at RM 2.1	7.1	1.5
Dry-1	Mouth of Brimstone Ck (trib to Dry Ck at RM 2.0)	1.9	0.08
Dry-2	Dry Ck at RM 2.1	4.7	dry
Dry-3	Dry Ck at RM 1.9	6.4	est 0.08
Dry-4	Dry Ck at RM 0.7	4.6	dry
East Prong-1	East Prong Little Klickitat at RM 0.3	10	dry
Idlewild-2	Idlewild Ck at RM 0.7	2.4	est 0.01-0.05
Little Klick-1	Little Klickitat at RM 18.4	--	1.4
Little Klick-2	Little Klickitat at RM 9.9	--	6.6
Little Klick-3	Little Klickitat at RM 0.3	--	30.6
Mill-1	Mill Ck at RM 14.5	3.9	1.8
Mill-2	Mill Ck at RM 12.7	6.3	2.0
Mill-3	Mill Ck at RM 8.4	15.4	4.1
Mill-4	Mill Ck at RM 4.0	24.5	5.0
Spring-1	Spring Ck at Olson Road - RM 0.6	--	9.2
West Prong-1	East Fork of West Prong Little Klickitat at RM 4.7	1.1	est 0.25
West Prong-2	West Prong Little Klickitat at RM 0.06	12.9	1.6
West Prong-3	West Prong Little Klickitat at RM 3.7	est 12-15	1.9

Notes:
RM: River mile measured from stream mouth.
est - visual estimate
no flow - stagnant surface water present
dry - no surface water present
-- not observed/measured

Table 2 - Water Quality Data, April and September 2003

			Field Parameters			Common Cations				Common Anions				
Sample	Location	Sample Date	Elec. Conduct. in µS/cm	pH	Temp. in °C	Calcium in mg/L	Potassium in mg/L	Magnesium in mg/L	Sodium in mg/L	Bicarbonate Alkalinity in mg/L as CaCO3	Sulfate in mg/L	Chloride in mg/L	Hardness in mg/l as CaCO3	Iron in mg/L
Swale Creek Subbasin														
Springs from Basalts														
Spr-1-Swale	North bank @ RM 9.4 (Wanapum Basalt)	4/2/03	80	8.7	10.0	8.58	2.01	6.23	5.29	49.6	2.78	1.38	47.1	1.51
		9/23/03	120	8.1	13.5	9.0	2.0 U	7.04	4.84	55.8	3.63	1.59	51.4	0.208
Spr-2-Swale	East bank @ RM 3.4 (Grande Ronde Basalt)	4/2/03	100	8.4	12.0	8.86	2.0 U	6.01	4.39	50.2	1.45	0.765	46.9	0.164
Spr-3-Swale	East bank @ RM ~3.5 (Grande Ronde Basalt)	9/23/03	500	7.7	19.0	32.3	6.3	35.4	42.2	308	0.4 U	3.56	225.9	1.2
Swale Ck Surface Water														
Swale-3	Swale Ck at Hwy 97 (RM 24.2)	4/21/03	270	7.3	11.0	26.6	2.78	14.4	15.3	130	12.8	2.70	125.5	0.852
		9/22/03	240	6.9	14.0									
Swale-2	Swale Ck at Harms Road (RM 12.2)	4/2/03	230	8.5	10.0	23.0	3.99	10.4	12.3	117	2.96	2.93	100.0	0.899
		9/22/03	300	8.7	21.0									
Swale-1	Swale Ck Nr Mouth (RM 0.3)	4/21/03	160	8.7	16.0	14.4	3.03	8.80	8.9	85.2	1.64	1.81	72.1	0.150 U
		9/26/03	380	7.7	17.0	31.7	4.17	20.40	23.9	215	0.551	3.69	162.9	0.150 U
Swale Creek Field Parameters	RM 10.8	9/23/03	200	7.1	13.0									
	RM 10.1	9/23/03	290	7.5	14.5									
	Confl. with Stacker Canyon (RM 9.2)	9/23/03	170	7.9	15.0									
	RM 9.2 abv Stacker Canyon	9/23/03	160	8.4	17.0									
	RM 4.6	9/23/03	180	7.6	19.5									
Mainstem Klickitat River														
MainStem-1	Mainstem Klickitat River at Confluence with Swale Ck.	4/2/03	100	8.3	9.0	9.78	2.0 U	5.23	6.99	50.4	1.54	1.23	46.0	0.294

Table 2 - Water Quality Data, April and September 2003

			Field Parameters			Common Cations				Common Anions				
Sample	Location	Sample Date	Elec. Conduct. in µS/cm	pH	Temp. in °C	Calcium in mg/L	Potassium in mg/L	Magnesium in mg/L	Sodium in mg/L	Bicarbonate Alkalinity in mg/L as CaCO3	Sulfate in mg/L	Chloride in mg/L	Hardness in mg/l as CaCO3	Iron in mg/L
Little Klickitat Subbasin														
Springs from Wanapum Basalt														
Shelton-1	Shelton Sprg (T6N R14E S35)	4/22/03	50	7.9	7.0	7.02	2.0 U	3.14	3.86	32.0	0.40 U	1.08	30.4	6.59
Springs from Simcoe Volcanics														
Presher-1	Presher Sprg (T6N R15E S34)	4/23/03	90	7.6	8.5	8.88	2.0 U	5.27	4.33	46.8	0.40 U	0.929	43.8	0.150 U
		9/24/03	70	7.1	10.5	8.24	2.0 U	4.72	3.75	48.2	0.40 U	0.78	40.0	0.150 U
Bloodgood-1	Bloodgood Spr (T4N R16E S8)	4/23/03	90	7.7	11.0	10.1	2.0 U	5.61	4.31	49.8	0.40 U	1.24	48.3	0.150 U
		9/25/03	90	7.7	11.0	8.53	2.0 U	4.68	3.6	51.8	0.40 U	0.955	40.5	0.150 U
Surface Waters														
Block-1	Blockhouse Ck @ RM 3.9	4/21/03	150	7.8	13.0	13.1	2.0 U	7.82	5.83	54	2.22	0.922	64.8	0.729
		9/22/03	110	7.8	13.5	10.4	2.0 U	6.11	4.91	57.4	0.689	0.825	51.1	0.797
Block-2	Blockhouse Ck @ RM 4.3	4/21/03	110	7.8	13.0									
		9/22/03	100	7.8	13.5									
Bloodgood-2	Bloodgood Ck @ N. Mill St. (RM	4/23/03	100	7.9	13.0	10	2.0 U	5.53	4.47	50.8	0.46	1.37	47.7	0.518
		9/25/03	90	7.8	14.0									
Bowman-1	Bowman Ck @ RM 0.5	4/22/03	90	7.6	11.0	7.73	2.0 U	4.38	4.47	41.6	0.55	1.07	37.3	0.441
		9/23/03	130	8.7	14.5	10.7	2.0 U	6.72	6.53	68.4	0.4 U	1.85	54.3	0.227
Bowman-2	Bowman Ck @ RM 3.6	4/22/03	90	7.8	10.0									
		9/24/03	90	7.5	10.5									
Bowman-3	Bowman Ck @ RM 12.8	4/22/03	50	7.9	12.0									
		9/24/03	80	7.8	11.0									
Bowman-4	Bowman Ck @ RM 16.8	4/22/03	30	8.0	8.0									
		9/24/03	40	7.2	10.0									
Butler-1	Butler Ck @ RM 3.7	4/24/03	30	8.1	5.5									
		9/25/03	50	7.8	11.0									
Butler-2	Butler Ck @ RM 0.1	4/25/03	40	7.9	5.5	4.23	2.0 U	1.99	2.22	22.4	0.40 U	0.502	18.7	0.150 U
		9/25/03	90	7.9	13.5	8.6	2.0 U	4.21	3.72	47.4	0.40 U	0.524	38.8	0.150 U
Canyon-1	Canyon Ck @ RM 5.0	4/22/03	80	7.8	11.5	7.45	2.0 U	3.31	4.14	35.6	0.40 U	1.09	32.2	0.277
Canyon-2	Canyon Ck @ RM 8.6	4/22/03	60	8.0	13.0									
Devil-1	Devils Canyon @ RM 2.1	4/23/03	40	7.8	5.0									
		9/24/03	40	7.5	12.5									

Table 2 - Water Quality Data, April and September 2003

Sample	Location	Sample Date	Field Parameters: Elec. Conduct. in µS/cm	Field Parameters: pH	Field Parameters: Temp. in °C	Common Cations: Calcium in mg/L	Common Cations: Potassium in mg/L	Common Cations: Magnesium in mg/L	Common Cations: Sodium in mg/L	Common Anions: Bicarbonate Alkalinity in mg/L as CaCO3	Common Anions: Sulfate in mg/L	Common Anions: Chloride in mg/L	Hardness in mg/l as CaCO3	Iron in mg/L
Little Klickitat Subbasin (continued)														
Surface Waters (continued)														
Dry-1	Mouth of Brimstone Ck	4/24/03 9/25/03	100 120	8.0 7.8	7.0 10.5	7.52	2.0 U	3.6	2.87	37.4	0.40 U	0.535	33.6	0.150 U
Dry-2	Dry Ck @ RM 2.1	4/24/03	40	8.0	7.5									
Dry-3	Dry Ck @ RM 1.9	4/24/03 9/25/03	70 120	8.0 7.4	7.0 10.5	12.6	2.0 U	6.54	3.74	67.2	0.40 U	0.431	58.3	0.150 U
Dry-4	Dry Ck @ RM 0.7	4/24/03	60	8.0	8.0									
Dry-5	Dry Ck @ RM 6.2	4/24/03	40	7.9	5.5									
East Prong-1	East Prong Little Klickitat @ RM 0.3	4/25/03	70	7.8	7.0	8.01	2.0 U	3.80	3.72	40.2	0.40 U	1.01	35.6	0.150 U
Idlewild-2	Idlewild Ck @ RM 0.7	4/24/03	70	7.7	6.5									
Mill-1	Mill Ck @ RM 14.5	4/22/03 9/24/03	60 60	7.7 7.5	9.0 11.0	5.88 5.78	2.0 U 2.0 U	2.85 2.73	2.89 2.77	28.6 32.6	0.40 U 0.40 U	0.586 0.502	26.4 25.6	0.188 0.244
Mill-2	Mill Ck @ RM 12.7	4/23/03 9/24/03	50 70	7.8 7.7	6.5 12.5									
Mill-3	Mill Ck @ RM 8.4	4/23/03 9/24/03	60 60	7.8 7.6	8.0 14.0									
Mill-4	Mill Ck @ RM 4.0	4/22/03 9/24/03	70 80	7.7 8.2	10.0 9.5	6.58 7.33	2.0 U 2.0 U	3.84 4.25	3.8 3.66	36.4 45.4	0.40 U 0.40 U	0.888 0.707	32.2 35.8	0.741 0.991
West Prong-1	Eastern tributary to West Prong	4/24/03	60	8.1	6.0									
West Prong-2	West Prong @ RM ~0.06	4/25/03 9/25/03	50 60	8.0 7.7	6.0 14.0	5.3 5.99	2.0 U 2.0 U	2.36 2.61	2.58 2.81	26.4 32.6	0.40 U 0.40 U	0.567 0.474	22.9 25.7	0.150 U 0.150 U
West Prong-3	Downstream of eastern tributary	9/25/03	50	8.0	11.0	5.34	2.0 U	2.25	2.62	30.6	0.40 U	0.542	22.6	0.150 U
Spring-1	Spring Creek at Olson Rd @ RM 0.7	9/22/03	100	8.0	13.5	9.42	2.0 U	5.55	4.24	56	0.40 U	1.15	46.3	0.464

Table 2 - Water Quality Data, April and September 2003

Sample	Location	Sample Date	Field Parameters: Elec. Conduct. in µS/cm	Field Parameters: pH	Field Parameters: Temp. in °C	Common Cations: Calcium in mg/L	Common Cations: Potassium in mg/L	Common Cations: Magnesium in mg/L	Common Cations: Sodium in mg/L	Common Anions: Bicarbonate Alkalinity in mg/L as CaCO3	Common Anions: Sulfate in mg/L	Common Anions: Chloride in mg/L	Hardness in mg/l as CaCO3	Iron in mg/L
Little Klickitat Subbasin (continued)														
Surface Waters (continued)														
Little Klick-1	Little Klickitat at Highway 97 @ RM 17.5	9/25/03	130	8.4	18.0									
Little Klick-2	Little Klickitat at Olson Rd @ RM 9.0	9/24/03	140	8.7	18.5									
Little Klick-3	Little Klickitat at SR142 @ RM 0.15	9/23/03	120	8.7	15.0									

Notes:
U: Not detected at associated reporting limit.
Carbonate alkalinity and hydroxide alkalinity (anions, not so common) were also analyzed in each sample, but neither was detected in any sample at a 5.0 mg/L detection limit.
Blanks indicate no analysis for that parameter.
RM: River mile measured from stream mouth.

Table 2 - Water Quality Data, April and September 2003

Manganese in mg/L
0.0185 0.01 U
0.01 U
0.0391
0.15
0.056
0.01 U 0.0168
0.01 U

Table 2 - Water Quality Data, April and September 2003

Manganese in mg/L
0.0434
0.01 U 0.01 U
0.01 U 0.01 U
0.0403 0.0797
0.0113
0.01 U 0.01 U
0.01 U 0.01 U
0.0105

Table 2 - Water Quality Data, April and September 2003

Manganese in mg/L
0.01 U
0.01 U
0.01 U
0.01 U 0.0131
0.014 0.029
0.01 U 0.01 U
0.01 U
0.0289

Table 2 - Water Quality Data, April and September 2003

Manganese in mg/L

APPENDIX A

Laboratory Certificates of Analysis
North Creek Analytical Inc.

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

08 October 2003

Steve Germiat, PG, CGWP
Aspect Consulting - Seattle
811 1st Avenue, Suite 480
Seattle, WA 98104

RE: WRIA 30 Water Storage Assessment

Enclosed are the results of analyses for samples received by the laboratory on 09/26/03 13:47. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Gerdes
Project Manager

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

www.ncalabs.com

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BLOCK-1	B3I0800-01	Water	09/22/03 15:30	09/26/03 13:47
SPRING-1	B3I0800-02	Water	09/22/03 17:30	09/26/03 13:47
SPR-1	B3I0800-03	Water	09/23/03 10:25	09/26/03 13:47
SPR-3	B3I0800-04	Water	09/23/03 14:45	09/26/03 13:47
SWALE-1	B3I0800-05	Water	09/23/03 15:40	09/26/03 13:47
BOWMAN-1	B3I0800-06	Water	09/23/03 16:30	09/26/03 13:47
MILL-4	B3I0800-07	Water	09/24/03 09:40	09/26/03 13:47
PRESHER-1	B3I0800-08	Water	09/24/03 13:20	09/26/03 13:47
MILL-1	B3I0800-09	Water	09/24/03 15:20	09/26/03 13:47
DRY-3	B3I0800-10	Water	09/25/03 10:35	09/26/03 13:47
BUTLER-2	B3I0800-11	Water	09/25/03 11:30	09/26/03 13:47
WEST PRONG-3	B3I0800-12	Water	09/25/03 14:00	09/26/03 13:47
WEST PRONG-2	B3I0800-13	Water	09/25/03 15:10	09/26/03 13:47
BLOOD GOOD-1	B3I0800-14	Water	09/25/03 16:20	09/26/03 13:47

North Creek Analytical - Bothell

Jeff Gerdes

Jeff Gerdes, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BLOCK-1 (B3I0800-01) Water Sampled: 09/22/03 15:30 Received: 09/26/03 13:47									
Calcium	**10.4**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.797**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**6.11**	0.500	"	"	"	"	"	"	
Manganese	**0.0797**	0.0100	"	"	"	"	"	"	
Sodium	**4.91**	0.250	"	"	"	"	"	"	
SPRING-1 (B3I0800-02) Water Sampled: 09/22/03 17:30 Received: 09/26/03 13:47									
Calcium	**9.42**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.464**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**5.55**	0.500	"	"	"	"	"	"	
Manganese	**0.0289**	0.0100	"	"	"	"	"	"	
Sodium	**4.24**	0.250	"	"	"	"	"	"	
SPR-1 (B3I0800-03) Water Sampled: 09/23/03 10:25 Received: 09/26/03 13:47									
Calcium	**9.00**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.208**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**7.04**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**4.84**	0.250	"	"	"	"	"	"	
SPR-3 (B3I0800-04) Water Sampled: 09/23/03 14:45 Received: 09/26/03 13:47									
Calcium	**32.3**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**1.20**	0.150	"	"	"	"	"	"	
Potassium	**6.30**	2.00	"	"	"	"	"	"	
Magnesium	**35.4**	0.500	"	"	"	"	"	"	
Manganese	**0.0391**	0.0100	"	"	"	"	"	"	
Sodium	**42.2**	0.250	"	"	"	"	"	"	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes

Jeff Gerdes, Project Manager

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

www.ncalabs.com

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SWALE-1 (B3I0800-05) Water Sampled: 09/23/03 15:40 Received: 09/26/03 13:47									
Calcium	**31.7**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	**4.17**	2.00	"	"	"	"	"	"	
Magnesium	**20.4**	0.500	"	"	"	"	"	"	
Manganese	**0.0168**	0.0100	"	"	"	"	"	"	
Sodium	**23.9**	0.250	"	"	"	"	"	"	
BOWMAN-1 (B3I0800-06) Water Sampled: 09/23/03 16:30 Received: 09/26/03 13:47									
Calcium	**10.7**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.227**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**6.72**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**6.53**	0.250	"	"	"	"	"	"	
MILL-4 (B3I0800-07) Water Sampled: 09/24/03 09:40 Received: 09/26/03 13:47									
Calcium	**7.33**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.991**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**4.25**	0.500	"	"	"	"	"	"	
Manganese	**0.0290**	0.0100	"	"	"	"	"	"	
Sodium	**3.66**	0.250	"	"	"	"	"	"	
PRESHER-1 (B3I0800-08) Water Sampled: 09/24/03 13:20 Received: 09/26/03 13:47									
Calcium	**8.24**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**4.72**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**3.75**	0.250	"	"	"	"	"	"	

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MILL-1 (B3I0800-09) Water Sampled: 09/24/03 15:20 Received: 09/26/03 13:47									
Calcium	**5.78**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	**0.244**	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**2.73**	0.500	"	"	"	"	"	"	
Manganese	**0.0131**	0.0100	"	"	"	"	"	"	
Sodium	**2.77**	0.250	"	"	"	"	"	"	
DRY-3 (B3I0800-10) Water Sampled: 09/25/03 10:35 Received: 09/26/03 13:47									
Calcium	**12.6**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**6.54**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**3.74**	0.250	"	"	"	"	"	"	
BUTLER-2 (B3I0800-11) Water Sampled: 09/25/03 11:30 Received: 09/26/03 13:47									
Calcium	**8.60**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**4.21**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**3.72**	0.250	"	"	"	"	"	"	
WEST PRONG-3 (B3I0800-12) Water Sampled: 09/25/03 14:00 Received: 09/26/03 13:47									
Calcium	**5.34**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**2.25**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**2.62**	0.250	"	"	"	"	"	"	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes, Project Manager

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project:	WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number:	020070	**Reported:**
Seattle, WA 98104	Project Manager:	Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
WEST PRONG-2 (B3I0800-13) Water	**Sampled: 09/25/03 15:10**		**Received: 09/26/03 13:47**						
Calcium	**5.99**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**2.61**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**2.81**	0.250	"	"	"	"	"	"	
BLOOD GOOD-1 (B3I0800-14) Water	**Sampled: 09/25/03 16:20**		**Received: 09/26/03 13:47**						
Calcium	**8.53**	0.250	mg/l	1	3I30051	09/30/03	10/01/03	EPA 6010B	
Iron	ND	0.150	"	"	"	"	"	"	
Potassium	ND	2.00	"	"	"	"	"	"	
Magnesium	**4.68**	0.500	"	"	"	"	"	"	
Manganese	ND	0.0100	"	"	"	"	"	"	
Sodium	**3.60**	0.250	"	"	"	"	"	"	

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BLOCK-1 (B3I0800-01) Water Sampled: 09/22/03 15:30 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**57.4**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**57.4**	5.00	"	"	"	"	"	"	
SPRING-1 (B3I0800-02) Water Sampled: 09/22/03 17:30 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**56.0**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**56.0**	5.00	"	"	"	"	"	"	
SPR-1 (B3I0800-03) Water Sampled: 09/23/03 10:25 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**55.8**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**55.8**	5.00	"	"	"	"	"	"	
SPR-3 (B3I0800-04) Water Sampled: 09/23/03 14:45 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**308**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**308**	5.00	"	"	"	"	"	"	
SWALE-1 (B3I0800-05) Water Sampled: 09/23/03 15:40 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**215**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**215**	5.00	"	"	"	"	"	"	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes, Project Manager

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BOWMAN-1 (B3I0800-06) Water Sampled: 09/23/03 16:30 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**68.4**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**68.4**	5.00	"	"	"	"	"	"	
MILL-4 (B3I0800-07) Water Sampled: 09/24/03 09:40 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**45.4**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**45.4**	5.00	"	"	"	"	"	"	
PRESHER-1 (B3I0800-08) Water Sampled: 09/24/03 13:20 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**48.2**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**48.2**	5.00	"	"	"	"	"	"	
MILL-1 (B3I0800-09) Water Sampled: 09/24/03 15:20 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**32.6**	5.00	mg/L as CaCO3	1	3J02036	10/02/03	10/02/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**32.6**	5.00	"	"	"	"	"	"	
DRY-3 (B3I0800-10) Water Sampled: 09/25/03 10:35 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**67.2**	5.00	mg/L as CaCO3	1	3J06061	10/06/03	10/06/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**67.2**	5.00	"	"	"	"	"	"	

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

www.ncalabs.com

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Conventional Chemistry Parameters by APHA/EPA Methods

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BUTLER-2 (B3I0800-11) Water Sampled: 09/25/03 11:30 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**47.4**	5.00	mg/L as CaCO3	1	3J06061	10/06/03	10/06/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**47.4**	5.00	"	"	"	"	"	"	
WEST PRONG-3 (B3I0800-12) Water Sampled: 09/25/03 14:00 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**30.6**	5.00	mg/L as CaCO3	1	3J06061	10/06/03	10/06/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**30.6**	5.00	"	"	"	"	"	"	
WEST PRONG-2 (B3I0800-13) Water Sampled: 09/25/03 15:10 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**32.6**	5.00	mg/L as CaCO3	1	3J06061	10/06/03	10/06/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**32.6**	5.00	"	"	"	"	"	"	
BLOOD GOOD-1 (B3I0800-14) Water Sampled: 09/25/03 16:20 Received: 09/26/03 13:47									
Bicarbonate Alkalinity	**51.8**	5.00	mg/L as CaCO3	1	3J06061	10/06/03	10/06/03	SM 2320B	
Carbonate Alkalinity	ND	5.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	5.00	"	"	"	"	"	"	
Total Alkalinity	**51.8**	5.00	"	"	"	"	"	"	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes, Project Manager

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Anions by EPA Method 300.0
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BLOCK-1 (B3I0800-01) Water Sampled: 09/22/03 15:30 Received: 09/26/03 13:47									
Chloride	**0.825**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	**0.689**	0.400	"	"	"	"	"	"	
SPRING-1 (B3I0800-02) Water Sampled: 09/22/03 17:30 Received: 09/26/03 13:47									
Chloride	**1.15**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
SPR-1 (B3I0800-03) Water Sampled: 09/23/03 10:25 Received: 09/26/03 13:47									
Chloride	**1.59**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	**3.63**	0.400	"	"	"	"	"	"	
SPR-3 (B3I0800-04) Water Sampled: 09/23/03 14:45 Received: 09/26/03 13:47									
Chloride	**3.56**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
SWALE-1 (B3I0800-05) Water Sampled: 09/23/03 15:40 Received: 09/26/03 13:47									
Chloride	**3.69**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	**0.551**	0.400	"	"	"	"	"	"	
BOWMAN-1 (B3I0800-06) Water Sampled: 09/23/03 16:30 Received: 09/26/03 13:47									
Chloride	**1.85**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
MILL-4 (B3I0800-07) Water Sampled: 09/24/03 09:40 Received: 09/26/03 13:47									
Chloride	**0.707**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

www.ncalabs.com

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Anions by EPA Method 300.0
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRESHER-1 (B3I0800-08) Water Sampled: 09/24/03 13:20 Received: 09/26/03 13:47									
Chloride	**0.780**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
MILL-1 (B3I0800-09) Water Sampled: 09/24/03 15:20 Received: 09/26/03 13:47									
Chloride	**0.502**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
DRY-3 (B3I0800-10) Water Sampled: 09/25/03 10:35 Received: 09/26/03 13:47									
Chloride	**0.431**	0.400	mg/l	1	3J03002	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
BUTLER-2 (B3I0800-11) Water Sampled: 09/25/03 11:30 Received: 09/26/03 13:47									
Chloride	**0.524**	0.400	mg/l	1	3J03004	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
WEST PRONG-3 (B3I0800-12) Water Sampled: 09/25/03 14:00 Received: 09/26/03 13:47									
Chloride	**0.542**	0.400	mg/l	1	3J03004	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
WEST PRONG-2 (B3I0800-13) Water Sampled: 09/25/03 15:10 Received: 09/26/03 13:47									
Chloride	**0.474**	0.400	mg/l	1	3J03004	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	
BLOOD GOOD-1 (B3I0800-14) Water Sampled: 09/25/03 16:20 Received: 09/26/03 13:47									
Chloride	**0.955**	0.400	mg/l	1	3J03004	10/02/03	10/02/03	EPA 300.0	
Sulfate	ND	0.400	"	"	"	"	"	"	

North Creek Analytical - Bothell

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Jeff Gerdes

Jeff Gerdes, Project Manager

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project:	WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number:	020070	**Reported:**
Seattle, WA 98104	Project Manager:	Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3I30051: Prepared 09/30/03 Using EPA 3010A										
Blank (3I30051-BLK1)										
Calcium	ND	0.250	mg/l							
Iron	ND	0.150	"							
Magnesium	ND	0.500	"							
Manganese	ND	0.0100	"							
Potassium	ND	2.00	"							
Sodium	ND	0.250	"							
LCS (3I30051-BS1)										
Calcium	5.01	0.250	mg/l	5.00		100	80-120			
Iron	5.05	0.150	"	5.00		101	80-120			
Magnesium	5.21	0.500	"	5.00		104	80-120			
Manganese	5.20	0.0100	"	5.00		104	80-120			
Potassium	11.1	2.00	"	10.0		111	80-120			
Sodium	4.93	0.250	"	5.00		98.6	80-120			
LCS Dup (3I30051-BSD1)										
Calcium	5.17	0.250	mg/l	5.00		103	80-120	3.14	20	
Iron	5.18	0.150	"	5.00		104	80-120	2.54	20	
Magnesium	5.34	0.500	"	5.00		107	80-120	2.46	20	
Manganese	5.34	0.0100	"	5.00		107	80-120	2.66	20	
Potassium	11.5	2.00	"	10.0		115	80-120	3.54	20	
Sodium	5.04	0.250	"	5.00		101	80-120	2.21	20	
Matrix Spike (3I30051-MS1)					**Source: B3I0800-01**					
Calcium	15.7	0.250	mg/l	5.00	10.4	106	75-125			
Iron	5.97	0.150	"	5.00	0.797	103	75-125			
Magnesium	11.4	0.500	"	5.00	6.11	106	80-120			
Manganese	5.40	0.0100	"	5.00	0.0797	106	75-125			
Potassium	12.7	2.00	"	10.0	1.39	113	80-120			
Sodium	10.2	0.250	"	5.00	4.91	106	75-125			

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project:	WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number:	020070	**Reported:**
Seattle, WA 98104	Project Manager:	Steve Germiat, PG, CGWP	10/08/03 13:25

Total Metals by EPA 6000/7000 Series Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3I30051: Prepared 09/30/03 Using EPA 3010A										
Matrix Spike Dup (3I30051-MSD1)					**Source: B3I0800-01**					
Calcium	15.9	0.250	mg/l	5.00	10.4	110	75-125	1.27	20	
Iron	5.94	0.150	"	5.00	0.797	103	75-125	0.504	20	
Magnesium	11.5	0.500	"	5.00	6.11	108	80-120	0.873	20	
Manganese	5.29	0.0100	"	5.00	0.0797	104	75-125	2.06	20	
Potassium	12.4	2.00	"	10.0	1.39	110	80-120	2.39	20	
Sodium	10.2	0.250	"	5.00	4.91	106	75-125	0.00	20	
Post Spike (3I30051-PS1)					**Source: B3I0800-01**					
Calcium	15.3	0.250	mg/l	5.00	10.4	98.0	75-125			
Iron	5.67	0.150	"	5.00	0.797	97.5	75-125			
Magnesium	11.1	0.500	"	5.00	6.11	99.8	75-125			
Manganese	5.08	0.0100	"	5.00	0.0797	100	75-125			
Potassium	12.0	2.00	"	10.0	1.39	106	75-125			
Sodium	9.81	0.250	"	5.00	4.91	98.0	75-125			

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3J02036: Prepared 10/02/03 Using General Preparation										
Blank (3J02036-BLK1)										
Bicarbonate Alkalinity	ND	5.00	mg/L as CaCO3							
Carbonate Alkalinity	ND	5.00	"							
Hydroxide Alkalinity	ND	5.00	"							
Total Alkalinity	ND	5.00	"							
LCS (3J02036-BS1)										
Total Alkalinity	51.2	5.00	mg/L as CaCO3	50.0		102	90-110			
LCS Dup (3J02036-BSD1)										
Total Alkalinity	51.1	5.00	mg/L as CaCO3	50.0		102	90-110	0.196	20	
Duplicate (3J02036-DUP1)					**Source: B3I0800-01**					
Bicarbonate Alkalinity	58.4	5.00	mg/L as CaCO3		57.4			1.73	6	
Carbonate Alkalinity	ND	5.00	"		ND			NA	6	
Hydroxide Alkalinity	ND	5.00	"		ND			NA	6	
Total Alkalinity	58.4	5.00	"		57.4			1.73	6	
Batch 3J06061: Prepared 10/06/03 Using General Preparation										
Blank (3J06061-BLK1)										
Bicarbonate Alkalinity	ND	5.00	mg/L as CaCO3							
Carbonate Alkalinity	ND	5.00	"							
Hydroxide Alkalinity	ND	5.00	"							
Total Alkalinity	ND	5.00	"							
LCS (3J06061-BS1)										
Total Alkalinity	51.3	5.00	mg/L as CaCO3	50.0		103	90-110			

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3J06061: Prepared 10/06/03 Using General Preparation										
LCS Dup (3J06061-BSD1)										
Total Alkalinity	51.1	5.00	mg/L as CaCO3	50.0		102	90-110	0.391	20	
Duplicate (3J06061-DUP1)					**Source: B3I0800-14**					
Bicarbonate Alkalinity	52.0	5.00	mg/L as CaCO3		51.8			0.385	6	
Carbonate Alkalinity	ND	5.00	"		ND			NA	6	
Hydroxide Alkalinity	ND	5.00	"		ND			NA	6	
Total Alkalinity	52.0	5.00	"		51.8			0.385	6	

Aspect Consulting - Seattle	Project: WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number: 020070	**Reported:**
Seattle, WA 98104	Project Manager: Steve Germiat, PG, CGWP	10/08/03 13:25

Anions by EPA Method 300.0 - Quality Control
North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3J03002: Prepared 10/02/03 Using General Preparation										
Blank (3J03002-BLK1)										
Chloride	ND	0.400	mg/l							
Sulfate	ND	0.400	"							
LCS (3J03002-BS1)										
Chloride	1.99	0.400	mg/l	2.00		99.5	90-110			
Sulfate	5.99	0.400	"	6.00		99.8	90-110			
LCS Dup (3J03002-BSD1)										
Chloride	2.04	0.400	mg/l	2.00		102	90-110	2.48	20	
Sulfate	6.08	0.400	"	6.00		101	90-110	1.49	20	
Duplicate (3J03002-DUP1)					**Source: B3J0038-01**					
Chloride	4.48	0.400	mg/l		4.52			0.889	25	
Sulfate	3.36	0.400	"		3.38			0.593	25	
Duplicate (3J03002-DUP2)					**Source: B3J0057-01**					
Chloride	1.67	0.400	mg/l		1.66			0.601	25	
Sulfate	2.04	0.400	"		2.08			1.94	25	
Matrix Spike (3J03002-MS1)					**Source: B3J0038-01**					
Chloride	6.24	0.800	mg/l	2.00	4.52	86.0	52-134			
Sulfate	9.30	0.400	"	6.00	3.38	98.7	58-135			
Matrix Spike (3J03002-MS2)					**Source: B3J0057-01**					
Chloride	3.71	0.400	mg/l	2.00	1.66	102	52-134			
Sulfate	7.99	0.400	"	6.00	2.08	98.5	58-135			

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588
Anchorage 2000 W International Airport Road, Suite A-10, Anchorage, AK 99502-1119
907.563.9200 fax 907.563.9210

Anions by EPA Method 300.0 - Quality Control

North Creek Analytical - Bothell

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3J03004: Prepared 10/02/03 Using General Preparation										
Blank (3J03004-BLK1)										
Chloride	ND	0.400	mg/l							
Sulfate	ND	0.400	"							
LCS (3J03004-BS1)										
Chloride	1.98	0.400	mg/l	2.00		99.0	90-110			
Sulfate	6.04	0.400	"	6.00		101	90-110			
LCS Dup (3J03004-BSD1)										
Chloride	2.02	0.400	mg/l	2.00		101	90-110	2.00	20	
Sulfate	6.00	0.400	"	6.00		100	90-110	0.664	20	
Duplicate (3J03004-DUP1)					**Source: B3I0800-11**					
Chloride	0.540	0.400	mg/l		0.524			3.01	25	
Sulfate	ND	0.400	"		0.172			5.99	25	
Matrix Spike (3J03004-MS1)					**Source: B3I0800-11**					
Chloride	2.44	0.400	mg/l	2.00	0.524	95.8	52-134			
Sulfate	6.15	0.400	"	6.00	0.172	99.6	58-135			

Aspect Consulting - Seattle	Project:	WRIA 30 Water Storage Assessment	
811 1st Avenue, Suite 480	Project Number:	020070	**Reported:**
Seattle, WA 98104	Project Manager:	Steve Germiat, PG, CGWP	10/08/03 13:25

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference