SCREENING-LEVEL RISK ASSESSMENT OF THE GREEN RIVER WATERSHED

Freshwater Project

August 2005

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King County

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Acronyms

7-DADmax	7-Day Average of Daily Maximum Temperatures
ACR	Acute-Chronic Ratio
AQUIRE	Aquatic Toxicity Information Retrieval Database
AWQC	Ambient Water Quality Criteria
B-IBI	Benthic Index of Biotic Integrity
BLM	Biotic Ligand Model
CCC	Criterion Continuous Concentration
ChV	Chronic Value (geometric mean of NOEC and LOEC)
CMC	Criterion Maximum Concentration
cfs	Cubic Feet Per Second
CSO	Combined Sewer Overflow
DNRP	Department of Natural Resources and Parks
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
EC50	Median Effect Concentration: Concentration affecting 50 percent of a test population
EDC	Endocrine Disrupting Compound
ELS	Early Life Stage
FAV	Final Acute Value
GD-WQA	Green-Duwamish Water Quality Assessment
HQ	Hazard Quotient
LC	Life Cycle
LC50	Median Lethal Concentration: Concentration that is lethal to 50 percent of a test population
LIMS	Laboratory Information Management System
LOEC	Lowest Observed Effect Concentration
MDL	Method Detection Limit
NOEC	No Observed Effect Concentration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RM	River Mile
SEV	Severity of Ill Effects Index
SLRA	Screening Level Risk Assessment
SMAV	Species Mean Acute Value

SV	Screening Value
SWAMP	Sammamish-Washington Analysis and Modeling Program
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
WQA	Water Quality Assessment
WQS	Water Quality Standards
WRIA	Watershed Resource Inventory Areas

EXECUTIVE SUMMARY

In support of King County's Green-Duwamish Watershed Water Quality Assessment (GD-WQA) project, this report presents a screening-level risk assessment (SLRA) of existing conditions in the Green-Duwamish watershed. The watershed is characterized by a variety of land uses, including residential and industrial uses in the Lower Green/Duwamish River, a mix of residential, commercial, agriculture, and forested land uses in the Middle Green River, and primarily forest production in the Upper Green River. Aquatic habitat in most portions of the Green River has been altered by one or more factors, including the Howard Hanson Dam (the boundary between the Upper and Middle Green River), channel modifications, and upland development, which have, among other things, reduced forest cover and increased impervious surface, resulted in altered stream flows, and increased non-point sources of pollutants. The Green River and several tributaries are on the Washington State Department of Ecology's 303(d) list for one or more of the following parameters: dissolved oxygen (DO), temperature, fecal coliform, pH, copper, and mercury. This quantitative assessment of existing conditions is based almost entirely on surface water quality data[1]. The Benthic Index of Biotic Integrity (B-IBI) was used as an additional line-of-evidence for evaluating watershed environmental health.

Water Quality Data

The watershed consists of 14 sub-basins. The water quality data used in the SLRA were collected from one or more streams in 11 of these: (1) Duwamish River; (2) Longfellow Creek; (3) Black River (Springbrook Creek); (4) Lower Green River - West; (5) Mill Creek; (6) Soos Creek; (7) Jenkins Creek; (8) Covington Creek; (9) Middle Green River; (10) Newaukum Creek; and (11) Upper Green River (outlet only[2]) (the three sub-basins lacking water quality data were Lower Green River – East, Coal Creek, and Deep Creek). The water quality parameters evaluated included chemical and physical stressors (e.g., temperature, dissolved oxygen, total suspended solids [TSS]), in addition to indicators of biological stressors (fecal coliform and *E. coli*). The primary data source was the King County Laboratory Information Management System (LIMS) database. These data were supplemented by additional data collected by the Washington State Department of Ecology and the U.S. Geological Survey. Data collected between January 1, 1999 and December 31, 2003 were used in the SLRA. The data from these various sources were collected to support a variety of studies in the watershed and much of the data were not specifically collected to support this SLRA. Consequently, the numbers and types of parameters analyzed at a given site are highly variable. Overall, 187 chemicals were

[1] Sediment and biota tissue chemistry data are generally lacking for the study area and this represents a data gap. The lower Duwamish River is an exception, but sediment and biota tissue in this reach were previously evaluated in the Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay (King County 1999).

[2] The Upper Green River sub-basin is not part of the project study area, although water quality data for a single station at the downstream boundary of the sub-basin were evaluated. This station is downstream from the Howard Hanson Dam and, thus, should not be considered representative of conditions in the Upper Green River.

evaluated in this SLRA, although the number of parameters measured at any given station varied.

Chemical Risks

Of the 187 chemicals evaluated as part of this SLRA, 127 were never detected in any water sample and were excluded from further evaluation in the SLRA. For the remaining 60 chemicals that were detected in at least one sample from any sub-basin, acute and chronic toxicity screening values (SVs) were identified. For each station, chemical concentrations were divided by their respective SVs on a sample-by-sample basis. The resulting quotient was termed a hazard quotient (HQ). An HQ equal to or less than 1.0 was assumed to be indicative of low or negligible chemical risk, while an HQ greater than 1.0 identified chemicals posing a potential risk. The range of resulting HQs was then characterized by their 5th, 25th, 50th, 75th, and 95th percentiles to provide information on the frequency with which HQs at each station exceeded 1.0.

Ten chemicals had an HQ greater than 1.0 for at least one sample and only two – aluminum and iron – had at least one HQ greater than 1.0 in all sub-basins in which they were analyzed. The chemicals measured in the Jenkins and Covington Creek sub-basins were limited to ammonia-nitrogen and nitrite+nitrate-nitrogen, but all HQs were less than 1.0. With the exception of aluminum, iron, and strontium, often less than five percent of the samples at a given station exceeded the SV. The SVs for aluminum, iron, and strontium are all highly uncertain, likely biased low for the Green-Duwamish watershed, and, consequently, these metals are unlikely to pose an unacceptable risk to aquatic life in the watershed. Overall, for the remaining chemicals, most HQs greater than 1.0 were based on exceedances of chronic SVs. Given (1) the relatively low number of chemicals with an HQ greater than 1.0 at each station; (2) the low frequency that HQs exceed 1.0 (generally only the 95th percentile or maximum HQs exceeded 1.0 when there was an exceedance); and (3) the generally low magnitude of the HQs, aquatic life appear to be at minimal risk from water column chemical stressors based on existing conditions. Consequently, a detailed chemical risk assessment is not recommended based on the existing water quality data.

Total Suspended Solids Risk

Potential risk posed by total suspended solids (TSS) to aquatic life was also evaluated using an HQ approach. Acute and chronic TSS SVs were conservatively identified based on effects studies conducted in the laboratory. Total suspended solids HQs exceeded 1.0 in at least a portion of the samples from nine of the 11 sub-basins for which these data were available, although median HQs never exceeded 1.0. In the Jenkins and Covington Creek sub-basins, all TSS HQs were less than 1.0. In the nine sub-basins with TSS HQs greater than 1.0, the relative frequency of exceedances was low (2-12% of the samples). Given the low frequency of exceedances and conservative nature of the TSS SVs, TSS risks to aquatic life in the Green River watershed are estimated to be low. More extensive sampling to evaluate TSS levels over shorter time intervals (hours to days) and TSS effects levels based on indigenous species would be required to refine the TSS risk estimates further.

Dissolved Oxygen and Temperature Results

Elevated temperatures and low dissolved oxygen (DO) are a concern for several water bodies in the Green-Duwamish watershed. The Duwamish River, Green River, Little Soos Creek, Soosette Creek, Mullen Slough, Newaukum Creek, Soos Creek, and Mill Creek are all on the 2002/2004 303(d) list for DO, and the Green River and Little Soos Creek are on the 303(d) list for temperature. The DO analyses in this SLRA support these listings, and also suggest that low DO levels in Longfellow Creek and the Black River (Springbrook Creek) may pose a risk to salmonids. Stations in Mullen Slough, Black River (Springbrook Creek), Mill Creek, Soos Creek, and Newaukum Creek had greater than 50 percent of samples out of compliance with water quality standards (WQS) for DO.

The temperature analysis and comparison to WQS presented in this SLRA were summarized from Taylor Associates and King County (2004). These temperature data were collected between July 2001 and September 2003 at 93 sites, representing 86 discrete locations and ten sub-basins. Of the 86 monitoring stations, 52 exceeded the temperature WQS applicable to the sub-basin (the WQS varies depending on the fish species and life stages present). Of these 52 stations, 20 had exceedances that averaged less than 1°C above the WQS, 26 stations had exceedances ranging from 1° to 3° above the WQS, and the remaining six stations averaged 3.0°C to 5.6°C above the WQS (Taylor Associates and King County 2004).

Overall, low DO and elevated temperatures appear to pose a risk to salmonids in several water bodies based on comparisons of field measurements to WQS. As recommended in Taylor Associates and King County (2004), areas with temperatures exceeding WQS that overlap with Chinook distribution should be targeted for temperature reduction measures. The recommendations include site-specific assessments on the potential for protection or acquisition of riparian areas, revegetation, restoration, and local management of water diversions or withdrawals (Taylor Associates and King County 2004).

pH Results

The Duwamish River is on the 2002/2004 303(d) list for pH; however, no other water bodies in the study area are on the list. Overall, pH in at least one sample is either below the minimum pH standard of 6.5 or above the maximum pH standard of 8.5 for nine of the 11 sub-basins with available pH data and 17 of the 70 stations evaluated watershed-wide. The stations with the highest frequency of not meeting WQS were Station 0317 in the Black River (Springbrook Creek) (pH in 6 of 81 samples [7%] were less than 6.5), Station Q320 in Soos Creek (pH in 5 of 66 samples [8%] were less than 6.5), and Station AA322 in Newaukum Creek (pH in 2 of 33 samples [6%] were greater than 8.5). Otherwise, the percentage of pH measurements not meeting the WQS ranged from 0-3.8 percent at the remaining stations. Overall, low pH may pose a risk to aquatic life in selected water bodies, but the risk is estimated to be low given the low frequency of samples that are out of compliance with WQS. Additional field studies and more

frequent sampling would be required to further determine the actual pH risk posed to aquatic life.

Benthic Index of Biotic Integrity

The benthic index of biotic integrity (B-IBI) was used as an additional line-of-evidence for evaluating potential risks to aquatic life in this SLRA. The B-IBI comprises ten metrics that describe different aspects of stream biology, including the diversity of species, abundance of certain species, presence/absence of species that are tolerant and intolerant to pollution, their reproductive strategy, feeding ecology, and population structure. Each metric is assigned a value of 1, 3, or 5 depending on what species are present at a site. A score of 5 is used to indicate little or no degradation, a score of 3 to indicate moderate degradation, and a score of 1 to indicate severe degradation.

All ten metric scores are summed to get a value ranging from 10 to 50. A score of 46-50 is generally considered excellent, 38-44 good, 28-36 fair, 18-26 poor and 10-16 very poor. Mean total-BIBI scores from studies conducted in 2002 and 2003 indicate that macroinvertebrate populations are ranked as “very poor” to “poor” in several sub-basins, yet the HQ analyses suggest low to negligible potential risk. Evaluating certain metrics expected to respond to elevated TSS or metal levels also did not identify strong correlations between the macroinvertebrate data and HQ results. Consequently, based on the water quality parameters evaluated, none seem to have a significant and strong influence on the macroinvertebrate community as measured by the B-IBI or the individual metrics. This is consistent with previous studies of basin impervious surface that found aquatic life was initially more affected by changes in habitat, land use and hydrologic conditions than chemical pollutants (e.g., Brabec et al. 2002).

A likely explanation for the low B-IBI scores and their poor correlation with chemical and physical water quality parameters is that habitat is likely an over-arching factor in the Green-Duwamish watershed. Habitat and development factors are important in the Green and Duwamish drainages. Using 2002 habitat data derived from the EVS report (EVS 2004), percent forest positively correlates ($r = 0.79$) with B-IBI scores for the Green-Duwamish sites. Furthermore, percent medium intensity developed land correlates negatively ($r = -0.77$) with B-IBI scores[3]. Therefore, the amount of development is likely masking any effect from chemical constituents in the water column. These habitat factors are likely much more important for the aquatic community than water quality parameters, such as individual metals.

Fecal Coliform and *Escherichia coli* Results

Fecal coliform and *Escherichia coli* data were used as an indicator of human pathogen exposure and risk to human health. Historically, fecal coliform had been indicated on the Ecology 303(d) listing as a water quality issue throughout many areas of the Green-

[3] These two habitat factors were evaluated as they correlated the best with B-IBI scores in the EVS report (2002).

Duwamish watershed. Analysis of current data showed that all sub-basins exceeded at least one of the water quality standards or criteria for pathogen indicators, except the outlet of the Upper Green River sub-basin (no fecal coliform or *E. coli* data were available for the Jenkins and Covington Creek sub-basins). Thus, fecal coliform and *E. coli* measurements throughout the watershed exceed human health-based water quality standards and criteria and indicate a potential risk to people using this area for recreational activities (e.g., swimming). However, it is uncertain whether the measured pathogen indicators are from human or other sources. King County is currently conducting a study to determine the sources of pathogens throughout the Green River watershed. This will assist in determining the origin of potential human pathogens and possibly indicate a link to the land use present at the various sub-basins.

1.0 INTRODUCTION

The King County Department of Natural Resources and Parks (DNRP) initiated the Green-Duwamish Watershed Water Quality Assessment (GD-WQA) project to develop analytical tools for evaluating current and future water quality issues in the Green-Duwamish watershed and to provide water quality information to a variety of clients, both internal and external to King County's DNRP. The GD-WQA will assist wastewater capital planning (including the Combined Sewer Overflow (CSO) program and habitat conservation planning), Watershed Resource Inventory Area (WRIA) 9 salmon conservation planning, stormwater management efforts, and the Department of Ecology's (Ecology) Total Maximum Daily Load (TMDL) program by collecting water quality information, developing a watershed model, and using the model to evaluate resource management options.

The specific purposes of the GD-WQA are as follows:

- To assess existing and future water quality conditions for selected parameters, and evaluate the impact of changes in landscape and/or best management practices for achieving Washington State water quality standards (WQS) in the Green-Duwamish Watershed.
- To assess the 303(d)-listed parameters of concern for the King County Wastewater Treatment Division (WTD) (e.g., parameters that could influence future CSO permit requirements - fecal coliform, enterococci, *E. coli*, and metals), including identification of sources of pathogen indicators and metals throughout the watershed.
- To provide information to support the WTD Habitat Conservation Plan (HCP) and WRIA 9 salmon conservation planning efforts, including information on water quality as a factor of decline for salmonids.
- To provide technical information to Ecology to support development of TMDLs and the assignment of waste load allocations.
- To create a working watershed model that can be used as a tool for regional water quality assessment and planning now and into the future.

The GD-WQA is comprised of a variety of tasks to assist with these project goals, with one of the first steps being an assessment of existing conditions using a screening-level risk assessment (SLRA) approach. The objective of the SLRA was to assess the risk of adverse effects to aquatic life from exposure to chemical (i.e., inorganic, organic substances) and physical (e.g., temperature, dissolved oxygen) stressors in surface water and adverse effects to people from exposure to pathogen indicators (e.g., *E. coli*, fecal coliform) in surface water for the purpose of prioritizing spatial and temporal control of these parameters in the watershed. The SLRA only evaluated water column stressors as

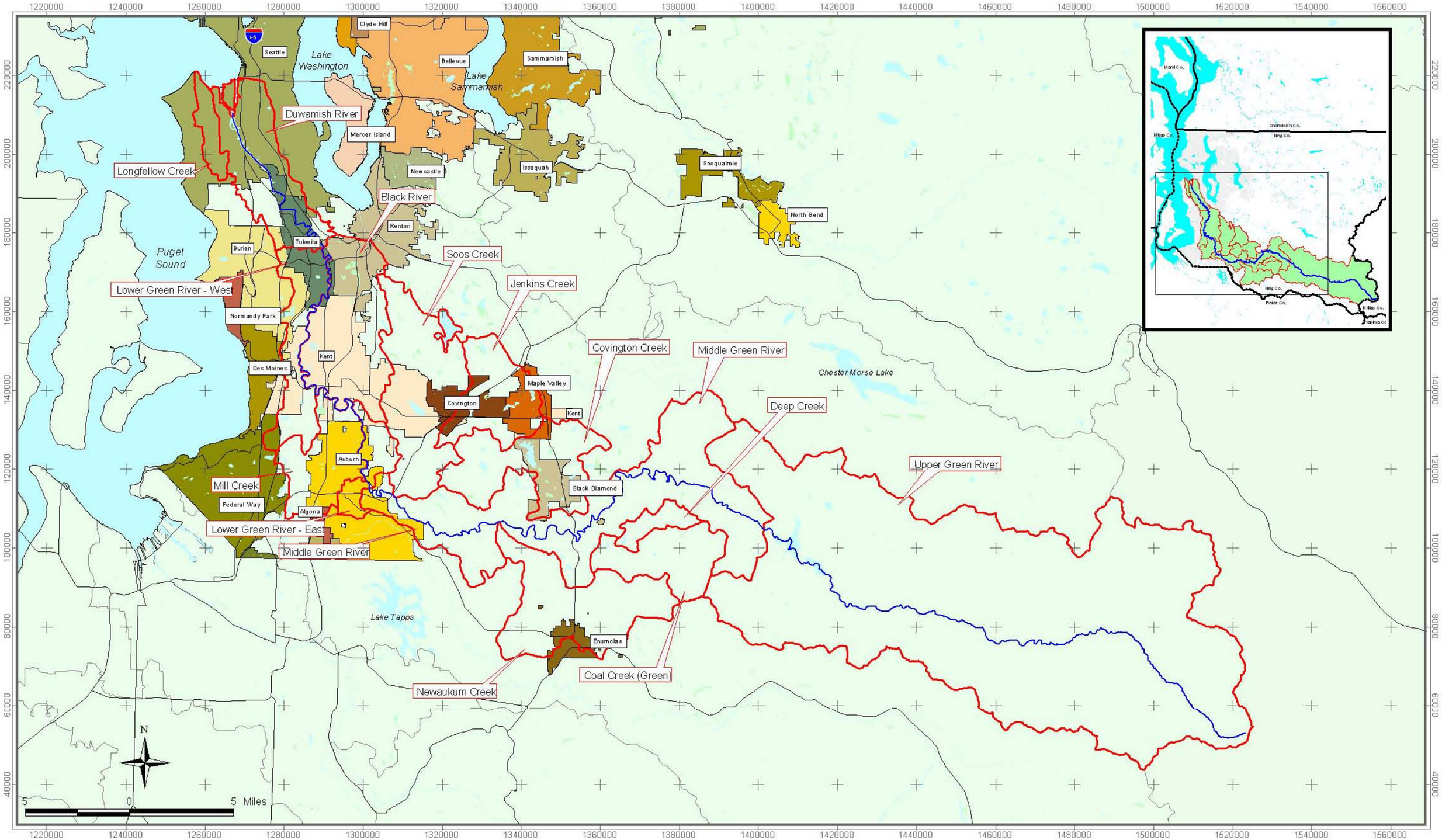
sediment and tissue chemistry data in the study area are limited[4] or not available. Thus, potential risks from sediment-associated chemicals or the food web were not evaluated in this SLRA.

The project study area encompasses the Green-Duwamish watershed from the Tacoma Diversion Dam at river mile 61 to the mouth of the Duwamish River at Elliott Bay, which represents an area of 261 square miles and consists of several cities and large areas of unincorporated King County (Figure 1-1). Further, the watershed consists of several sub-basins, which are shown in Figure 1-2.

Historical water quality data for the Green River indicate that conditions vary widely throughout the watershed and among the sub-basins. Studies of the Upper Green River suggest that temperature and turbidity are above WQS (King County 2000). Currently, segments of the Upper Green River are on the 303(d) list for temperature. The Middle Green River generally exhibits good water quality. Past sampling results indicate the river experiences moderate summer temperatures and is generally clear and well oxygenated with occasionally elevated fecal coliform bacteria levels. This river reach (including tributaries) is included on the state's 2002/2004 303(d) list as impaired for temperature, fecal coliform bacteria, and dissolved oxygen (DO). The Lower Green River generally has fair to good water quality. However, it is listed as impaired on the state's 2002/2004 303(d) list for temperature, fecal coliform, chromium, and mercury. Past sampling results indicate that river waters do not always meet state WQS for water temperature and DO during the mid- to late-summer. The Green/Duwamish River has been identified with poor water quality since the early 1960s; however, conditions improved in the 1980s due to the reduction of domestic and industrial waste discharges. This portion of the Green has had 303(d) listings for a number of chemical contaminants (in sediments), DO and fecal coliform. The SLRA evaluated whether historically impaired water quality parameters still exceed WQS and other effects thresholds based on currently available data.

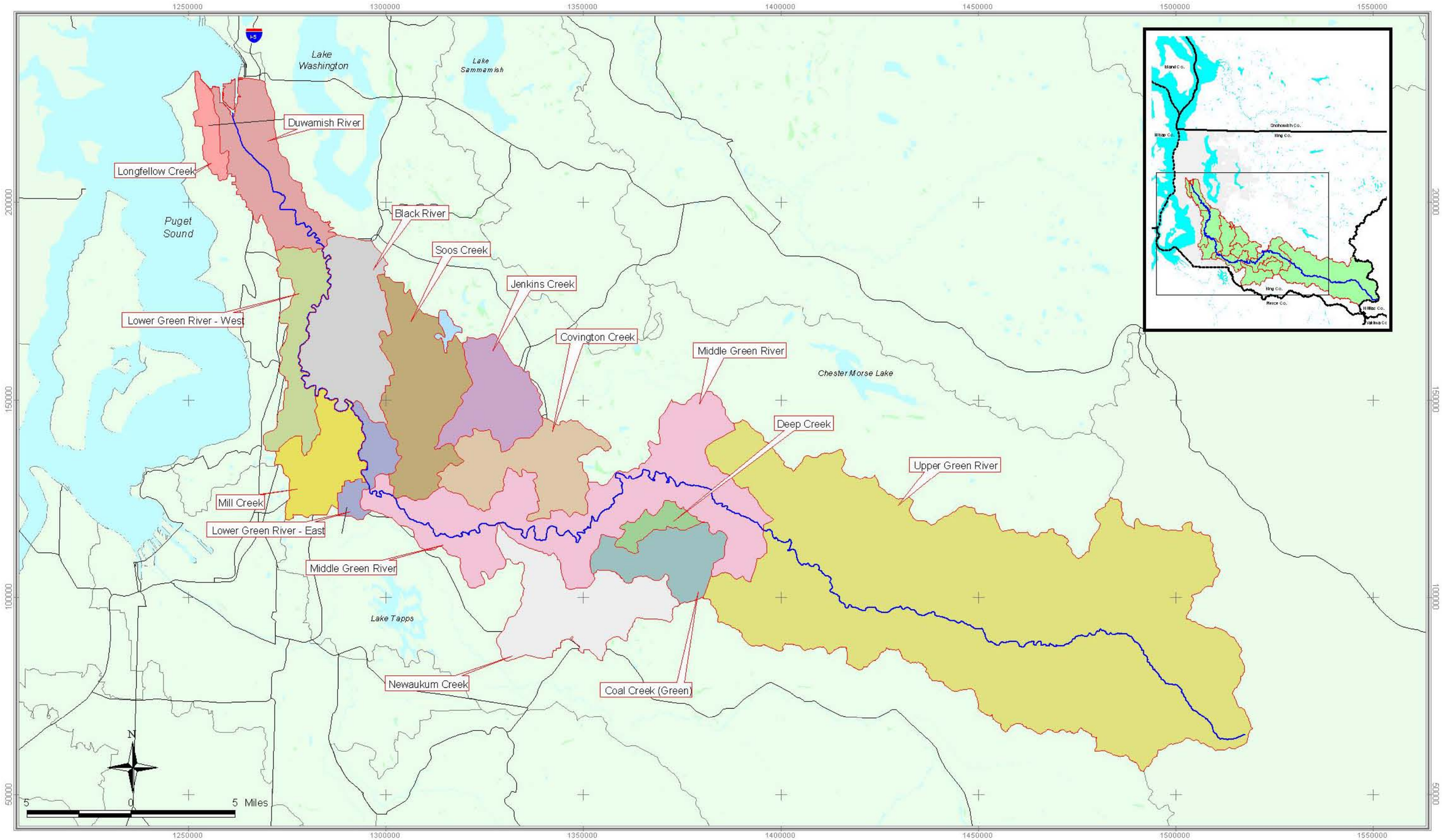
It should be emphasized that the SLRA does not evaluate potential risks from altered stream flows in the Green-Duwamish Watershed. The potential impacts of altered stream flows are currently being evaluated by King County under the Normative Flow Studies Project. The term "normative flow" refers to a flow regime that resembles the natural flow regime sufficiently to sustain all life stages of a diverse assemblage of native species. Alterations to normative flows may impact aquatic life populations or communities independent from water quality-related stresses, or compound the effects of water quality stressors. Future evaluations may attempt to integrate the results from the Normative Flow Studies Project and the GD-WQA, but this is beyond the scope of this SLRA.

[4] The lower Duwamish River is an exception, but sediment and tissue in this reach were previously evaluated in the Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay (King County 1999).



Green River

Figure 1-1
Study Area
Green River Watershed
Jurisdictions



Green River Basin
Green River
Roads
Rivers and Lakes
Wetland
Watershed.shp

Figure 1-2
Study Area
Green River Watershed

Project : C:\Projects\4\REENPA\Greenriver.apr Layout : Study Area Layout Date : January 14, 2006

This SLRA follows standard ecological risk assessment guidance (USEPA 1998) and includes the following sections:

Section 2: Problem Formulation

Section 3: Exposure Characterization

Section 4: Effects Characterization

Section 5: Risk Characterization

Section 6: Summary and Conclusions

Each of these components is discussed in detail in the following sections.

2.0 PROBLEM FORMULATION

The problem formulation defines the overall objectives of the SLRA. It describes the study area, biological characteristics, and water quality stressors of concern. The end product of the problem formulation is the development of assessment endpoints, measures for evaluating the assessment endpoints, a conceptual model that guides the SLRA, and an analysis plan.

2.1 Study Area

The Green-Duwamish watershed has experienced substantial modifications since the early 1850s. From 1850 to the 1900s, settlement began and expanded in the watershed and land was used primarily for logging and agriculture. The drainage of the watershed was significantly altered when the Cedar and White Rivers were diverted in the early 1900s. These diversions reduced the size of the watershed from about 1,600 square miles to its present size of 484 square miles. The Duwamish River was heavily modified by dredging and filling between 1905 and 1912.

During the last century, about 97 percent of the tidal wetlands of the system were filled or diked, and about 90 percent of the once-extensive floodplain is no longer inundated on a regular basis. Most of the banks are lined by levees on one or both sides below the Auburn Narrows in the Lower Green basin. Finally, water quality has been degraded throughout the watershed by a variety of human activities, including substantial changes in land use. A detailed overview of these changes can be found in the Habitat Limiting Factors and Reconnaissance Assessment Report (King County 2000).

The following describes the physical characteristics and land uses in the watershed further, followed by a review of biological characteristics and water quality.

2.1.1 Physical Characteristics/Land Use

The Green/Duwamish River watershed (WRIA 9) includes the area 30 miles northeast of Mt. Rainier to Puget Sound at Elliott Bay in Seattle. The Green/Duwamish watershed is bordered by the Lake Washington watershed (WRIA 8) on the north and by the Puyallup-White watershed (WRIA 10) on the south. The project study area encompasses the Green-Duwamish watershed from the Tacoma Diversion Dam at river mile (RM) 61 to the mouth of the Duwamish River at Elliott Bay, an area of 261 square miles. The terrain and geology varies throughout the watershed (Figure 2-1). The upper Green River Basin (an additional 231 square miles) is not included in the study area. Summer flow conditions in the river, gauged at Auburn, are in the range of 250 cubic feet per second (cfs). Winter flow conditions average about 1,500 to 2,000 cfs, with peaks of more than 10,000 cfs during storm events and a controlled maximum of 12,000 cfs just downstream of the Soos Creek confluence at the USGS gage in Auburn.

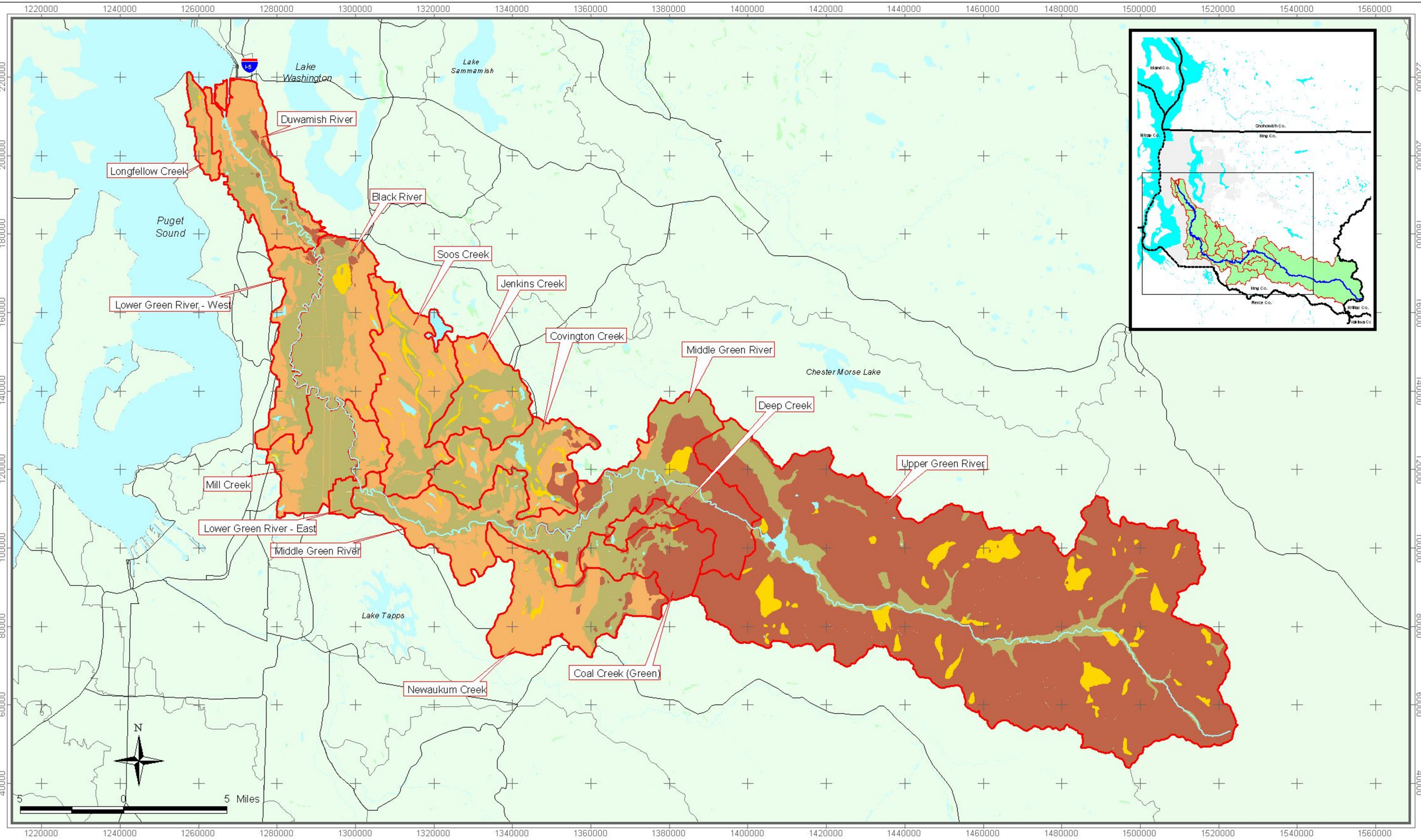
The study area has a population of about 324,000 people (King County 2000). Extensive population growth is occurring in the Soos Creek basin in unincorporated King County and within the cities of Kent, Covington and Maple Valley. The watershed includes a drainage

basin of varied terrain and land use that ranges from forested headwater areas at the crest of the Cascade Mountains to the industrial and port facilities of the Duwamish estuary (Figures 2-2). The land use areas are distinctly different and can be subdivided accordingly:

Upper Green River: The Tacoma Water Supply Diversion Dam was built in 1913 to supply potable water to the City of Tacoma, and the Howard Hanson Dam was built in 1963 for flood control. As mentioned earlier, the Upper Green River is not part of the project area *per se*, although a single water quality station downstream from the Howard Hanson Dam, and upstream from the Water Diversion Dam (sometimes considered the lower boundary of the Upper Green River sub-basin), was evaluated. The primary land use in the sub-basin is forest production (Figure 2-2). The forested areas drain to the Howard Hanson Reservoir where the US Army Corps of Engineers (USACE) operates the Howard Hanson Dam to control floods and augment in-stream flows. Downstream of the Howard Hanson Dam, the Diversion Dam is operated by the City of Tacoma to divert water for their municipal water supply. Given that the single water quality station evaluated in this SLRA is below the Howard Hanson Dam, water quality reflects the influence of the reservoir and the dam and, therefore, these data should not be considered indicative of upstream conditions. Consequently, the water quality station at the lower boundary of the Upper Green River is categorized as the "Upper Green River Outlet" throughout the remainder of this SLRA.

Middle Green River: The Middle Green River consists of several sub-basins, including Soos Creek, Jenkins Creek, Covington Creek, Newaukum Creek, Coal Creek, and Deep Creek. The Middle Green River (approximately 30 miles in length) is the most unconstrained segment of the mainstem channel system. Land use is characterized by a mix of residential, commercial, forest, and agriculture (Figure 2-2). This sub-watershed drains 35 percent of the total basin area. Major tributaries in the Middle Green include Newaukum Creek draining the Enumclaw plateau and Soos Creek draining the Covington upland area. Newaukum Creek is mostly flat agriculture and pasture with a dense set of unidentified diversion ditches creating a complex drainage network, with no significant lakes. In contrast, Soos Creek has multiple lakes with groundwater linkages, significant amounts of medium/high density development, and some pasturelands.

Lower Green River: The Lower Green River is characterized predominantly by residential, industrial, and commercial land uses (Figure 2-2). The Lower Green has higher levels of development and habitat alteration than the Middle Green. Approximately 90 percent of the Lower Green watershed is developed, with 65 percent of that in urban commercial land use. As a result of the various flood protection plans, most of the commercial and rural developments rely on the built-up levee/revetment system for flood protection. There are two significant tributaries (or sub-basins) in the Lower Green River Watershed, including Mill Creek (including Mullen Slough) and the Black River (Springbrook Creek). Both tributaries experience backwater effects during high flow conditions in the Green River. Moreover, the Black River (Springbrook Creek) has a pump station that evacuates the ponding water into the Green River. As a result, under large flow events in the Green River, the Black River (Springbrook Creek) does not discharge into the Green River, resulting in localized flooding.

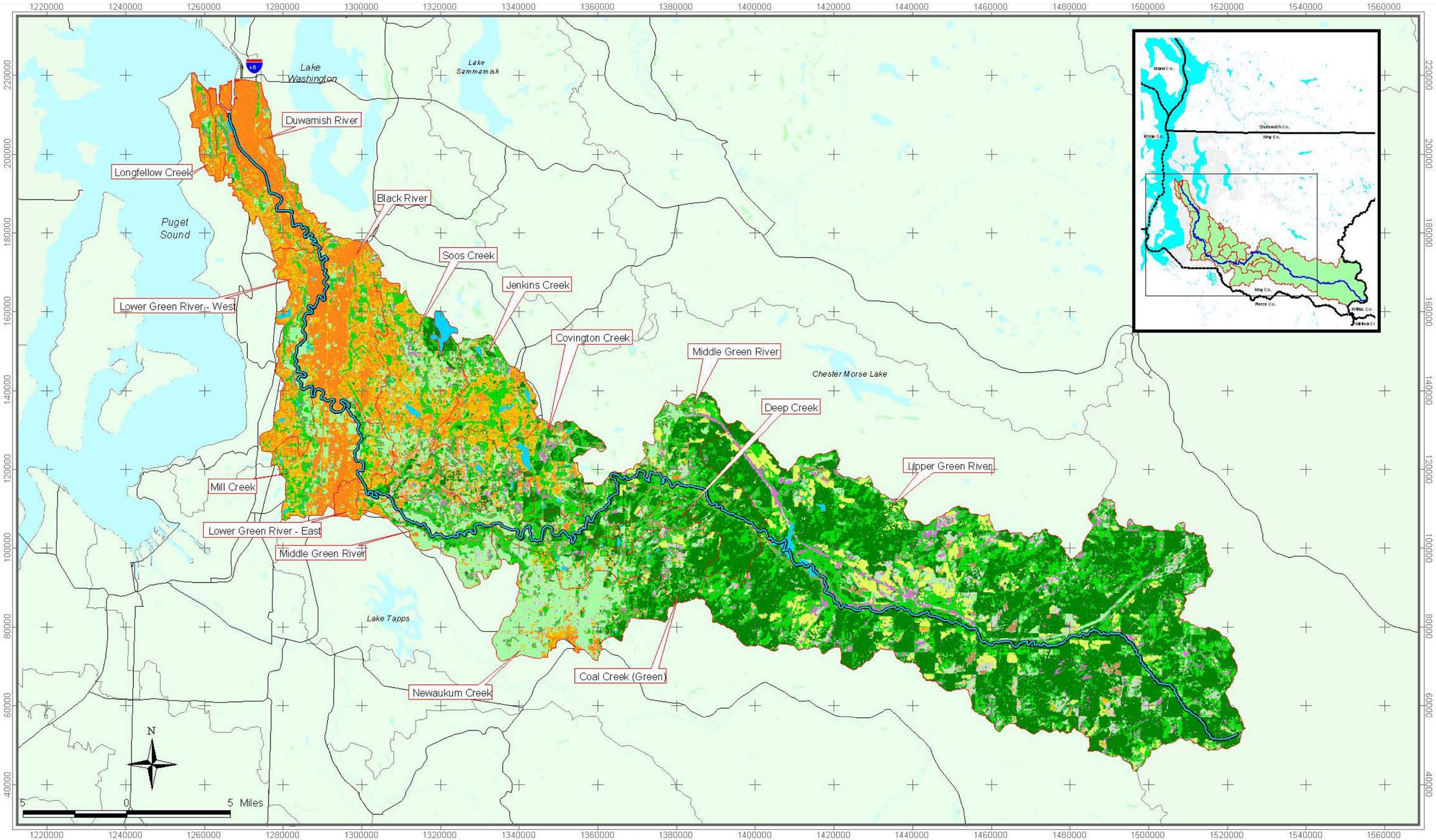


Rivers & Streams
Green River Basin

Surface Geology
- Bedrock
- Hydric
- Outwash
- Till
- Water

Figure 2-1
Surficial Geology
Green River Watershed

Project: C:\Projects\GREENRA\Greenriverapr Layout: Study Area Layout - Surficial Geology Date: February 22, 2006 - (Original data source date: 1989



Landcover derived from August 11, 2001 Landsat TM image.
Landcover classification done by Marshall & Associates.

Green River
Green River Basin

Landcover
- Urban/High Density
- Mixed Urban/Low Density
- Water
- Bare Earth
- Conifer Forest
- Deciduous Forest
- Mixed Forest
- Recent Regenerated Forest
- Recent Clearcut
- Herbaceous Vegetation
- Shrub/Scrub Vegetation

Figure 2-2
Landcover
Green River Watershed

Green/Duwamish River: Residential and industrial uses split this area of the watershed. The Duwamish/Elliott Bay estuary is the lowest reach of the Green River watershed and is under significant tidal influence from Puget Sound. Tidal waters have been observed to cause flow reversal as much as 13 miles upstream from the estuary confluence. Associated with this flow reversal is a salinity wedge that extends up to 9 miles upstream from the estuary confluence, depending on Green River flow rates and tidal magnitude.

2.1.2 Biological Characteristics and Water Quality

The characteristics of the aquatic community, water quality and available habitat vary throughout the Green-Duwamish watershed and are linked to land use and modifications to river flow. The biological characteristics of the Green-Duwamish watershed have been extensively described in the *Habitat Limiting Factors and Reconnaissance Assessment Report: Green/Duwamish and Central Puget Sound Watersheds* (King County 2000). All native, west coast salmonid species have been identified in the watershed including Chinook, chum, coho, sockeye, and pink salmon, cutthroat, steelhead, and bull trout/Dolly Varden char as well as non-native Atlantic salmon (King County 2000). Summaries of this information from each portion of the project area are presented below.

Upper Green River Outlet: As previously indicated, habitat in the Upper Green River was altered by construction of a water diversion dam (Tacoma Headworks) and the Howard Hanson Dam. Currently, only resident forms of coastal cutthroat trout and anadromous salmonids that have been transported around the dam use this portion of the watershed. The Howard Hanson Dam also alters the natural flow of sediment and woody debris to the Lower Green River mainstem and chronically floods upstream habitat. Logging practices near the Upper Green River and its tributaries have further reduced riparian habitat functions by reducing shade and large woody debris. These practices may also contribute to fish passage barriers, sedimentation, reduced water quality, and altered stream hydrology.

Middle Green River: The habitat of the Middle Green has also been significantly impacted by the Howard Hanson Dam. Upriver sediment transport has been reduced by the dam, leaving portions of the river scoured and gravel-starved. Fish passage has been altered and currently Chinook, steelhead, coastal cutthroat, coho and chum use this area for spawning and rearing while pink and sockeye salmon are limited. Residential, urban, and agricultural land uses have resulted in reduced forest cover, impaired riparian function, altered stream flows and introduction of non-native plant and animal species.

Lower Green River: River flow and habitat quality have been altered due to increased urbanization, diversion of the White River in 1911 and the operation of the Howard Hanson Dam. Changes in habitat include decreased sediment transport, lowering of the floodplain, reduced flood and summer flows, and blocking of adjacent wetlands by revetments. This reach provides habitat for rearing and upstream/downstream migration for all native anadromous salmonid species.

Duwamish River: In this portion of the river, urbanization and industrialization have resulted in filling of tidelands and the historical floodplain. Ninety-seven percent of the historical Duwamish estuary floodplains, mudflats, and swamps have been eliminated by filling, dredging and channel straightening. There are several small tributaries and numerous stormwater discharges that enter the Duwamish River and, in addition, there are nine combined sewer overflows that discharge infrequently during large runoff events. All salmonid species migrate, rear and acclimate in this area between marine and freshwaters. Juvenile Chinook and chum salmon and bull trout char are dependent on this reach.

2.2 Stressors of Concern

The following section first discusses historical water quality issues in the Green-Duwamish watershed, including 303(d) listings and then identifies the water quality stressors evaluated in the SLRA.

2.2.1 Historical and Existing Water Quality Issues

This section summarizes historical water quality conditions in the Green-Duwamish watershed from documents previously prepared by or for King County (King County 1999, 2000; Herrera 2004; Taylor Associates and King County 2004). The historical water quality data indicate that conditions vary widely throughout the watershed and among the sub-basins. Previous water quality information for the Green River has focused on Ecology's 303(d) listings for WRIA 9 and the estimated risks to aquatic life from chemicals identified within the Duwamish River (King County 1999). The most recent 303(d) list for surface waters was developed by Ecology in 2004 (Table 2-1).

Table 2-1.
Washington Department of Ecology 2004 303(d) Listings for Surface Water

Basin	Water Body Name	Parameter	Number of Segments[1]	Category[2]
Lower Green/Duwamish	Longfellow Creek	DO	1	5
Lower Green/Duwamish	Longfellow Creek	Fecal Coliform	2	5
Lower Green/Duwamish	Duwamish Waterway and River	DO	2	5
Lower Green/Duwamish	Duwamish Waterway and River	pH	7	5
Lower Green/Duwamish	Mullen Slough	DO	2	5
Lower Green/Duwamish	Mullen Slough	Fecal Coliform	1	5
Lower Green/Duwamish	Springbrook (Mill) Creek	DO	1	5
Lower Green/Duwamish	Springbrook (Mill) Creek	Fecal Coliform	1	5
Lower Green/Duwamish	Hill (Mill) Creek	Copper	1	5
Lower Green/Duwamish	Hill (Mill) Creek	DO	4	5
Lower Green/Duwamish	Hill (Mill) Creek	Fecal Coliform	5	5
Lower Green/Duwamish	Hill (Mill) Creek	Temperature	1	5
Lower Green	Green River	DO	1	5
Lower Green	Green River	Fecal Coliform	1	5

Table 2-1.
Washington Department of Ecology 2002/2004 303(d) Listings (continued)

Basin	Water Body Name	Parameter	Number of Segments[1]	Category[2]
Lower Green	Green River	Temperature	3	5
Middle Green	Green River	DO	1	5
Middle Green	Green River	Fecal Coliform	2	5
Middle Green	Green River	Temperature	3	5
Middle Green	Little Soos Creek	DO	1	5
Middle Green	Little Soos Creek	Fecal Coliform	2	5
Middle Green	Little Soos Creek	Temperature	2	5
Middle Green	Little Soosette Creek	DO	2	5
Middle Green	Little Soosette Creek	Fecal Coliform	3	5
Middle Green	Newaukum Creek	Copper	2	5
Middle Green	Newaukum Creek	DO	1	5
Middle Green	Newaukum Creek	Fecal Coliform	7	5
Middle Green	Big Soos Creek	DO	2	5
Middle Green	Big Soos Creek	Fecal Coliform	3	5
Middle Green	Soosette Creek	Fecal Coliform	1	5
Middle Green	Covington Creek	Fecal Coliform	1	5
Middle Green	Jenkins Creek	Fecal Coliform	1	5
Middle Green	Crisp Creek	Fecal Coliform	1	5
Upper Green	Green River	Temperature	2	5

Source: http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents/wq_assessment_cats2004.html

[1] A segment is defined in the 303(d) listing guidance as a rectangular grid sized at 4.5 seconds longitude by 4.5 seconds latitude (approximately 2,460 feet by 3,650 feet).

[2] Category 5: Polluted waters that require a TMDL. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. TMDLs are required for the water bodies in this category.

2.2.1.1 Upper Green River

As mentioned previously, the SLRA evaluated water quality data collected below the Howard Hanson Dam, which can be considered the Upper Green River outlet. Available water quality information has been previously summarized by King County (2000). The Upper Green River at the Howard Hanson dam is currently listed as a category 5[5] waterway for temperature on the Washington Department of Ecology's 303(d) list (Ecology 2004). The maximum temperature measured was 20ºC, and less than 10 percent of the measurements exceeded 14.5ºC (the salmonid spawning threshold). King County (2000) concluded that current temperatures are not likely to be a concern for salmonids. Monitoring of benthic macroinvertebrates showed fair scores of 32 and 28 based on the benthic index of biotic integrity (B-IBI)[6] above the Howard Hanson and Tacoma Diversion dams, respectively.

[5] A category 5 waterway is a waterbody segment with at least one characteristic or designated use that is impaired as evidenced by failure to attain applicable WQS. These waters which do not have a pollution control plan or total maximum daily load (TMDL) shall be submitted to EPA for prioritization for the development of a TMDL to improve water quality.

[6] The derivation of these scores is described in Section 4.1.1.4.

2.2.1.2 Middle Green River

The Middle Green River generally exhibits good water quality. Historical data indicate that river waters experience reasonably moderate summer temperatures, and are generally clear and well oxygenated with occasionally elevated fecal coliform bacteria levels. The Middle Green River is currently listed on Ecology's 2004 303(d) list for temperature west of the Tacoma Diversion Dam and for temperature and DO upstream of the confluence of Newaukum Creek. Newaukum Creek was on the 2004 303(d) listing for fecal coliform, DO and copper.

The following creeks in the Middle Green River sub-basin are on the 2004 303(d) list for fecal coliform: Crisp Creek, Covington Creek, Jenkins Creek, Big Soos Creek, Little Soos Creek, Soosette Creek, and Little Soosette Creek. Temperature monitoring from 1996 to 1999 indicated that several measurements exceeded the proposed spawning standard for salmonids (King County 2000). Measurement of DO, TSS, pH, and ammonia during this time period did not indicate a concern for salmonids. Benthic macroinvertebrate data indicated fair B-IBI scores (28-30). King County (2000) recommended that further data are needed for metals and organic compounds in the Middle Green watershed sub-basins to evaluate whether or not these parameters are factors of decline for salmonids.

2.2.1.3 Lower Green River

Based on recent (1996 through 1999) water quality data, the Lower Green River can be characterized as having fair to good water quality. The river reach is listed as impaired on the state's 2004 303(d) list for temperature, fecal coliform, pH, and copper in surface water. Historical data indicate that river waters do not always meet state criteria for water temperature and DO during the mid- to late-summer. The river generally has low turbidity with peak values observed during storm events. King County (2000) assessed water quality data for 1996-1999 and found that temperature and DO are of concern for salmonids, however, TSS, pH, ammonia and metals (except aluminum) are not of concern. Benthic macroinvertebrate communities are characterized as fair based on the B-IBI index (score of 28 at RM 28). Additional metals and organics data are needed to further assess this portion of the Green River.

2.2.1.4 Duwamish River

The Duwamish River and Elliott Bay have been identified as having poor water quality since the early 1960s. Water quality improved somewhat in the 1980s due to the reduction of domestic and industrial waste discharges. However, this waterway is on the 2004 303(d) listing for a number of constituents, including:

- Category 5 listings for tissue: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-BHC, PAHs, and total PCBs
- Category 5 listings for water: DO and pH

King County (1999) examined the existing water and sediment quality conditions in the Green/Duwamish River and Elliott Bay in 1996. The water quality assessment results found:

- Minimal risks to aquatic life from chemicals in the water column, no risks to juvenile salmon from direct exposure to water column chemicals, and no risks to salmon smolts associated with consumption of amphipods in the Duwamish Estuary.
- Potential risks to the benthic community from sediment associated chemicals, and localized areas of risk from sedimentation and scouring. Chemicals that posed potential risks to benthic organisms included: bis(2-ethylhexyl)phthalate, 1,4-dichlorobenzene, mercury, PAHs, PCBs, and TBT.
- Eliminating CSO discharges could increase benthic diversity in the CSO footprint. The effects of other nearby discharges (i.e., storm drains) could at least partially offset the nearfield benefits of removing CSOs.
- Removal of all CSO discharges would not eliminate fecal coliform exceedances.

Table 2-2 below summarizes the primary land uses for each sub-basin and those parameters that are on Washington State's 2004 303(d) list for various segments.

Table 2-2.
Summary of Primary Land Uses and 303(d) Listings by Sub-Basin

		Primary Land Use					303(d) Listing				
Area	**Sub-Basin**	Agriculture	Forest	Residential	Commercial	Industrial	DO	Fecal Coliform	Metals	pH	Temperature
Duwamish River	Duwamish			X		X	X			X	
	Longfellow Creek			X		X	X	X			
Lower Green	Lower Green			X	X	X	X	X			X
	Black River /			X	X	X					
	Springbrook Creek			X	X	X	X	X			
	Mill Creek		X	X			X	X	X		X
Middle Green	Middle Green	X	X	X	X						
	Soos Creek	X	X	X	X		X	X			X
	Jenkins Creek	X	X	X	X		X	X			X
	Covington Creek	X	X	X	X			X			
	Newaukum Creek	X	X	X	X			X			
	Deep Creek	X	X	X	X		X	X	X		
	Coal Creek	X	X	X	X						
Upper Green	Upper Green		X								X

2.2.2 Stressors Being Evaluated

The parameters available for evaluation in the Green River SLRA are presented in Table A-1 in Appendix A. These include chemical and physical stressors, and indicators of biological stress. The number of analytes within each stressor class is presented in Table 2-3. While data were available for numerous parameters, not all were evaluated in the SLRA. Parameters were excluded from assessment primarily due to the parameter not being a toxicant for aquatic life or, in the case of several metals, dissolved inorganics were evaluated rather than total. The parameters not evaluated and basis for exclusion of each are presented in Table A-2 (Appendix A). In addition, a parameter was excluded if it was never detected in samples where it was measured (Table A-3), although detection limits were compared to effects-based screening values. Table A-4 presents all parameters detected in at least one sample watershed-wide.

Table 2-3.
Types of Analytes Evaluated (Number of Analytes for Chemical Stressors Shown in Parentheses).

Parameters	Type
Chemical	• Inorganics (22) • Pesticides (91) • Polycyclic Aromatic Hydrocarbons (PAHs) (15) • Polychlorinated Biphenyls (PCBs) (7) • Other Organics (57) • Conventionals (6)
Physical	• Dissolved Oxygen • Temperature • Total Suspended Solids (TSS) • pH
Biological Indicators	• Fecal Coliform • *E. coli*

2.3 Receptors of Concern

Aquatic life present in the study area include typical stream assemblages for the region. Salmonids are of particular interest due to their economical, recreational, and cultural importance to the region and because support of WRIA 9 salmon conservation planning efforts is a goal of the GD-WQA (Section 1). Protection of salmon also requires protection of the food web that supports them. Due to the functional relationships (e.g., food web interactions) between aquatic species, the aquatic community in general was considered the aquatic life “receptor” in the SLRA. This approach is consistent with many aquatic life risk assessments and development of water quality criteria. As discussed later in the effects characterization (Section 4), conservative toxicity screening values were identified that are generally based on the lowest or 5th percentile toxicity value. For stressors of potential concern, toxicity data were evaluated in more detail to

determine whether toxicity data were available for salmonids and whether the screening values (SVs) were adequately protective.

In addition to aquatic life, the SLRA contains a limited human health evaluation in which fecal coliform and *E. coli* are compared to USEPA ambient water quality criteria (AWQC) or Washington State water quality standards (WQS).

2.4 Assessment Endpoints and Measures

Assessment endpoints and measures (previously termed measurement endpoints) link management goals (i.e., ecological values) to specific measurable characteristics of ecological entities. As defined by the USEPA (1998), assessment endpoints are explicit statements of the environmental values to be protected at a site, which are operationally defined by an ecological entity and its attributes. Examples of ecological entities include a species, community of species, or functional group of species (e.g., piscivores), among others (USEPA 1998). The second element of assessment endpoints is the characteristic of the ecological entity that is important to protect and potentially at risk, such as reproductive success (USEPA 1998). For practical reasons, it is often useful to identify assessment endpoints that have well developed test methods and field assessment techniques (Suter 1993). The assessment endpoints in this risk assessment are linked to the receptors of concern identified in Section 2.3 (the aquatic community and salmon). Each of these receptors represents an ecological entity. For the community-based endpoint, the attributes of concern are community structure and function. The assessment endpoints are provided in Table 2-4.

Table 2-4.
Assessment Endpoints and Measures Used in the SLRA

Assessment Endpoint	Measures
Aquatic community structure and function	• Water chemistry data • Water quality standards/ambient water quality criteria • Laboratory-derived water-based acute and chronic toxicity values • Benthic Index of Biological Integrity (B-IBI)
Human health	• Fecal coliform and *E. coli* data for surface waters • Water quality standards (fecal coliform) • Ambient water quality criteria (*E. coli*)

Often, the assessment endpoint cannot be directly measured, so one or more measures are identified. There are three types of measures: (1) measures of effect (e.g., toxicity data), (2) measures of exposure (e.g., tissue chemistry data), and (3) measures of ecosystem and receptor characteristics (e.g., stream flow) (USEPA 1998). As discussed by Suter (1993), multiple measures (or lines of evidence) should be evaluated when possible because it provides more accurate estimates of effects and more reliable estimates about causation. A variety of measures were evaluated in the aquatic life risk assessment.

The measures in the SLRA focus on the potential for chemical, physical, and biological stressors (using fecal coliform and *E. coli* as indicators) to adversely impact the assessment endpoints. Accordingly, measures of exposure include chemistry, physical,

and biological data collected in the Green River watershed. Measures of effect, although not site-specific, include the SVs: WQS/AWQC and toxicity data (Appendix A-7, A-8). An additional measure of effect used in the SLRA is the B-IBI, which is used as an additional line-of-evidence to measure impacts to the assessment endpoints.

While the primary focus of this SLRA was to assess aquatic life, human health was examined for two parameters: fecal coliform and *E. coli* (see Table 2-4). The measurements of fecal coliform and *E. coli* were compared to human health-based WQS and AWQC, respectively.

2.5 Conceptual Model

The above information on stressors, receptors, assessment endpoints, and measures were integrated into conceptual site models for aquatic life and people. The conceptual model graphically depicts the relationships between the site-specific assessment endpoints and exposure scenarios[7].

The SLRA is focusing on potential stressors to aquatic life in surface water. Aquatic life may also be affected by chemicals in sediment or food items or from physical stressors such as water flow and habitat loss. However, these are beyond the scope of this SLRA. On the other hand, the B-IBI data should reflect possible effects of sediment chemistry and habitat loss on the macroinvertebrate community. Water quality stressors include chemicals (e.g., metals, organics, pesticides) and physical parameters (e.g., temperature, DO, TSS). As shown in Figure 2-3, representative sources of these stressors include vehicles (brakes, exhaust), manufacturing, and pesticide applications. These stressors may then be released to the environment and into water bodies via a number of pathways, including spills, stormwater runoff, and point source discharges. Reduction in water quality may then result in direct effects on organism survival, growth, development, and reproduction. Direct effects on any one component of the aquatic community may cause indirect effects on the food web through loss of prey items or a shift in community structure.

For human health, the potential for adverse effects from fecal coliforms or *E. coli* is being evaluated through a comparison of site-specific data to available WQS and AWQC (Figure 2-3). Fecal coliform and *E. coli* are bacteria that are present in the intestinal tracts of warm-blooded animals and represent indicator organisms for exposure of humans to water-borne pathogens. Sources of fecal coliform and *E. coli* include failing septic systems, domestic pet waste, wildlife, livestock and CSOs. The presence of fecal coliforms and *E. coli* are linked with gastrointestinal illness from studies of recreational swimming in water containing fecal matter (USEPA 1986). Therefore, the SLRA results will indicate if recreational users of the Green River watershed are at risk for developing illness associated with water-borne pathogens present in the water column.

[7] The term exposure scenario refers to the pathway by which a receptor is exposed to a stressor, and may also refer to the timeframe of interest. For example, in this SLRA, the aquatic life exposure scenario for chemical stressors is uptake from surface water under current conditions.

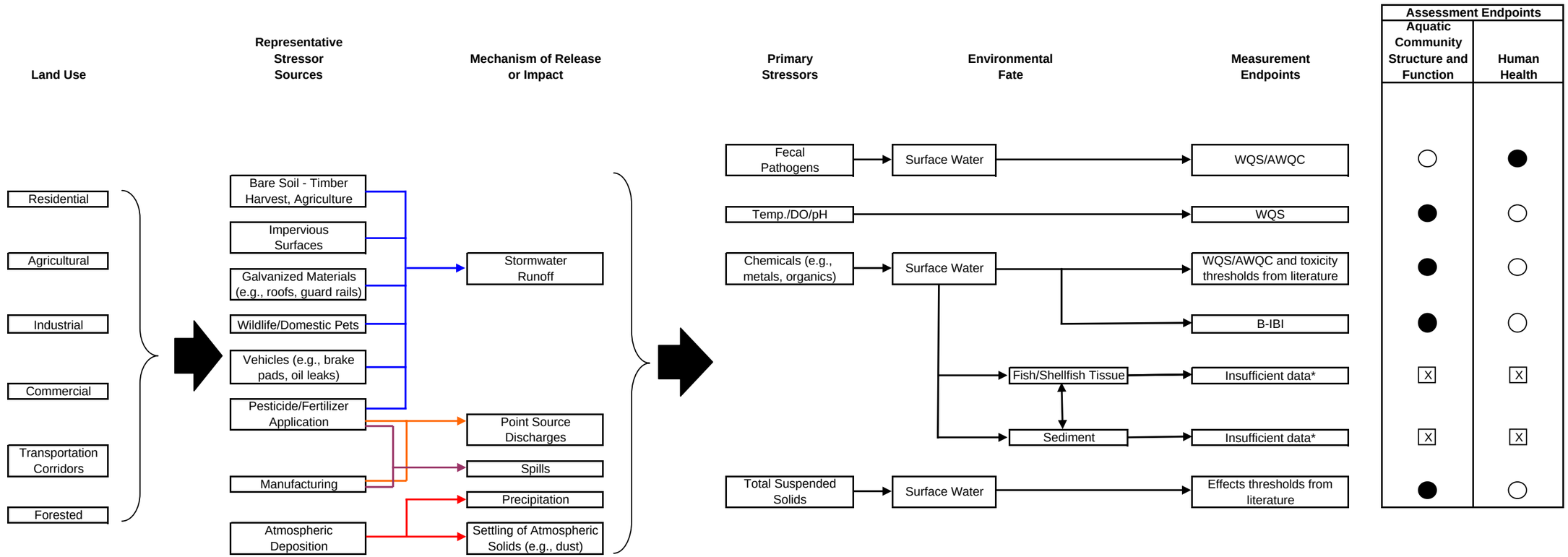


Figure 2-3.
Conceptual model of surface water stressors being evaluated in the Green River SLRA.

2.6 Analysis Plan

The final component of the problem formulation is typically an analysis plan that provides an overview of the methods that will be used to complete the risk assessment. This includes a description of the data sources, the effects data used, and risk characterization methods. The data describing the chemical and physical parameters of the Green watershed were primarily derived from the King County Laboratory Information Management System (LIMS) database with additional data obtained from the U.S. Geological Survey (USGS) and Ecology. These sources are further described in Section 3.1.1. The water quality data were summarized and examined on a station-by-station basis (i.e., data were assessed for each individual sampling location, rather than spatially combining the data across stations). The chemical, physical, and biological data were summarized by percentiles (e.g., 5th, 25th, 50th, 75th and 95th percentiles) of the distribution and then compared to screening values representing toxicity thresholds.

Both acute (short-term) and chronic (long-term) surface water effect values were identified (hereafter referred to as screening values, or SVs). The typical approach for identifying surface water SVs for the aquatic community is to identify the concentration protective of 95 percent of the species that have been tested (the approach used to derive WQS and AWQC, see below), or to simply use the lowest toxicity value identified for each chemical (as was done when AWQC or WQS were not available). Regardless of the approach used, there is always some level of uncertainty as to whether the aquatic community is adequately protected. In general, the more species tested, and the greater the diversity of tested species, the less the uncertainty in the SV. The following hierarchy was used to identify surface water SVs: (1) Washington State WQS (Ecology 2003); (2) USEPA ambient water quality criteria (AWQC) (final or proposed) (USEPA 2002a); (3) USEPA's AQUIRE database (USEPA 2002b), and (4) the scientific literature.

With the exception of temperature, DO, pH, and pathogen indicators, the aquatic life and human health SLRAs were based on a hazard quotient (HQ) methodology, which is defined as the ratio of the stressor concentration (e.g., 95th percentile) to its respective SV:

$$\textbf{HQ = Stressor Concentration / SV} \qquad \textbf{3-1}$$

The HQ provides a numerical method to quantify the potential risk posed by a stressor. In the SLRA, stressors with an HQ exceeding 1.0 were identified as stressors of potential concern that may be further evaluated in a more detailed evaluation. Stressors with HQs equal to or less than 1.0 were deemed to pose negligible risk.

Temperature, DO, and pH were evaluated separately because the HQ concept does not apply well to these parameters. A temperature study was recently conducted by Taylor Associates and King County (2004); results of this evaluation are summarized in the SLRA. For DO, an HQ is not applicable because the DO WQS is a minimum threshold, rather than a maximum threshold. Accordingly, DO was evaluated as percentage of measurements that exceed the WQS. Finally, because the Washington State WQS represents a range of pH levels, pH was evaluated as the percentage of measurements that fell outside the acceptable range.

3.0 EXPOSURE CHARACTERIZATION

The problem formulation presented above (Section 2) described the study area, types of surface water data available, and the receptors of concern. The exposure characterization presented here describes the sources of surface water data in the SLRA and how exposure levels were quantified.

3.1 Exposure Characterization Methods

3.1.1 Sources of Water Quality Data

The primary sources of water quality data were King County, the USGS, and the Washington State Department of Ecology (Ecology). In addition, a recent temperature study of the Green-Duwamish watershed, including data from the University of Washington and the City of Kent in addition to King County data (Taylor Associates and King County 2004) was used as the primary source of temperature information. The time period of data used in the SLRA was 1999-2003, representing current conditions.

3.1.1.1 Monitoring Programs

The above agencies collected samples under a variety of programs with different purposes and objectives. The majority of the data come from King County's own monitoring programs. From 1999 through 2003, King County monitoring programs in the Green-Duwamish River watershed included the Streams Monitoring Program, the GD-WQA Comprehensive Monitoring Program (King County 2002), as well as some limited monitoring conducted for smaller projects in the watershed. The USGS collected samples from two sites in the Green-Duwamish River watershed during this time period as part of its Puget Sound Streams Monitoring Program (http://wa.water.usgs.gov/data/); Ecology monitored two sites in the watershed for its Long-term Monitoring Program (http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html). The sample design for each of these programs is described generally below:

- The King County Streams Program consists primarily of monthly grabs of conventional and physical parameters, nutrients, and bacteria. At select sites, storm samples are also collected up to six times per year for the same parameters, in addition to metals.
- The GD-WQA sampling program included a three year monitoring effort (2001-2003) focused on isolating potential impacts of land use on water quality during storm events. At selected sites, autosamplers were employed to collect either multiple grabs over time (analyzed individually) or flow-weighted composite samples during both storm and baseflow conditions; the remaining sites were sampled using manual grabs. Parameters included physical and conventional parameters, nutrients, bacteria, and metals. Grab samples for priority pollutant organic parameters were collected on a quarterly basis.

- The USGS Puget Sound Streams monitoring was conducted to evaluate urban stream water quality, and to evaluate pesticide concentrations in particular. Most samples were collected during storm conditions 1 to 12 times per year.
- Ecology monitored two sites on the Green River during the 1999 through 2003 time period. Both sites were sampled monthly using grab samples for conventional and physical parameters, nutrients, and bacteria. One site was also sampled on a bi-monthly basis for some metals.

Table 3-1.
Water quality sampling locations in the Green-Duwamish River watershed.

Locator	Basin	Waterbody	Source	Program
A326	Black River	Panther Creek	King County	GD-WQA
0317	Black River	Springbrook Creek	King County	Streams
A317	Black River	Springbrook Creek	King County	GD-WQA
B317	Black River	Springbrook Creek	King County	GD-WQA
C317	Black River	Springbrook Creek	King County	GD-WQA
0321	Crisp Creek	Crisp Creek	King County	Streams
F321	Crisp Creek	Crisp Creek	King County	Streams/GD-WQA
0305	Duwamish River	Duwamish River	King County	Streams
0307	Duwamish River	Duwamish River	King County	Streams
0309	Duwamish River	Duwamish River	King County	Streams
UDUWAM	Duwamish River	Duwamish River	USGS	Puget Sound Small Streams
A307	Duwamish River	Hamm Creek	King County	GD-WQA
C370	Longfellow Creek	Longfellow Creek	King County	Streams
L370	Longfellow Creek	Longfellow Creek	King County	Streams
J370	Longfellow Creek	Longfellow Creek	King County	Streams
K370	Longfellow Creek	Longfellow Creek	King County	Streams
ULCB	Longfellow Creek	Longfellow Creek	USGS	Puget Sound Small Streams
EC09A080	Lower Green River	Green River (near Tukwila)	Ecology	Long-term monitoring
0311	Lower Green River	Green River	King County	Streams
A310_3106	Lower Green River	Green River	King County	Streams/GD-WQA
D319	Lower Green River	Green River	King County	Limited (E. coli only)
G319	Lower Green River	Green River	King County	Streams
A330	Lower Green River	Unnamed trib to Lower Green River	King County	GD-WQA
EC09A190	Middle Green River	Green River (at Kanaskat)	Ecology	Long-term monitoring
A319	Middle Green River	Green River	King County	Streams
B319	Middle Green River	Green River	King County	Streams
A341	Middle Green River	Unnamed trib to Middle Green River	King County	GD-WQA
A315	Mill Creek	Mill Creek	King County	Streams/GD-WQA
MULLEN1	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN2	Mill Creek	Mullen Slough	King County	Limited (2 samples)

Table 3-1
Water quality sampling locations in the Green-Duwamish River watershed (continued).

Locator	Basin	Waterbody	Source	Program
MULLEN3	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN4	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN5	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN6	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN7	Mill Creek	Mullen Slough	King County	Limited (2 samples)
MULLEN8	Mill Creek	Mullen Slough	King County	Limited (2 samples)
0322	Newaukum Creek	Newaukum Creek	King County	Streams/GD-WQA
AA322	Newaukum Creek	Newaukum Creek	King County	Streams
AB322	Newaukum Creek	Newaukum Creek	King County	Streams
AD322	Newaukum Creek	Newaukum Creek	King County	Streams
AE322	Newaukum Creek	Newaukum Creek	King County	Streams
AF322	Newaukum Creek	Newaukum Creek	King County	Streams
AI322	Newaukum Creek	Newaukum Creek	King County	Streams
AJ322	Newaukum Creek	Newaukum Creek	King County	Streams
AK322	Newaukum Creek	Newaukum Creek	King County	Streams
F322	Newaukum Creek	Newaukum Creek	King County	Streams
H322	Newaukum Creek	Newaukum Creek	King County	Streams
J322	Newaukum Creek	Newaukum Creek	King County	Streams
N322	Newaukum Creek	Newaukum Creek	King County	Streams
S322	Newaukum Creek	Newaukum Creek	King County	GD-WQA
AC322	Newaukum Creek	Spring Creek	King County	Streams
AG322	Newaukum Creek	Stonequarry Creek	King County	Streams
B322	Newaukum Creek	Unnamed trib to Newaukum Creek	King County	GD-WQA
D322	Newaukum Creek	Unnamed trib to Newaukum Creek	King County	GD-WQA
I322B	Newaukum Creek	Unnamed trib to Newaukum Creek	King County	GD-WQA
AH322	Newaukum Creek	Watercress Creek	King County	Streams
WH322	Newaukum Creek	Watercress Creek	King County	Streams
A320	Soos Creek	Big Soos Creek	King County	Streams/GD-WQA
L320	Soos Creek	Big Soos Creek	King County	Streams
Q320	Soos Creek	Big Soos Creek	King County	Streams
C320	Soos Creek	Covington Creek	King County	Streams
R320	Soos Creek	Covington Creek	King County	Streams
S320	Soos Creek	Covington Creek	King County	Streams
D320	Soos Creek	Jenkins Creek	King County	Streams
G320	Soos Creek	Little Soos Creek	King County	Streams
U320	Soos Creek	Little Soos Creek	King County	Streams

Table 3-1
Water quality sampling locations in the Green-Duwamish River watershed (continued).

Locator	Basin	Waterbody	Source	Program
B320	Soos Creek	Soosette Creek	King County	Streams
Y320	Soos Creek	Soosette Creek	King County	GD-WQA
E319	Upper Green River Outlet	Green River	King County	GD-WQA

3.1.1.2 Temperature Studies (UW, City of Kent, King County)

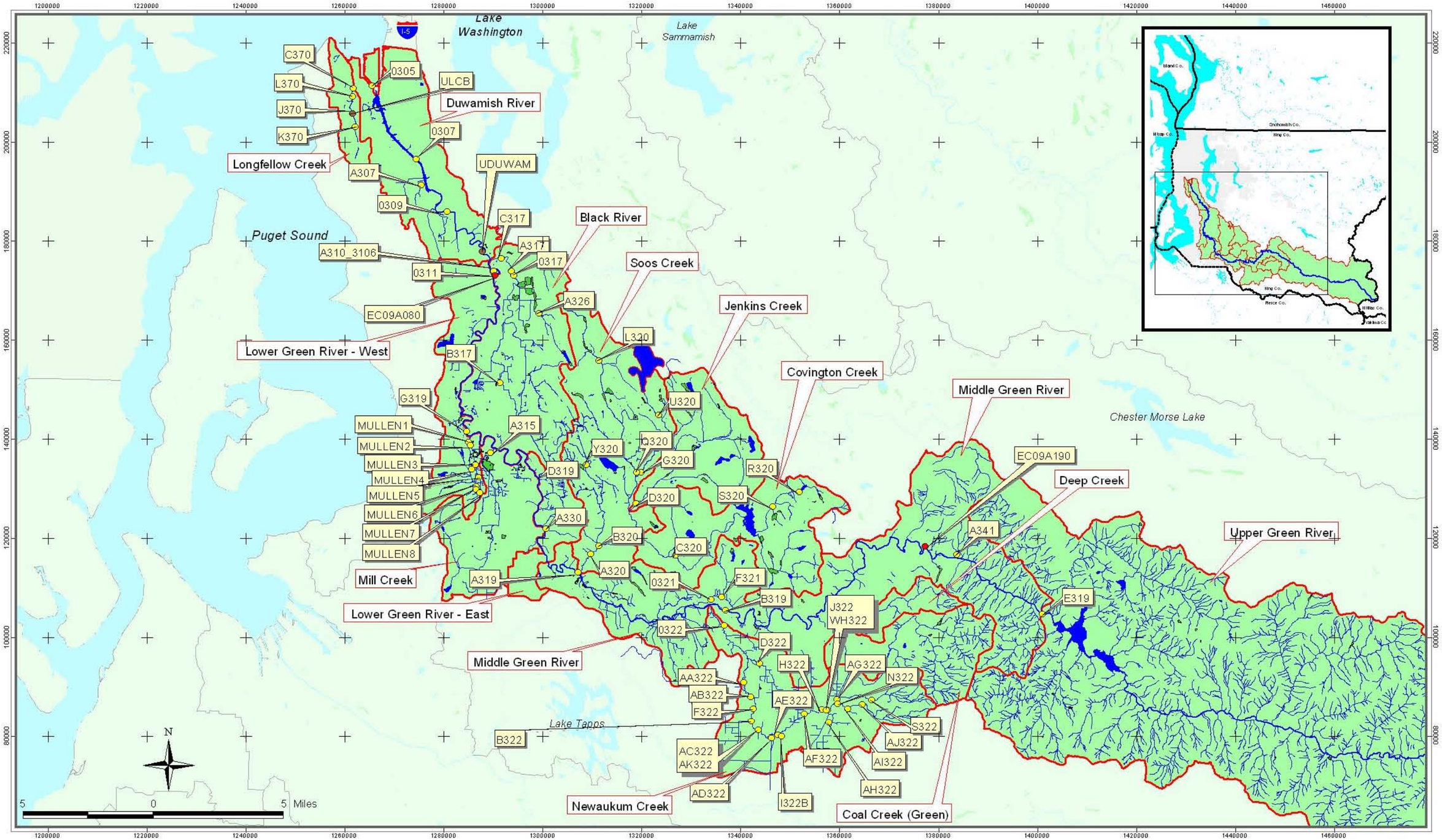
Taylor Associates and King County (2004) assessed surface water temperature conditions as part of the larger assessment of the Green-Duwamish watershed. Temperature measurements were collected continuously at 15-minute intervals using data loggers between July 2001 and September 2003 at 93 surface water monitoring stations (representing 10 sub-basins). Data for each monitoring station were organized by major river section or subbasin. For each month data were collected, average minimum, mean, 1-day maximum and 7-day average daily maximum values were calculated and summarized. The LIMS database did contain limited temperature data (mostly monthly grabs along with some storms) that generally agreed with the results presented by Taylor Associates and King County (2004). Since Taylor Associates and King County provided a comprehensive assessment of temperature throughout the Green watershed, the results in this report were used to describe temperature trends throughout the basin, and superseded data from the LIMS database. The methods and results from the Taylor Associates and King County report are summarized throughout the remainder of this report.

3.1.2 Sampling Stations

The exposure characterization was conducted on a station-by-station basis. Although most aquatic life and fish in particular, can be highly mobile, data were not pooled across multiple stations for several reasons. First, the study area is large and the distances between sampling stations are great enough that many components of the aquatic community are unlikely to travel over these distances. Second, pooling data over sampling areas could mask potential stressor sources that may be important to the aquatic community at a specific location, but not to the aquatic community in, for example, an entire stream reach. Third, expressing data on a station-by-station basis will make the results more transparent and will eliminate the possibility that the spatial coverage of sampling stations will be over-stated. Region specific results will be discussed in a narrative form in Section 5.0. The sampling stations are shown in Figure 3-1.

3.1.3 Statistical Approach

The exposure characterization used varying approaches depending on the parameter evaluated. Chemical (e.g., metals and organics) and physical parameters (e.g., TSS) were evaluated using a distributional approach. The 5th, 25th, 50th, 75th, and 95th percentiles, in addition to the maximum, for each chemical parameter at each station were calculated



Green River
Rivers and Lakes
Green River Basin

LIMS Water Quality Stations
USGS Stations
Ecology Stations

Figure 3-1 Water Quality Sampling Locations Green River Watershed

Project: C:\Projects\GRB\WR\greenriver_aug18-2006.apr Layout: Water Quality Locations (RA_Locator) Layout Date: August 18, 2006

and are summarized in Section 3.2. The percentiles were then compared to acute and chronic SVs, as described in Section 4.0. Certain unique parameters were evaluated differently than described above. Those parameters are described below:

Dissolved Oxygen (DO): As previously discussed, DO was not evaluated using the HQ approach. Rather, data from each station were compared to the geographically specific aquatic life WQS as defined in WAC 173-201A. The WQS vary throughout the different reaches of the Green River Watershed depending on the uses present in that region (e.g., salmon spawning, rearing and migration). Data from each station were compared to the WQS and locations that did not meet the minimum DO requirement for that geographic region were identified.

Temperature: Temperature was also not assessed using an HQ approach (by either Taylor Associated and King County [2004] or in this SLRA). Similar to DO, temperature was compared to the geographically specific aquatic life WQS as defined in WAC 173-201A. The WQS vary throughout the different reaches of the Green River Watershed depending on the uses present in that region (e.g., salmon spawning, rearing and migration). Temperature measurements at each station were compared to the appropriate WQS and were identified if they exceeded WQS for that geographic region.

Pathogen Indicators: Fecal coliforms and *E. coli* measured throughout the Green Watershed were evaluated on a seasonal basis (i.e., months or dates corresponding to spring, summer, winter, and fall). The WQS for bacteria (WAC 173-201A) require that the geometric mean bacteria levels within a season should not exceed the WQS, and that no more than 10 percent of all samples should exceed the WQS. Therefore, the geometric mean bacteria concentrations were calculated on a station and seasonal basis. Individual samples within a season were also compared to the corresponding WQS to determine what percent, if any, exceeded the WQS. Results are presented as the number of seasons exceeding the WQS and number of samples exceeding the WQS.

3.2 Exposure Characterization Results

The exposure concentrations were estimated for all chemical parameters as described in Section 3.1. A summary of the chemical and TSS (physical stressor) concentrations and associated summary statistics by sub-basin are presented in Table 3-2. Chemical concentrations are also presented by station and sub-basin with additional statistics in Appendix A-5.

3.3 Exposure Characterization Uncertainties

All risk assessments contain uncertainties and understanding these uncertainties is critical for interpretation of results. Some of the key uncertainties in the exposure characterization are described below.

- **Spatial Distribution of Sampling Stations:** Given the large size of the study area, there is often considerable distance between sampling stations and, in

some cases, only one or two stations may have been sampled in a stream (e.g., Jenkins Creek, Mill Creek). Consequently, there is uncertainty in the characterization of water quality conditions in some stream reaches. However, this uncertainty may be somewhat negligible since downstream stations will to some degree reflect upstream water quality.

- **Temporal Distribution of Samples:** Sample collection frequency was variable depending on the station and parameters being measured for the different projects that contributed to this database. Most of the chemical parameters evaluated were measured either during selected storms over a three-year period or quarterly over the five years of data considered. Overall, these data probably provide a good reflection of water quality over the period evaluated, as they would reflect possible seasonal influences on chemical concentrations (e.g., spring and summer when pesticide usage is greatest, and storm events that may increase chemical loading to streams from runoff). However, it is likely that short-term spikes in levels of chemicals and physical stressors could have been missed between sampling events.

- **Relevance to Aquatic Life Exposure Durations:** The water quality data were generally collected as grab samples. It was assumed that concentrations reflected by these grab samples would persist over chronic exposure durations. As discussed further in the effects characterization below (Section 4), the chronic exposure duration for application of chronic WQS or AWQC is four days, and chronic toxicity data for most species are on the order of weeks to months. Under base flow stream conditions, this is probably not a significant uncertainty. However, if samples were collected during or shortly after an event that resulted in a short-term spike in a water quality parameter, comparison of the measured concentration to a chronic SV would likely be very conservative. Because samples were rarely collected over consecutive days, it was not possible to evaluate time-weighted average concentrations that may be more appropriate for comparison to chronic SVs.

- **Number of Parameters Measured:** In general, a large suite of chemicals was analyzed in most of the sub-basins. However, analysis of samples from Jenkins and Covington Creeks has been limited to nitrogen compounds (ammonia, nitrate, and nitrite), *E. coli*, fecal coliform, pH, temperature, and TSS (Table 3-2). Additional analyses of a larger suite of chemicals in creeks would help reduce uncertainty in the risk estimates.

Table 3-2.
Concentrations of Chemicals by Sub-basin

Parameter	Units	Sub-basin (arithmetic mean, min, max, sample size) [1,2]										
		Duwamish River	Longfellow Creek	Lower Green River	Black River	Mill Creek	Soos Creek	Jenkins Creek	Covington Creek	Middle Green River	Newaukum Creek	Upper Green Outlet
1,2-Diphenylhydrazine	ug/L		0.05 (0.0475-0.055), 16									
2,4-D	ug/L		0.01 (0.0075-0.0075), 1	0.01 (0.008-0.0205), 14	0.05 (0.0075-0.378), 28	0.02 (0.008-0.0917), 17	0.01 (0.0075-0.02), 17				0.03 (0.0075-0.194), 17	0.01 (0.0075-0.019), 15
3-Methylphenol	ug/L		0.03 (0.024-0.13), 16									
4-Methylphenol	ug/L		0.07 (0.0245-0.18), 16	0.13 (0.125-0.14), 12	0.13 (0.12-0.14), 16	0.3 (0.12-1.2), 10	0.13 (0.12-0.14), 10				0.13 (0.12-0.14), 11	0.13 (0.12-0.14), 10
4-Nonylphenol, total	ug/L		0.09 (0.09-0.09), 1	0.13 (0.047-0.27), 4	0.26 (0.124-0.836), 15	0.08 (0.0245-0.21), 10	0.04 (0.024-0.071), 8				0.05 (0.025-0.118), 9	0.05 (0.0095-0.106), 7
Acenaphthene	ug/L		0.01 (0.00475-0.0055), 17	0.01 (0.00475-0.0055), 15	0.01 (0.00475-0.025), 27	0 (0.0047-0.0055), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Aluminum, Total	ug/L	792.69 (13.8-19800), 99	2999.53 (20-16900), 43	442 (11.8-3630), 124	726.54 (16.1-22000), 163	546.82 (40.7-1400), 18	346.46 (23.7-1350), 93			199.18 (9.9-1420), 40	657.31 (11.4-10500), 441	561.33 (23.3-5850), 43
Ammonia-nitrogen	mg/L	0.05 (0.005-1.46), 379	0.06 (0.005-1.75), 161	0.03 (0.005-0.234), 335	0.13 (0.005-0.523), 222	0.11 (0.005-1.7), 88	0.02 (0.005-0.182), 383	0.01 (0.005-0.061), 57	0.01 (0.005-0.0702),137	0.03 (0.005-0.27), 384	0.07 (0.005-6.82), 995	0.01 (0.005-0.0555), 34
Aniline	ug/L		1 (0.95-1.1), 16									
Anthracene	ug/L		0.01 (0.005-0.011), 17	0.01 (0.00475-0.0055), 15	0.01 (0.0047-0.025), 27	0.01 (0.0047-0.016), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Antimony, Dissolved	ug/L	0.24 (0.044-0.333), 95	0.65 (0.224-0.897), 17	0.21 (0.023-0.25), 136	0.29 (0.073-1.3), 166	0.2 (0.0642-0.286), 27	0.2 (0.041-0.25), 95			0.17 (0.011-0.25), 68	0.25 (0.018-1.3), 414	0.2 (0.016-0.25), 42
Arsenic, Dissolved	ug/L	1.06 (0.59-1.7), 98	10.15 (1.18-25), 27	0.56 (0.25-1.06), 150	0.74 (0.25-1.2), 178	0.6 (0.43-0.805), 31	0.53 (0.25-1.4), 108			0.44 (0.05-0.81), 72	0.57 (0.2-6.88), 453	0.35 (0.24-0.867), 43
Atrazine	ug/L		0.47 (0.05-0.55), 17	0.02 (0.024-0.0245), 3	0.03 (0.0235-0.0485), 11	0.03 (0.0235-0.048), 7	0.03 (0.024-0.0485), 7			0 (0.0005-0.06), 43	0.03 (0.024-0.062), 6	0.03 (0.024-0.05), 5
Barium, Dissolved	ug/L	7.93 (4.49-12.8), 97	12.36 (9.21-19.3), 17	2.87 (1.07-6.16), 137	9.26 (4.16-17.2), 165	6.2 (3.53-8.95), 29	8.62 (3.7-15.3), 99			3.12 (0.78-7.22), 67	8.48 (1.41-32.2), 425	0.46 (0.29-0.68), 41
Benzidine	ug/L		1 (0.95-1.1), 16									
Benzo(a)pyrene	ug/L		0.02 (0.005-0.027), 17	0.01 (0.00475-0.0055), 15	0.01 (0.0047-0.025), 27	0.01 (0.0047-0.018), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Benzo(b)fluoranthene	ug/L		0.02 (0.005-0.027), 17	0.01 (0.00475-0.0055), 15	0.01 (0.0047-0.0335), 27	0.01 (0.0047-0.018), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Benzo(k)fluoranthene	ug/L		0.02 (0.005-0.027), 17	0.01 (0.00475-0.0055), 15	0.01 (0.0047-0.0301), 27	0.01 (0.0047-0.013), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Benzoic Acid	ug/L		0.74 (0.25-1.9), 16									
Benzyl Alcohol	ug/L		0.38 (0.0495-0.805), 16									
Bis(2-ethylhexyl)adipate	ug/L		0.03 (0.029-0.029), 1	0.23 (0.029-0.67), 4	0.1 (0.025-0.838), 15	0.05 (0.023-0.073), 10	0.04 (0.018-0.068), 8				0.07 (0.023-0.24), 9	0.07 (0.019-0.204), 7
Bis(2-Ethylhexyl)Phthalate	ug/L		0.96 (0.24-4.61), 17	0.8 (0.334-1.41), 15	1.36 (0.305-5.8), 27	1.8 (0.334-4.11), 17	1.3 (0.245-5.16), 17				2.03 (0.211-15.8), 17	1.39 (0.345-5.4), 15
Bisphenol A	ug/L		0.12 (0.121-0.121), 1	0.03 (0.02-0.049), 4	0.05 (0.024-0.17), 15	0.04 (0.017-0.055), 10	0.03 (0.012-0.0485), 8				0.03 (0.013-0.049), 9	0.03 (0.014-0.05), 7
Butylbenzylphthalate	ug/L		0.24 (0.063-0.27), 17	0.06 (0.024-0.122), 15	0.08 (0.021-0.346), 27	0.07 (0.017-0.209), 17	0.05 (0.00485-0.0841), 17				0.05 (0.0049-0.0946), 17	0.05 (0.012-0.0764), 15
Cadmium, Dissolved	ug/L	0.04 (0.005-0.05), 98	0.56 (0.005-1.5), 27	0.04 (0.005-0.05), 151	0.04 (0.005-0.16), 179	0.03 (0.005-0.05), 32	0.03 (0.005-0.05), 110			0.04 (0.005-0.23), 75	0.04 (0.005-0.23), 454	0.04 (0.005-0.05), 43
Caffeine	ug/L		0.28 (0.027-0.818), 17	0.04 (0.00475-0.198), 15	0.26 (0.012-1.74), 27	0.13 (0.00485-0.485), 17	0.02 (0.005-0.037), 17				0.02 (0.0048-0.0598), 17	0.01 (0.00475-0.0125), 15
Carbaryl	ug/L									0.02 (0.0015-0.23), 43		
Carbazole	ug/L		0.01 (0.0095-0.0125), 17	0.01 (0.012-0.014), 15	0.01 (0.012-0.065), 27	0.02 (0.012-0.0526), 17	0.02 (0.012-0.06), 17				0.01 (0.012-0.014), 17	0.01 (0.012-0.014), 15
Chromium, Dissolved	ug/L	0.35 (0.025-0.8), 98	1.2 (0.14-2.5), 27	0.23 (0.025-0.71), 151	0.41 (0.097-1.9), 179	0.26 (0.058-0.6), 32	0.26 (0.1-0.61), 110			0.2 (0.09-0.44), 75	0.3 (0.025-1.46), 454	0.17 (0.025-0.2), 43
Chrysene	ug/L		0.01 (0.0095-0.034), 17	0.01 (0.012-0.014), 15	0.02 (0.012-0.065), 27	0.01 (0.012-0.014), 17	0.02 (0.012-0.06), 17				0.01 (0.012-0.014), 17	0.01 (0.012-0.014), 15
Cobalt, Dissolved	ug/L	0.1 (0.025-0.168), 98	0.11 (0.049-0.156), 17	0.1 (0.018-1.12), 144	0.15 (0.0575-1.73), 178	0.21 (0.075-0.537), 31	0.14 (0.034-5.34), 102			0.07 (0.012-0.1), 72	0.16 (0.022-3.77), 430	0.16 (0.02-3.46), 43
Copper, Dissolved	ug/L	1.71 (0.2-3.57), 98	2.75 (0.737-5.7), 27	0.72 (0.2-2.94), 151	2.06 (0.45-6.37), 179	2.41 (0.703-7.24), 32	1.21 (0.3-2.69), 110			0.39 (0.11-1.7), 75	2.69 (0.2-11), 454	0.21 (0.11-0.62), 43
Diazinon	ug/L			0.02 (0.0205-0.042), 15	0.02 (0.0205-0.0415), 27	0.02 (0.0205-0.024), 17	0.02 (0.0205-0.042), 17			0 (0.001-0.011), 43	0.02 (0.0205-0.041), 17	0.02 (0.0205-0.0415), 15
Dichloroprop	ug/L		0.01 (0.012-0.012), 1	0.01 (0.0055-0.0165), 14	0.01 (0.0055-0.016), 28	0.01 (0.006-0.016), 17	0.01 (0.0055-0.0175), 17				0.01 (0.0055-0.0887), 17	0.01 (0.0055-0.0155), 15
Diethyl Phthalate	ug/L		0.26 (0.0834-0.55), 17	0.03 (0.005-0.0665), 15	0.07 (0.018-0.27), 27	0.05 (0.021-0.112), 17	0.03 (0.014-0.0827), 17				0.04 (0.005-0.124), 17	0.04 (0.011-0.126), 15
Dimethyl Phthalate	ug/L		0.25 (0.24-0.27), 16	0.01 (0.00495-0.0432), 12	0.01 (0.005-0.025), 16	0.02 (0.00475-0.0714), 10	0.01 (0.0047-0.025), 10				0.01 (0.0047-0.014), 11	0.01 (0.00475-0.0055), 10
Di-N-Butyl Phthalate	ug/L		0.24 (0.0592-0.27), 17	0.08 (0.04-0.16), 15	0.1 (0.0055-0.3), 27	0.11 (0.0356-0.223), 17	0.07 (0.021-0.182), 17				0.09 (0.0286-0.196), 17	0.08 (0.0257-0.165), 15
Di-N-Octyl Phthalate	ug/L		0.25 (0.24-0.27), 16	0.01 (0.00495-0.0323), 12	0.04 (0.005-0.345), 16	0.03 (0.005-0.155), 10	0.01 (0.0047-0.025), 10				0.01 (0.0047-0.0286), 11	0.01 (0.00475-0.0055), 10
Dissolved Oxygen	mg/L	8.67 (3.2-12.9), 319	10.36 (3.8-13.5), 153	10.17 (1.8-13.3), 245	7.34 (1.8-14), 158	7.83 (5.12-12.4), 92	10.04 (4-14.3), 371	11.18 (9.6-13.2), 55	10.97 (8-14.5), 138	11.16 (7.1-14.5), 342	10.62 (1.5-14.4), 768	11.86 (7.4-14.3), 27
E. Coli	col/100mL	202.65 (0-11000), 367	977.88 (18-21000), 136	121.79 (2-1400), 275	792.41 (12-12000), 227	1069.41 (12-11000), 91	389.7 (1-15000), 382	51.81 (7-370), 57	56.05 (0-1200), 133	83.72 (0-4700), 314	1189.27 (0-45000), 999	6.51 (0-43), 44
Endosulfan	ug/L		0 (0.00265-0.00265), 1	0 (0.00235-0.0028), 15	0 (0.00235-0.0028), 28	0 (0.00235-0.0174), 17	0 (0.00235-0.00285), 17				0 (0.0024-0.0028), 17	0 (0.0024-0.00285), 15
Fecal Coliform	col/100mL	257.82 (0-21000), 373	1440.27 (25-39000), 137	117.89 (0-1200), 332	1923.5 (11-210000), 220	954.51 (13-9000), 87	448.26 (2-16000), 388	53.81 (5-320), 57	48.55 (0-740), 134	77.93 (0-4100), 319	1265.52 (0-54000), 1022	5.41 (0-29), 34
Fluoranthene	ug/L		0.03 (0.018-0.054), 17	0.01 (0.00475-0.018), 15	0.02 (0.0047-0.0449), 27	0.01 (0.0047-0.021), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Fluoride, Dissolved	ug/L									90.91 (50-700), 33		
Hexachlorocyclopentadiene	ug/L		1 (0.95-1.1), 16									
Iron, Total	ug/L	1433.44 (140-26700),99	1226.53 (120-23000), 116	803.74 (160-3820), 138	2553.73 (75-24800), 179	2310.16 (513-5190), 32	603.3 (130-13600), 110			475.12 (25-3350), 75	805.77 (25-9450), 455	508.02 (25-5060), 43
Isophorone	ug/L		0.25 (0.24-0.27), 16	0.01 (0.00495-0.026), 12	0.01 (0.00475-0.025), 16	0.01 (0.00475-0.0055), 10	0.01 (0.0047-0.025), 10				0.01 (0.0047-0.0055), 11	0.01 (0.00475-0.0055), 10
Lead, Dissolved	ug/L	0.14 (0.0125-0.36), 98	5.82 (0.087-15), 27	0.09 (0.01-0.55), 151	0.21 (0.0125-0.87), 179	0.12 (0.0125-0.48), 32	0.08 (0.0125-0.27), 110			0.07 (0.0125-0.1), 75	0.11 (0.0125-1.1), 454	0.08 (0.0125-0.1), 43

Table 3-2.
Concentrations1,2 of Chemicals by Sub-basin (continued)

Parameter	Units	Sub-basin (arithmetic mean, min, max, sample size) [1,2]										
		Duwamish River	Longfellow Creek	Lower Green River	Black River	Mill Creek	Soos Creek	Jenkins Creek	Covington Creek	Middle Green River	Newaukum Creek	Upper Green Outlet
Manganese, Dissolved	ug/L	56.23 (10.7-280), 98	47.64 (28.5-87.6), 17	26.1 (2.02-111), 124	104.57 (1.57-550), 163	153.87 (7.81-475), 18	17.97 (2.32-120), 93			18.23 (0.24-111), 73	17.98 (0.91-388), 440	31.4 (7.9-104), 43
Mercury, Dissolved	ug/L	0 (0.0004-0.011), 99	0.1 (0.1-0.1), 10	0.02 (0.00033-0.1), 146	0.01 (0.00022-0.1), 176	0.04 (0.00037-0.1), 32	0.02 (0.00042-0.1), 110			0.05 (0.00005-0.1), 75	0.01 (0.0004-0.1), 455	0 (0.00023-0.0058), 43
Mercury, Total	ug/L	0.02 (0.000819-0.244), 99	0.1 (0.1-0.1), 126	0.02 (0.000699-0.1), 158	0.02 (0.000554-0.204), 176	0.05 (0.000726-0.1), 32	0.02 (0.000693-0.1), 110			0.05 (0.00018-0.1), 75	0.01 (0.000551-0.1), 455	0 (0.00046-0.042), 43
Metolachlor	ug/L									0 (0.001-0.009), 43		
Molybdenum, Dissolved	ug/L	0.34 (0.25-0.74), 98	0.52 (0.411-0.806), 17	0.24 (0.102-0.72), 144	0.98 (0.117-5.15), 178	0.51 (0.25-0.986), 31	0.23 (0.092-0.329), 102			0.21 (0.0794-0.272), 72	0.37 (0.071-3.24), 430	0.21 (0.0603-0.25), 43
Naphthalene	ug/L		0.02 (0.012-0.029), 17	0.02 (0.012-0.033), 15	0.02 (0.012-0.065), 27	0.01 (0.012-0.014), 17	0.02 (0.012-0.06), 17				0.01 (0.012-0.014), 17	0.01 (0.012-0.014), 15
Nickel, Dissolved	ug/L	1.4 (0.53-3.95), 98	4.47 (0.944-10), 27	0.47 (0.14-1.5), 151	1.04 (0.565-2.28), 179	1.01 (0.655-1.66), 32	0.71 (0.36-3.08), 110			0.27 (0.15-0.99), 75	0.74 (0.15-3.51), 454	0.18 (0.071-1.89), 43
Nitrate-nitrogen	ug/L									1161.33 (160-2930), 6		
Nitrite+Nitrate-Nitrogen	ug/L	660.85 (105-3010), 379	1109.29 (329-2610), 144	446.21 (10-2280), 335	447.53 (119-972), 222	564.57 (147-1400), 88	684.67 (10-2100), 383	1228.75 (729-2040), 57	742.8 (178-2040), 137	486.47 (19-1460), 366	2041.13 (52.3-17900), 995	144.48 (10-385), 34
Nitrite-nitrogen	ug/L									6.6 (3-43), 50		
Pentachlorophenol	ug/L		0.71 (0.4-1.1), 17	0.15 (0.06-0.49), 15	0.25 (0.06-0.55), 27	0.21 (0.06-0.495), 17	0.22 (0.06-0.5), 17				0.21 (0.06-0.49), 17	0.2 (0.06-0.5), 15
pH	pH	7.5 (6.2-8.6), 397	7.72 (6.6-8.7), 186	7.12 (5.7-8.3), 393	6.98 (6.2-8.1), 282	6.95 (6.2-7.6), 104	7.23 (6.1-8), 425	7.25 (6.7-7.9), 57	7.26 (6.5-7.8), 139	7.41 (6.4-8.2), 380	7.41 (6-9.8), 1119	7.44 (6.1-7.9), 76
Phenanthrene	ug/L		0.02 (0.0095-0.051), 17	0.01 (0.00475-0.017), 15	0.01 (0.0047-0.0393), 27	0.01 (0.0047-0.0265), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Phenol	ug/L		0.52 (0.0495-2.37), 17	0.09 (0.0495-0.245), 15	0.16 (0.0475-0.67), 27	0.17 (0.0475-0.5), 17	0.16 (0.047-0.37), 17				0.17 (0.047-0.541), 17	0.15 (0.0475-0.67), 15
Prometon	ug/L									0.01 (0.005-0.01), 38		
Pyrene	ug/L		0.02 (0.0095-0.046), 17	0.01 (0.00475-0.016), 15	0.02 (0.0047-0.0628), 27	0.01 (0.0047-0.0264), 17	0.01 (0.0047-0.025), 17				0 (0.0047-0.0055), 17	0.01 (0.00475-0.0055), 15
Pyridine	ug/L		1 (0.95-1.1), 16									
Selenium, Total	ug/L	0.7 (0.25-2.5), 99	1.96 (0.25-25), 134	0.64 (0.25-0.75), 152	0.58 (0.25-0.83), 179	0.47 (0.25-0.75), 32	0.55 (0.25-0.75), 110			0.56 (0.25-0.75), 74	0.65 (0.25-0.75), 454	0.63 (0.25-0.75), 43
Simazine	ug/L		0.5 (0.475-0.55), 16							0.01 (0.0025-0.05), 43		
Strontium, Dissolved	ug/L	76.28 (74.7-79.6), 4		40 (18.7-83.4), 6	135.23 (94.6-179), 6		164 (159-169), 2			59.56 (49.3-64.8), 5	107.77 (60.8-131), 9	8.4 (8.29-8.51), 2
Tebuthiruron	ug/L									0.01 (0.005-0.01), 43		
Temperature	deg C	10.7 (3.6-21.6), 397	10.01 (3.3-17.4), 186	9.94 (2.5-22.3), 384	10.73 (3.2-20.4), 282	10.16 (2-18.6), 104	9.36 (0.7-23), 425	10.03 (4.14-16.6), 57	9.8 (3-16.4), 139	9.26 (1.92-19.6), 380	8.61 (1.89-16.4), 1119	7.12 (1.6-17.3), 76
Thallium, Dissolved	ug/L	0.09 (0.005-0.1), 96	0 (0.005-0.005), 17	0.08 (0.005-0.1), 143	0.07 (0.005-0.1), 176	0.05 (0.005-0.1), 30	0.07 (0.005-0.1), 100			0.06 (0.005-0.1), 71	0.09 (0.005-0.1), 427	0.08 (0.005-0.1), 43
Tin, Total	ug/L		0.15 (0.15-0.15), 3									
TSS	mg/L	12.79 (0.54-627), 379	30.7 (0.51-448), 170	10.89 (1.2-99.6), 318	19.99 (0.25-698), 219	11.28 (1.2-50.2), 88	5.3 (0.25-347), 388	2.67 (0.9-16.8), 57	1.66 (0.25-12.3), 135	6.04 (0.25-98.8), 319	10.33 (0.25-392), 1032	12.53 (0.25-147), 33
Vanadium, Dissolved	ug/L	0.84 (0.54-1.49), 93	1.54 (1.33-1.71), 11	0.59 (0.15-1.15), 140	0.62 (0.15-2.38), 176	0.41 (0.275-0.7), 30	0.39 (0.15-1.3), 99			0.62 (0.343-1.1), 69	1.07 (0.15-3.27), 425	0.69 (0.5-1.1), 42
Zinc, Dissolved	ug/L	2.49 (0.25-5.24), 98	4.39 (1.08-10), 27	5.33 (0.21-557), 151	10.99 (0.93-52), 179	5.15 (0.771-9.38), 32	3.12 (0.25-28), 110			0.7 (0.21-4.96), 75	7.57 (0.25-58.9), 454	0.49 (0.23-1.45), 43

[1]When a chemical was not detected in a sample, one-half the detection limit was used to develop summary statistics.

[2]Blanks indicate that no data were available for a chemical in a particular sub-basin.

4.0 EFFECTS CHARACTERIZATION

Both acute (short-term) and chronic (long-term) surface water effect values were identified (referred to as screening values, or SVs). A typical approach for identifying surface water SVs for the aquatic community is to identify the concentration protective of 95 percent of the species that have been tested (the approach used to derive WQS and AWQC, see below), or to simply use the lowest toxicity value identified for each chemical (as was done when AWQC or WQS were not available). Regardless of the approach used, there is always some level of uncertainty as to whether the aquatic community is adequately protected. In general, the more species tested, and the greater the diversity of tested species, the less the uncertainty in the SV. The following hierarchy was used to identify surface water SVs: (1) Washington State WQS (Ecology 2003); (2) USEPA AWQC (final or proposed) (USEPA 2002a); (3) USEPA's AQUIRE database (USEPA 2002b), and (4) the scientific literature. The SVs identified from all sources are presented in Appendix Tables A-6 through A-9.

In addition to the water quality-based SVs, the B-IBI was used as an additional line-of-evidence in the SLRA. The B-IBI uses a scoring system to categorize benthic communities as very poor, poor, fair, good, or excellent based on benthic macroinvertebrate samples collected in streams. The various metrics that comprise the B-IBI, and the associated scoring system, are also summarized below.

4.1 Effects Characterization Methods

4.1.1 Water Quality-Based Effects Levels

4.1.1.1 Washington State WQS/USEPA AWQC

Chemicals

Both Washington State WQS and USEPA AWQC are designed to be protective of ≥95 percent of the species in a generic and diverse aquatic community. Thus, chemicals with WQS or AWQC have toxicity data for a minimum diversity of aquatic species (details associated with the minimum data requirements will not be provided here, but can be found in the USEPA guidelines [Stephan et al. 1985]). In some instances, the WQS or AWQC are adjusted based on physical properties in the water column. These adjustments are described below:

Hardness-dependent metals: Hardness concentration can have a significant effect on the bioavailability of some metals in water; as such, AWQC/WQS are adjusted to reflect site specific hardness levels. These metals include cadmium, chromium (III), copper, lead, nickel, silver (acute only), and zinc. Therefore, for each sample the metal concentration was compared to the sample-specific hardness-adjusted WQS following the procedures defined in WAC 173-201A. If the hardness was not directly measured in the sample, then

it was calculated from total calcium and total magnesium concentrations (or dissolved concentrations if total concentrations were unavailable) using the following equation:

$$\text{Hardness} = \text{Ca (mg/L)} \times 2.497 + \text{Mg (mg/L)} \times 4.118 \qquad (4\text{-}1)$$

Temperature and pH-dependent parameters: The ammonia WQS are temperature- and pH-dependent and the pentachlorophenol WQS are pH-dependent. For each sample, WQS were calculated based on measured temperature and pH following the procedures defined in WAC 173-201A. The concentrations at each station were then compared to temperature and pH adjusted standards.

Acute and chronic WQS and AWQC for chemicals evaluated in the SLRA are provided in Tables A-6 and A-7, respectively, in Appendix A.

Dissolved Oxygen

Water quality standards for DO are based on aquatic life use categories. The 1-day minimum DO requirements for fresh water are listed in Table 4-1.

Table 4-1.
Dissolved Oxygen Water Quality Standards

Category	1-Day Minimum	Applicable Sub-Basins
Char	9.5 mg/L	Upper Green
Salmon and Trout Spawning, Core Rearing and Migration	9.5 mg/L	Upper Green, Middle Green[1]
Salmon and Trout Spawning, Noncore Rearing and Migration	8.0 mg/L	Longfellow Creek, Lower Green (east & west), Black River, Mill Creek, Soos Creek, Middle Green[1], Newaukum Creek
Salmon and Trout Rearing and Migration Only	6.5 mg/L	Duwamish River
Non-anadromous Interior Redband Trout	8.0 mg/L	None
Indigenous Warm Water Species	6.5 mg/L	None

Source: WAC 173-201A (July 1, 2003)

[1]The Middle Green River contains WQS for DO changes from 8.0 to 9.5 mg/L at RM 42.3.

The aquatic life uses for the Green River and associated tributaries are defined in WAC 173-201A. The area from the Duwamish River mouth to the Black River (Springbrook Creek) (Green River mile 11.0) is designated for salmon/trout rearing (i.e., DO standard of 6.5 mg/L). The Green River from river mile 11.0 to the west boundary of Flaming Geyser State Park (river mile 42.3) is currently designated for noncore salmon/trout spawning, rearing and migration (i.e., DO standard of 8.0 mg/L). The area from river mile 42.3 to river the Green River headwaters is designated for core salmon/trout spawning, rearing and migration (i.e., DO standard of 9.5 mg/L). Tributaries that drain into each section of the Green River described above were compared to the DO standard that applied to that section of the river. The WQS that apply to each sub-basin evaluated in

this SLRA are shown in Table 4-1. Dissolved oxygen levels are not to fall below these WQS at a probability frequency of more than once every ten years on average.

Temperature

As discussed previously, temperature was evaluated by Taylor Associates and King County (2004). As for DO, temperature WQS are based on aquatic life use categories and are designated as the 7-day average of the daily maximum temperatures (7-DADMax)[8]. The temperature WQS are provided in Table 4-2.

Table 4-2.
Temperature Water Quality Standards

Category	7-DADMax	Applicable Sub-Basins
Char	12°C	Upper Green
Salmon and Trout Spawning, Core Rearing and Migration	16°C	Upper Green
Salmon and Trout Spawning, Noncore Rearing and Migration	17.5°C	Longfellow Creek, Lower Green (east & west), Black River / Springbrook Creek, Mill Creek, Soos Creek, Middle Green, Newaukum Creek
Salmon and Trout Rearing and Migration Only	17.5°C	Duwamish River
Non-anadromous Interior Redband Trout	18°C	None
Indigenous Warm Water Species	20°C	None

Source: WAC 173-201A (July 1, 2003)

Temperatures are not to exceed the WQS at a probability frequency of more than once every ten years on average. Taylor Associates and King County (2004) evaluated temperature based on the above WQS and the designated aquatic life uses by river segment. In addition to comparisons to WQS, Taylor Associates and King County (2004) used the following risk categories for impacts to salmonid migration based on a general review of Ecology's (2002) guidance:

- Presumably no impairment <18°C
- Potential for impairment 18°C to 21°C
- Potential for blockage 21°C to 23°C
- Potential lethality >23°C

The results are summarized in Section 5.0.

pH

As for DO and temperature, pH WQS are dependent on the aquatic life use category (Table 4-3).

[8] The 7-DADMax is the 7-d average of daily maximum temperatures. Accordingly, if temperature was monitored continuously over seven days, the 7DADMax is the average of the maximum temperature measured on each of those seven days.

Table 4-3.
pH Water Quality Standards

Category	pH Units	Applicable Sub-Basins
Char	pH shall be within the range of 6.5-8.5, with a human caused variation within the above range of less than 0.2 units	Upper Green
Salmon and Trout Spawning, Core Rearing and Migration	Same as above	Upper Green
Salmon and Trout Spawning, Noncore Rearing and Migration	pH shall be within the range of 6.5-8.5, with a human caused variation within the above range of less than 0.5 units	Longfellow Creek, Lower Green (east & west), Black River / Springbrook Creek, Mill Creek, Soos Creek, Middle Green, Newaukum Creek
Salmon and Trout Rearing and Migration Only	Same as above	Duwamish River
Non-anadromous Interior Redband Trout	Same as above	None
Indigenous Warm Water Species	Same as above	None

Source: WAC 173-201A (July 1, 2003)

Pathogen Indicators

Pathogen indicators (fecal coliform and *E. coli*) were evaluated based on human health AWQC developed by USEPA (1986) and Washington State WQS (WAC 173-201A). For each sampling location, the protocol for evaluating the biological stressors was as follows:

- **Fecal Coliform:** The geometric mean concentration was calculated by season and year (i.e., 5 yrs X 4 seasons = 20 geometric means). Each geometric mean was compared to the WQS of 50 colonies/100 mL (WAC 173-201A). A sample-by-sample comparison was also conducted by comparing each sample to the WQS of 100 colonies/100 ml (WAC 173-201A). If >10 percent of the samples at a station exceeded the WQS, then fecal coliform levels at that station were determined to be above the WQS. The fecal coliform WAC standards apply to primary contact recreation in fresh waters. The Duwamish River to the Black River is designated for 'Secondary Contact Recreation', the Black River to river mile 42.3 is designated as 'Primary Contact recreation', and the area above river mile 42.3 is designated as 'Extraordinary Primary Contact Recreation'. The standards 50 and 100 colonies/mL are for 'Extraordinary Primary Contact Recreation', the most stringent category for assessing fecal coliforms and were conservatively applied to all sections of the watershed.

- ***E. coli*:** The geometric mean concentration was again calculated by season and year (i.e., 5 yrs X 4 seasons = 20 geometric means). Each geometric mean was compared to the USEPA (1986) criterion of 126 *E. coli*/100 mL and the maximum *E. coli* concentration was compared to the criterion of 235 *E. coli*/100 mL.

4.1.1.2 AQUIRE and Scientific Literature

Chemicals

When it was necessary to use the AQUIRE database or scientific literature to identify SVs (i.e., no WQS or AQWC were available), the USEPA guidelines in Stephan et al. (1985) were used to identify acceptable toxicity studies. These guidelines predominantly consider mortality and immobilization to be acceptable acute endpoints, while survival, growth, reproduction, and development are acceptable chronic endpoints. These endpoints have traditionally been considered because they can clearly be linked to population-level effects. However, toxicological research since the 1980s has identified additional endpoints that may be equally important for assessing population-level effects. Additional endpoints considered were chemical avoidance and olfactory inhibition. The acute and chronic SVs and study details are provided in Tables A-8 and A-9, respectively, in Appendix A.

Total Suspended Solids

No Washington State WQS or USEPA AWQC are available for TSS. Accordingly, the scientific literature was reviewed for appropriate toxicity thresholds. Effect endpoints for TSS are distinguished from those for turbidity based on the stressor's mechanism of action. Studies were not considered when the distinctions between turbidity and TSS were ambiguous. Adverse TSS effects are defined as those attributable to physical effects of particles that could be expressed in milligrams per liter. Examples include mortality from abrasion, clogging of gills (Muncy et al. 1979), and disruption of filter and net feeding (Strand and Merritt 1997). In contrast, turbidity's assumed mode of action are effects arising from reduced light penetration as a result of water clarity, and these were consistent with its definition. Examples of turbidity effects include changes in the ability to see and capture prey (Vogel and Beauchamp 1999), reduced benthic algal (periphyton) populations in response to reduced light penetration (Quinn et al. 1992), and reductions in benthic macroinvertebrate production and species richness in response to reduced primary production of periphyton. Turbidity was not evaluated in the SLRA. The following summarizes effects data for TSS that have been compiled by Joe Volosin and Rick Cardwell of Parametrix, Inc. (King County 1999).

The TSS measurement endpoints for fish and invertebrates comprise both acute and chronic effects on behavior, survival, growth, abundance, and reproduction of plants, invertebrates, and fish following different exposure durations. Data for plankton were included because some species inhabit slower-moving rivers, and data for marine species were included because salinity does not appear to influence the modes of action of TSS on aquatic life, though it does affect concentration. For acute exposures, about 61 percent of the TSS endpoints in the database compiled were lethal. For chronic exposures, the TSS endpoints often were lowest observed effect concentrations (LOECs), from which no observed effect concentrations (NOECs) were estimated using one of two methods: dividing by a safety factor of 2, or by regressing the data and calculating the concentration causing a 25 percent effect (EC25). The latter metric is often a reasonable approximation of the NOEC (Moore and Caux 1997).

The time required to elicit a response is also important in evaluating the risk associated with TSS exposures. Newcombe and McDonald (1991) presented data that confirmed a relationship between exposure duration and TSS concentration and they developed a transformation that takes exposure duration into account. They showed that the strength of the relationship between TSS concentration and effects could be improved from r^2 = 14% to r^2 =64%, when the TSS concentration was multiplied by exposure duration and then log-transformed. Newcombe and McDonald termed this normalized metric a stress index, calculated as follows:

$$\text{TSS Stress Index} = \ln(\text{TSS, mg/L} \times \text{Exposure, hours}) \quad (4\text{-}2)$$

In this SLRA, however, temporal TSS data (e.g., daily) were not available, which precluded use of the stress index. Consequently, the lowest acute and chronic effects thresholds of 244 and 22 mg/L, respectively, were identified as SVs (Table A-8 and A-9 in Appendix A).

4.1.1.3 Benthic Index of Biotic Integrity

In addition to water quality-based effects levels for chemical and physical parameters, the B-IBI was used as an additional line-of-evidence for evaluating potential risks associated with existing conditions to aquatic life. The King County WLRD conducted macroinvertebrate monitoring in the Green-Duwamish watershed in 2002 and 2003 (EVS 2004, 2005). In support of this SLRA, King County supplied all of the 2002 and 2003 B-IBI data (Doug Henderson, personal communication). These data were used to develop B-IBI scores. The B-IBI consists of 10 metrics that are used as an indicator of the overall biological integrity of a stream ecosystem. These 10 metrics are:

1. Total Number of Taxa
2. Total Number of Ephemeroptera Taxa
3. Total Number of Plecoptera Taxa
4. Total Number of Trichoptera Taxa
5. Percent tolerant individuals
6. Number of clinger taxa
7. Percent predator individuals
8. Percent dominance
9. Number of long-lived taxa
10. Number of intolerant taxa

These metrics are given a score of 1, 3, or 5 (1 being the worst and 5 being the best), and then the scores for all 10 metrics are summed, resulting in a total B-IBI score of 10 to 50. Based on the total B-IBI scores, water bodies are given rankings, as shown in Table 4-4.

Table 4-4.
Stream Rankings Based on Total B-IBI Scores.

Total B-IBI Score	Ranking
46-50	Excellent
34-44	Good
28-36	Fair
18-26	Poor
10-16	Very Poor

In this SLRA, B-IBI data provided another line of evidence in the aquatic life risk characterization. The reader is referred to EVS (2004, 2005) for a detailed review and analysis of the B-IBI data.

4.2 Effects Characterization Results

The number of available ambient water quality criteria/standards and literature derived toxicity values for all parameters evaluated in this SLRA are summarized in Table 4-5. Details on all screening values determined for each chemical or parameter are summarized in Appendix Tables A-6 through A-9. Screening values were not identified for some parameters and these were excluded from further assessment. There was only one detected chemical, deethyl atrazine, for which an SV could not be identified. Tables A-6 and A-7 present the acute and chronic SVs based on Washington State WQS or USEPA AWQC. Tables A-8 and A-9 provide screening values developed from toxicity studies identified in the AQUIRE database or scientific literature. Details of each study are presented along with the screening value and reference for the original study.

Table 4-5.
Summary of Screening Values by Chemical Class and Reference

	Washington State WQS		US EPA AWQC		AQUIRE/Literature		
Chemical Group	Acute	Chronic	Acute	Chronic	Acute	Chronic	None
Inorganics	11	10	2	2	13	14	0
Conventionals	6	6	0	0	3	3	0
Semi-volatile organics	1	1	2	2	72	74	2
Volatile organics	0	0	0	0	35	34	2
Pesticides	10	10	3	4	37	37	8
Other	0	0	0	0	2	2	2

4.3 Effects Characterization Uncertainties

The primary uncertainty in the effects characterization is whether the SVs are protective of aquatic species in the study area. The uncertainty varies by parameter depending on the amount of toxicity data available (e.g., number of species tested) and the variety of

species tested. If toxicity data are available for a large number of species with phylogenic diversity (e.g., several fish families, crustaceans, insects, other arthropods, annelids, molluscs, etc.), then the likelihood that there are significantly more sensitive species that have not been tested is reduced. Use of SVs based on protection of 95 percent of the species (for WQS and AWQC) or the most sensitive toxicity value (for AQUIRE or literature-derived SVs) also helps reduce the uncertainty of whether the SVs are adequately protective.

For those chemicals with salmonid toxicity data available, the SVs should be protective of salmonids since WQS/AWQC are lowered to protect salmonids if they are more sensitive than the 5th percentile species. However, because many WQS/AWQC were developed in the 1980s, additional salmonid toxicity data has been published for a variety of chemicals. For those chemicals identified as being of potential concern in the risk characterization, salmonid toxicity values were identified to understand whether salmonids are likely to be directly at risk from chemical exposure. For chemicals lacking WQS or AWQC, SVs are based on the lowest toxicity value for the most sensitive species, so if a salmonid was the most sensitive species to a given chemical the SV would be based on the toxicity threshold for that species. Of course, there is still uncertainty if toxicity data are limited for salmonids or if there are more sensitive endpoints that have not been evaluated.

In addition, WQS for several metals may be conservative for many of the site waters. Although the WQS for divalent metals are normalized to the hardness of the site water to more properly account for the bioavailability of the metal to aquatic biota, other factors, such as dissolved organic carbon (DOC) can also substantially impact bioavailability. The biotic ligand model (BLM) is a tool for estimating toxicity values based on site-specific water quality characteristics that influence metal bioavailability. The USEPA has incorporated the BLM into the latest draft AWQC document for copper (USEPA 2003a) and is used in Section 5.2.1.5 to demonstrate how copper HQs may be affected when bioavailability is considered further.

Finally, the chemicals evaluated in the SLRA were not assessed for their potential to disrupt the endocrine system. Rather, the screening values for potential endocrine disruptors were based on survival, growth or reproduction endpoints, as defined in Section 4.1.1.2. The effects of potential endocrine disruptors in surface waters are being evaluated in a separate King County effort. Visit the County's website for more information on this program (http://dnr.metrokc.gov/WTD/community/edc/index.htm).

5.0 RISK CHARACTERIZATION

The risk characterization integrates the results of the exposure and effects concentrations to estimate potential risks to aquatic life and human health. The following sections provide the methods and results of the risk characterization.

5.1 Risk Characterization Methods

Risks from chemical, biological and physical water quality parameters were evaluated by various methods. The risk characterizations for chemical constituents and TSS were based on hazard quotients (HQs), which were defined as the ratio of the chemical or TSS concentration to the respective SV:

$$\text{HQ} = \frac{\text{Measured Chemical or TSS Concentration}}{\text{SV}}$$

The HQ provides a numerical method to quantify the potential risk posed by a chemical or TSS in a given medium. Stressors with an HQ less than 1.0 were deemed to not pose a potential risk, while those with HQs greater than 1.0 *may* pose a potential risk and further study may be warranted. Hazard quotients were calculated on a sample-by-sample basis and are summarized in Appendix A-5. Chemicals with at least one HQ of 1.0 or greater at a station are discussed further in Section 5.2 below.

Pathogen indicators (i.e., fecal coliform and *E. coli*) were evaluated based on two separate criteria as defined in (USEPA 1986 and WAC 173-201A):

- Geometric mean over a season compared to the SV of 50 colonies/100 mL (fecal coliform) or 126 colonies/100 mL (*E. coli*).
- The percent of samples exceeding 100 colonies/100 mL (fecal coliform) or 235 colonies/100 mL (*E. coli*) within a sampling season.

Physical characteristics of water quality (i.e., temperature, DO, pH) were evaluated based on more qualitative methods rather than the HQ process, as previously discussed.

5.2 Risk Characterization Results

5.2.1 Aquatic Life

The following first presents the HQ evaluation (Section 5.2.1.1), followed by the DO (Section 5.2.1.2), temperature (Section 5.2.1.3), and pH (Section 5.2.1.4) assessments. In these sections, results are organized by sub-basin. Subsequently, Section 5.2.1.5 is organized by stressor to facilitate comparisons between sub-basins.

5.2.1.1 Chemicals and TSS

The chemical and TSS HQs are summarized and presented by sub-basin below. Table 5-1 summarizes all parameters with at least one HQ exceeding 1.0 (HQ summary statistics for all parameters are provided in Table A-5 of Appendix A). Table 5-1 shows the frequency of detection, number of samples, and the minimum, 5th percentile, 25th percentile, 50th percentile, 75th percentile, 95th percentile, and maximum HQs. The table also shows the number of HQs greater than 1.0 that are based on detection limits (to identify whether any exceedances are based on elevated detection limits) and the total number of HQs greater than 1.0. As discussed in Section 3, the data used to derive these HQs include a mixture of baseflow and stormwater data, but the data were not aggregated by weather conditions (i.e., all data for a given site were pooled).

Before presenting and discussing the HQs below; however, aluminum, iron, and strontium are discussed since HQs for these metals frequently exceeded 1.0 in almost all sub-basins. The significance of this pattern of exceedances is highly uncertain and this uncertainty applies to all sub-basins. Hence, HQs for these metals are not included in the main body of the report, but can be found in Table A-5.

Aluminum: Washington State has not adopted WQS for aluminum, but the USEPA has recommended acute and chronic criteria of 750 and 87 µg/L (total recoverable) (USEPA 1988). As noted by the USEPA, field data for many high quality waters in the U.S. contain aluminum concentrations greater than 87 µg/L when either total recoverable or dissolved aluminum are measured (USEPA 2002a). Given that the chronic aluminum criterion is known to be overly protective for many high quality waters, it was concluded that exceedance of the aluminum WQS does not provide an indication of potential risks to aquatic life. Median aluminum HQs across all stations ranged from 0.08-6.2 and maximum HQs ranged from 1.1-253.

Iron: Washington State has not adopted WQS for iron; however, the USEPA has recommended a chronic criterion of 1,000 µg/L (no acute criterion has been recommended). This value is based on a field study at a site receiving acid mine drainage and, thus, its applicability to the Green-Duwamish watershed is questionable. Furthermore, iron levels may be naturally elevated at some locations. For example, the USGS suggested that elevated iron levels measured in Springbrook Creek between 1995 and 1998 may be attributable to a groundwater source (Embrey and Frans 2003). Median iron HQs across all stations ranged from 0.05-4.0 and maximum HQs ranged from 0.8-27.

Strontium: No Washington State WQS or USEPA AWQC are available for strontium. The strontium SVs used in this SLRA were derived based on toxicity data identified in the AQUIRE database (see Section 4.1.1.2). The chronic SV of 49 µg/L is based on an LC10 for rainbow trout (*O. mykiss*) larval mortality following exposure through four days post-hatch (exposure duration of approximately 32 days through embryo-larval life stages). Median and maximum chronic HQs across all stations ranged from 0.1-3.7 based on this SV (limited strontium data were available for each station, so the median and maximum HQs were virtually identical). If other available SVs are considered, the strontium HQs fall well below 1.0. For example, Suter and Tsao (1996) recommended a chronic value of 1,500 µg/L, which is well above the SV of 49 µg/L used in the SLRA. Given this and the low magnitude of the strontium HQs

Table 5-1.
Summary of HQs for Chemicals and TSS Greater than 1.0 by Sub-basin.

Station	Parameter	FOD (%)	Sample Size	Exposure Type	Hazard Quotients Min	5%	25%	50%	75%	95%	Max	# of HQs>1 Based on Detection Limit	# of HQs>1
Duwamish River Sub-basin													
0305	TSS	99	118	Chronic	0.03	0.07	0.12	0.15	0.23	0.39	1.2	0	1
0307	TSS	100	116	Chronic	0.05	0.1	0.17	0.31	0.57	2.4	6.5	0	17
0309	TSS	100	54	Chronic	0.08	0.1	0.17	0.24	0.41	0.85	1.9	0	3
A307	TSS	100	91	Acute	0.002	0.008	0.02	0.04	0.08	0.35	2.6	0	1
A307	TSS	100	91	Chronic	0.02	0.09	0.18	0.4	0.87	3.9	29	0	21
Longfellow Creek Sub-basin													
C370	TSS	100	79	Chronic	0.8	0.05	0.10	0.17	0.43	4.1	7.7	0	12
J370	TSS	100	66	Chronic	0.02	0.03	0.05	0.09	0.24	0.66	6.9	0	1
K370	Selenium, Total	0	7	Acute	1.3	1.3	1.3	1.3	1.3	1.3	1.3	7	7
K370	Selenium, Total	0	7	Chronic	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7	7
K370	TSS	100	8	Acute	0.08	0.26	0.7	0.91	1.2	1.7	1.8	0	4
K370	TSS	100	8	Chronic	0.86	2.85	7.8	10.1	13.7	19.3	20.4	0	7
L370	Simazine	0	16	Chronic	1.5	1.6	1.6	1.6	1.6	1.7	1.8	16	16
L370	TSS	100	17	Chronic	0.27	0.69	1.6	2.9	6.7	10.8	11.0	0	15
Lower Green River Sub-basin													
A310_3106	TSS	100	160	Chronic	0.05	0.11	0.23	0.34	0.54	1.3	4.4	0	12
A330	TSS	100	24	Chronic	0.12	0.13	0.2	0.34	1.1	2.2	4.5	0	6
A330	Zinc	100	24	Acute	0.002	0.003	0.005	0.01	0.02	0.03	7.9[a]	0	1
A330	Zinc	100	24	Chronic	0.002	0.003	0.005	0.01	0.02	0.03	7.8[a]	0	1
0311	TSS	100	53	Chronic	0.07	0.09	0.19	0.28	0.39	0.78	1.8	0	2
EC09A080	TSS	100	55	Chronic	0.09	0.12	0.30	0.41	0.73	1.6	3.2	0	7

Table 5-1.
Summary of HQs Greater than 1.0 by Sub-basin (continued).

Station	Parameter	FOD (%)	Sample Size	Exposure Type	Hazard Quotients Min	5%	25%	50%	75%	95%	Max	# of HQs>1 Based on Detection Limit	# of HQs>1
Black River / Springbrook Creek Sub-basin													
0317	Cadmium	13	16	Chronic	0.32	0.34	0.37	0.42	0.56	1.1	1.1	0	2
0317	Copper	100	16	Chronic	0.22	0.42	0.61	0.69	0.95	1.1	1.2	0	3
0317	Lead	88	16	Chronic	0.09	0.10	0.31	0.46	0.49	0.92	1.2	0	1
0317	TSS	100	81	Chronic	0.11	0.19	0.27	0.37	0.56	2.1	3.9	0	14
A317	Copper	100	59	Chronic	0.04	0.06	0.17	0.69	0.88	1.1	1.3	0	5
A317	Manganese	100	59	Chronic	0.004	0.02	0.07	0.13	0.52	1	1.2	0	5
A317	TSS	100	50	Chronic	0.13	0.27	0.4	0.7	1.4	3.4	5.4	0	21
A326	TSS	98	45	Acute	0.001	0.004	0.007	0.01	0.04	0.21	2.9	0	1
A326	TSS	98	45	Chronic	0.01	0.04	0.08	0.14	0.47	2.3	32	0	6
B317	Cadmium	37	38	Chronic	0.02	0.05	0.2	0.34	0.53	0.95	1.4	0	2
B317	Copper	100	38	Acute	0.06	0.07	0.1	0.54	0.76	1.1	1.1	0	4
B317	Copper	100	38	Chronic	0.09	0.1	0.14	0.74	1	1.4	1.6	0	11
B317	TSS	100	29	Chronic	0.04	0.11	0.32	0.77	1.5	2.7	4.8	0	10
B317	Zinc	100	38	Acute	0.02	0.03	0.1	0.44	0.63	1	1	0	3
B317	Zinc	100	38	Chronic	0.02	0.03	0.1	0.44	0.62	1	1	0	2
C317	Copper	100	14	Chronic	0.04	0.05	0.09	0.3	0.59	1	1.3	0	1
C317	Manganese	100	14	Chronic	0.09	0.1	0.17	0.39	0.96	1	1	0	2
C317	TSS	100	14	Chronic	0.21	0.25	0.32	0.38	0.59	1.4	1.7	0	2
Mill Creek Sub-basin													
A315	Copper	100	32	Chronic	0.07	0.09	0.26	0.42	0.73	1.1	1.3	0	2
A315	Manganese	100	18	Chronic	0.02	0.02	0.08	0.17	0.54	0.9	1	0	1
A315	TSS	100	88	Chronic	0.05	0.08	0.15	0.38	0.67	1.7	2.3	0	12
Soos Creek Sub-basin													
A320	TSS	100	100	Acute	0.004	0.006	0.01	0.01	0.03	0.15	1.4	0	1
A320	TSS	100	100	Chronic	0.05	0.06	0.12	0.16	0.28	1.7	16	0	9
B320	TSS	97	32	Chronic	0.01	0.03	0.05	0.09	0.27	0.95	2.6	0	2

Table 5-1.
Summary of HQs Greater than 1.0 by Sub-basin (continued).

Station	Parameter	FOD (%)	Sample Size	Exposure Type	Hazard Quotients Min	5%	25%	50%	75%	95%	Max	# of HQs>1 Based on Detection Limit	# of HQs>1
Middle Green River Sub-basin													
0321	Cadmium	6	16	Chronic	0.31	0.32	0.33	0.36	0.37	0.72	1.7	0	1
0321	TSS	100	72	Chronic	0.03	0.06	0.15	0.28	0.43	1	3.3	0	4
A319	TSS	100	54	Chronic	0.03	0.05	0.07	0.1	0.19	1.1	2.9	0	4
A341	TSS	100	16	Chronic	0.14	0.14	0.18	0.2	0.5	0.84	1.1	0	1
B319	Cadmium	5	19	Chronic	0.48	0.48	0.56	0.58	0.66	0.91	2.8	0	1
B319	TSS	99	83	Chronic	0.01	0.03	0.05	0.07	0.2	1.7	4.5	0	8
EC09A190	TSS	92	12	Chronic	0.02	0.04	0.05	0.09	0.14	1	1.5	0	1
F321	TSS	93	82	Chronic	0.01	0.01	0.03	0.04	0.07	0.17	1.7	0	1
Newaukum Creek Sub-basin													
0322	Cadmium	2	102	Chronic	0.03	0.03	0.27	0.32	0.34	0.39	1.3	0	1
0322	Copper	99	102	Chronic	0.03	0.1	0.28	0.47	0.78	0.92	1.1	0	3
0322	TSS	98	146	Acute	0.002	0.005	0.011	0.022	0.072	0.34	1.2	0	1
0322	TSS	98	146	Chronic	0.02	0.05	0.12	0.25	0.8	3.8	13	0	30
AA322	TSS	94	33	Chronic	0.01	0.03	0.09	0.14	0.25	0.66	1.1	0	1
AG322	TSS	100	37	Chronic	0.04	0.08	0.19	0.34	0.7	2.1	2.4	0	7
AI322	TSS	100	33	Chronic	0.05	0.08	0.11	0.16	0.3	0.76	3	0	1
AJ322	TSS	97	100	Chronic	0.01	0.04	0.06	0.12	0.18	0.79	3.2	0	3
B322	Ammonia	100	56	Chronic	0.01	0.03	0.08	0.17	0.28	1	3.1	0	4
B322	Copper	100	63	Acute	0.09	0.35	0.5	0.57	0.66	0.9	1	0	3
B322	Copper	100	63	Chronic	0.12	0.53	0.74	0.85	0.97	1.3	1.5	0	14
B322	Nitrite + Nitrate	100	56	Chronic	0.16	0.2	0.33	0.56	1.5	2	2.2	0	21
B322	TSS	100	56	Chronic	0.04	0.07	0.11	0.21	0.51	1.3	2.4	0	6
D322	Cadmium	7	118	Chronic	0.02	0.02	0.17	0.24	0.33	0.39	1.6	0	1
D322	Copper	100	118	Acute	0.03	0.03	0.11	0.32	0.65	0.92	1.8	0	5
D322	Copper	100	118	Chronic	0.04	0.04	0.16	0.46	0.91	1.3	2.5	0	24
D322	Lead	21	118	Chronic	0.004	0.01	0.04	0.06	0.09	0.31	1.1	0	2

Table 5-1.
Summary of HQs Greater than 1.0 by Sub-basin (continued).

Station	Parameter	FOD (%)	Sample Size	Exposure Type	Hazard Quotients Min	5%	25%	50%	75%	95%	Max	# of HQs>1 Based on Detection Limit	# of HQs>1
Newaukum Creek Sub-basin (continued)													
D322	Nitrite + Nitrate	100	92	Chronic	0.18	0.22	0.32	0.41	0.5	0.58	1.2	0	1
D322	TSS	100	108	Acute	0.004	0.01	0.02	0.03	0.05	0.21	1.6	0	1
D322	TSS	100	108	Chronic	0.04	0.12	0.21	0.32	0.51	2.4	18	0	15
H322	TSS	100	37	Chronic	0.05	0.06	0.11	0.2	0.35	1	2.1	0	2
I322B	Copper	100	82	Acute	0.21	0.23	0.38	0.47	0.54	0.77	1	0	1
I322B	Copper	100	82	Chronic	0.3	0.34	0.52	0.62	0.74	1	1.3	0	6
I322B	Lead	28	82	Chronic	0.008	0.02	0.09	0.11	0.22	0.38	1.6	0	1
I322B	TSS	90	72	Chronic	0.01	0.02	0.13	0.23	0.55	1.2	2.4	0	7
J322	TSS	100	36	Chronic	0.05	0.07	0.15	0.24	0.34	1.1	1.7	0	3
N322	TSS	100	39	Chronic	0.06	0.07	0.19	0.29	0.49	1.5	2.7	0	4
S322	Copper	98	89	Acute	0.04	0.07	0.1	0.19	0.23	0.3	1.4	0	1
S322	Copper	98	89	Chronic	0.05	0.1	0.13	0.25	0.31	0.4	1.8	0	1
S322	TSS	90	81	Acute	0.001	0.001	0.02	0.04	0.08	0.3	1.3	0	1
S322	TSS	90	81	Chronic	0.01	0.01	0.19	0.39	0.85	3.3	14	0	16
Upper Green River Outlet													
E319	TSS	97	33	Chronic	0.01	0.04	0.06	0.12	0.45	2.3	6.7	0	6

Shaded cells note HQs greater than 1.0.

[a]Acute and chronic water quality standards are virtually identical and the dissolved conversion factor for the acute WQS is slightly less than for the chronic WQS, resulting, in some cases, a slightly higher acute HQ than chronic HQ.

(maximum HQ of 3.7 across the entire watershed) and that the chronic SV is likely overly protective, strontium was not identified as a chemical of potential concern and is not discussed further in the SLRA. All strontium summary statistics and HQs are available in Table A-5.

Duwamish River Sub-Basin

Water quality data were available for four stations in the Duwamish River sub-basin. Data were available for ammonia-nitrogen, nitrite+nitrate nitrogen, metals, and TSS. Data were not available for organic compounds or pesticides. Of these, only TSS had HQs greater than 1.0. Total suspended solids levels in at least one sample exceeded the chronic SV at all four stations; however, only the 95th percentile or maximum HQs exceeded 1.0 (see Table 5-1). Because the TSS data are based on grab samples, and the SV exceedance is based on a chronic exposure, there is uncertainty whether these TSS levels would persist for a sufficient duration to truly pose a chronic risk to aquatic life. At Station A307, the maximum acute TSS HQ was 2.6, but no other measured TSS concentrations exceeded the acute SV. As discussed later in the uncertainty section (Section 5.3.7), alternative approaches exist for assessing potential TSS risks to aquatic life that explicitly account for the exposure duration. However, such evaluations would require additional data collection, such as daily TSS measurements under various flow regimes.

Overall conclusions:

- TSS**:** There is potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Ammonia, nitrite+nitrate, metals: There is negligible risk to aquatic life.
- Organic compounds and pesticides: Risks are uncertain due to a lack of data.

Longfellow Creek Sub-Basin

Water quality data were available for five stations and 51 parameters, including nitrogen compounds, metals, PAHs, pesticides, other organic compounds, and TSS in the Longfellow Creek sub-basin. Total suspended solids levels at stations C370, J370, K370 and L370 resulted in chronic HQs exceeding 1.0 and levels at Station K370 resulted in some acute HQs exceeding 1.0 (see Table 5-1). Maximum chronic HQs were 7.7, 6.9, 20.4, and 11.0, respectively, and the maximum acute HQ at K370 was 1.8. Selenium and simazine HQs exceeded 1.0, but these exceedances were based entirely on the magnitude of the detection limit (one-half the detection limit was used) as neither of these chemicals were detected above MDLs in Longfellow Creek (see Table 5-1).

Overall conclusions:

- TSS**:** There is a potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Ammonia, nitrite+nitrate, metals, organic compounds, and pesticides: There is a negligible risk to aquatic life.

Lower Green River Sub-Basin

Water quality data were available for 12 stations and 21 parameters (nitrogen compounds, metals, and TSS) in the Lower Green River sub-basin. Parameters with HQs exceeding 1.0 in at least one sample from one station were TSS and zinc. Total suspended solids levels exceeded the chronic TSS SV at four stations (see Table 5-1), although exceedances were relatively infrequent and the HQ magnitudes were generally low (maximum HQs $\leq$4.5). At station A330, the maximum zinc concentration exceeded both the acute and chronic WQS (see Table 5-1). All other acute and chronic zinc HQs were well below 1.0, with the 95th percentile HQ being only 0.03. Accordingly, potential zinc risks to aquatic life are assumed to be negligible in the Lower Green River sub-basin.

Overall conclusions:

- TSS**:** There is a potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Ammonia, nitrite+nitrate, metals: There is negligible risk to aquatic life.
- Organic compounds and pesticides: Risks are uncertain due to a lack of data.

Black River (Springbrook Creek) Sub-Basin

Water quality data were available for six stations and 46 parameters, including nitrogen compounds, metals, PAHs, pesticides, other organic compounds, and TSS in the Black River (Springbrook Creek) sub-basin. Overall, the number of parameters with HQs exceeding 1.0 was greater here than for most other sub-basins. Total suspended solids levels exceeded the chronic TSS SV in at least a portion of the samples at all six stations, but no levels exceed the acute SV in any sample. The maximum chronic TSS HQs ranged from 1.7-5.4 (see Table 5-1), suggesting a potential TSS risk if water column TSS concentrations persisted for a sufficient duration. Chronic cadmium, copper, manganese, and zinc HQs exceeded 1.0 at two, four, two, and one station(s), respectively (see Table 5-1). In general, only the 95th percentile HQs exceeded 1.0, and then only slightly. Given the potential additive toxic effects of certain metals, and if metal concentrations persisted for a sufficient duration, there could be a slight potential for chronic risks associated with exposure to these metals in the water column under certain conditions, although additional bioavailability considerations suggest the HQs may be biased high for metals (see Section 5.2.1.4). The acute 95th percentile HQ for copper also slightly exceeded 1.0 for Station B317 (see Table 5-1).

Overall conclusions:

- TSS**:** There is a potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Metals: Metals may pose a low risk to aquatic life if their concentrations and toxicities are considered additively, but the reduced bioavailability expected in site waters may mitigate the low risk potential. Site-specific toxicity studies would be required to understand the potential risks posed by metals to aquatic life with more certainty.
- Ammonia-nitrogen, nitrite+nitrate nitrogen, organic compounds, and pesticides: There is negligible risk to aquatic life.

Mill Creek Sub-Basin

Water quality data were available for a single station and 46 parameters, including nitrogen compounds, metals, PAHs, pesticides, other organic compounds, and TSS in the Mill Creek sub-basin. Chronic HQs greater than 1.0 for at least one sample were identified for copper, manganese, and TSS (see Table 5-1). The frequency and magnitude of HQs greater than 1.0 are quite low, suggesting existing conditions for these parameters pose a negligible risk to aquatic life.

Overall conclusions:

- Nitrogen compounds, metals, PAHs, pesticides, and other organic compounds: There is negligible risk to aquatic life.

Soos Creek Sub-Basin

Water quality data were available for seven stations and for 47 parameters, including nitrogen compounds, metals, PAHs, pesticides, other organic compounds, and TSS in the Soos Creek sub-basin. Hazard quotients greater than 1.0 were calculated for at least one sample for TSS (see Table 5-1). No other parameters had HQs greater than 1.0.

Overall conclusions:

- TSS**:** There is a potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Ammonia-nitrogen, nitrite+nitrate nitrogen, metals, organic compounds, and pesticides: There is negligible risk to aquatic life.

Jenkins Creek Sub-Basin

Water quality data were available for a single station in the Jenkins Creek sub-basin. Data were limited to ammonia, nitrite+nitrate, and TSS (as well as DO and temperature data, discussed below). None of the HQs were greater than 1.0.

Overall conclusions:

- Ammonia, nitrite+nitrate nitrogen, and TSS: There is negligible risk to aquatic life.
- Metals, organic compounds and pesticides: Risks are uncertain due to a lack of data.

Covington Creek Sub-Basin

Water quality data were available for three stations in the Covington Creek sub-basin. Like the Jenkins Creek sub-basin, data were limited to ammonia, nitrite+nitrate, and TSS (as well as DO and temperature data, discussed below). None of the HQs were greater than 1.0.

Overall conclusions:

- Ammonia, nitrite+nitrate nitrogen, and TSS: There is negligible risk to aquatic life.
- Metals, organic compounds and pesticides: Risks are uncertain due to a lack of data.

Middle Green River Sub-Basin

Water quality data the Middle Green River sub-basin were available for seven stations and 26 parameters (nitrogen compounds, metals, TSS, and the pesticide simazine). Parameters with HQs exceeding 1.0 were cadmium and TSS (see Table 5-1). The maximum cadmium HQs at Stations 0321 and B319 were 1.7 and 2.8, respectively, but 95th percentile HQs were less than 1.0 at both stations. As further discussed in Section 5.2.1.5, additional consideration of cadmium bioavailability could potentially result in maximum cadmium HQs of less than 1.0. For TSS, maximum and sometimes 95th percentile HQs exceeded 1.0 at seven Stations (e.g., 0321, A319, A341, B319, EC09A190, and F321). As previously discussed, daily (or more frequently during storm event conditions) TSS monitoring at certain locations may provide a better estimate of potential TSS risks to aquatic life.

Overall conclusions:

- TSS**:** There is potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Nitrogen compounds, metals, and simazine: There is negligible risk to aquatic life.
- Organic compounds and pesticides (in addition to simazine): Risks are uncertain due to a lack of data.

Newaukum Creek Sub-Basin

In the Newaukum Creek sub-basin water quality data were available for 21 stations and 47 parameters, including nitrogen compounds, metals, PAHs, pesticides, other organic compounds, and TSS. More parameters were observed to have HQs exceeding 1.0 in this basin than in the other sub-basins (cadmium, copper, lead, ammonia, nitrite+nitrate, and TSS). Overall, chronic HQs for chemical constituents were relatively low, with maximum HQs ranging from 1.1 to 3.1. Acute copper HQs were also 1.0 and 1.8 at Stations B322 and D322. Maximum ammonia and nitrite+nitrate HQs were 3.1 and 2.2, respectively, at B322, and the maximum nitrite+nitrate HQ at D322 was 1.2. However, given that the HQs for these parameters are low and because the frequency with which HQs exceed 1.0 is low, the potential risk posed by ammonia and nitrite+nitrate is likely negligible. The TSS HQs were greater than 1.0 at more stations than chemical parameters, and HQs were generally greater. At Stations 0322 and D322, maximum chronic TSS HQs were 13 and 18, respectively. Acute TSS HQs also exceeded 1.0 at these two stations.

Overall conclusions:

- TSS**:** There is potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Metals: Metals may pose a low risk to aquatic life if their concentrations and toxicities are considered additively, but the reduced bioavailability expected in site waters may mitigate the low risk potential. Site-specific toxicity studies would be required to reduce uncertainty.

- Nitrogen compounds, organic compounds, and pesticides: There is negligible risk to aquatic life.

Upper Green River Outlet

Water quality data (nitrogen compounds, metals, organics, and TSS) were available for a single station in the Upper Green River sub-basin. The 95th percentile TSS HQ was 2.3 and the maximum HQ was 6.7, otherwise no other HQs exceeded 1.0 (see Table 5-1).

Overall conclusions:

- TSS**:** There is potential risk to aquatic life based on a conservative screen; site-specific studies would be required to reduce uncertainty.
- Nitrogen compounds, metals, organic compounds, and pesticides: There is negligible risk to aquatic life.

5.2.1.2 Dissolved Oxygen

Results for DO risk are summarized in Table A-10 in Appendix A for all sub-basins. The DO results across all sub-basins are also presented in Figure 5-1. It should be noted that the DO data are from discrete sampling events and do not necessarily reflect worst-case conditions that might occur during diurnal fluctuations.

Duwamish River Sub-Basin

Dissolved oxygen was monitored at five stations (0305, 0307, 0309, A307, and UDUWAM) in the Duwamish River sub-basin. Dissolved oxygen levels in this sub-basin were compared to the WQS of 6.5 mg/L, as described in Section 4.1.1.2. Stations 0305, 0307, and 0309 were found to have 15 (12%), 20 (16%), and 1 (2%) measurements, respectively, below the minimum DO standard (Table 5-2). All measurements at station A307 (Hamm Creek) and UDUWAM met the minimum DO WQS. However, results suggest that conditions at stations 0305 and 0307 have the potential to impair salmon and trout rearing and migration, while Stations 0309, A307, and UDUWAM do not have DO levels that would impair fish rearing and migration.

Overall conclusion:

- Low DO levels at stations 0305 and 0307 may impair salmon and trout rearing and migration; site-specific studies would be required to confirm this conclusion.

Longfellow Creek Sub-Basin

Dissolved oxygen was monitored at three stations (C370, J370, and K370) in the Longfellow Creek sub-basin. Dissolved oxygen levels in this sub-basin were compared to the WQS of 8.0 mg/L, as described in Section 4.1.1.2. Stations C370, J370, and K370 were found to have 3 (4%), 1 (2%), and 1 (13%) measurements, respectively, below the minimum DO standard (Table 5-2). The results suggest that DO concentrations in the Longfellow Creek sub-basin would have minimal impacts on fish migration.

Overall conclusion:

- Dissolved oxygen levels in the Longfellow Creek sub-basin are almost always in compliance with WQS, suggesting minimal risk to salmon and trout spawning, noncore rearing and migration.

Lower Green River Sub-Basin

Dissolved oxygen was monitored at seven stations (0311, G319, ECO9A080, MULLEN3, MULLEN5, A310_3106, and A330) in the Lower Green River sub-basin. Dissolved oxygen levels at each station were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. Stations 0311, G319, MULLEN3, A310_3106, and MULLEN5 were found to have 6 (12%), 1 (4%), 1 (100%), 11 (13%) and 1(100%) measurements, respectively, below the minimum DO WQS (Table 5-2). All measurements at station A330 (tributary to the Green River) and ECO9A080 met the DO WQS. However, results suggest that DO concentrations at station 0311 and A310_3106 have the potential to impair salmon and trout spawning, noncore rearing and migration. Station G319 had a minimal number of measurements below the DO WQS and therefore is not anticipated to impair fish spawning, rearing or migration. Stations MULLEN3 and MULLEN5 had only one measurement to compare to the WQS, while this value was below the DO WQS, it is uncertain if this is representative of annual DO conditions at this location.

Overall conclusion:

- Low DO levels at stations 0311, G319, ECO9A080, A310_3106, MULLEN3, and MULLEN5 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Black River (Springbrook Creek) Sub-Basin

Dissolved oxygen was monitored at five stations (0317, A317, B317, C317, and A326) in the Black River (Springbrook Creek) sub-basin. Concentrations of DO at each station were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. Stations 0317, A317, B317, and C317 were found to have 56 (73%), 17 (74%), 6 (50%), and 11 (50%) measurements, respectively, below the DO WQS (Table 5-2). All measurements at station A326 met the DO WQS.

Overall conclusion:

- Low DO levels at stations 0317, A317, B317, and C317 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Figure 5-1
Dissolved Oxygen
Green River Watershed

Project: C:\Projects\GRBENR\Greenriver.apr Layout: Study Area Layout - D O Fig. 5-1 Date: August 17, 2006

Table 5-2.
Summary of Dissolved Oxygen Analysis by Sub-Basin

Sub-Basin	Station	DO WQS (mg/L)	# of Samples	# Samples less than WQS	% Less than WQS
Duwamish River	0305	6.5	127	15	12
Duwamish River	0307	6.5	125	20	16
Duwamish River	0309	6.5	51	1	2
Longfellow Creek	K370	8	8	1	13
Longfellow Creek	C370	8	79	3	4
Longfellow Creek	J370	8	66	1	2
Lower Green River - West	A310_3106	8	88	11	13
Lower Green River - West	G319	8	26	1	4
Lower Green River - West	MULLEN3	8	1	1	100
Lower Green River - West	MULLEN5	8	1	1	100
Lower Green River - West	0311	8	51	6	12
Black River / Springbrook Creek	A317	8	23	17	74
Black River / Springbrook Creek	B317	8	12	6	50
Black River / Springbrook Creek	C317	8	22	11	50
Black River / Springbrook Creek	0317	8	77	56	73
Mill Creek	A315	8	92	57	62
Soos Creek	G320	8	52	1	2
Soos Creek	L320	8	60	33	55
Soos Creek	Q320	8	66	24	36
Soos Creek	U320	8	35	8	23
Soos Creek	Y320	8	20	3	15
Middle Green River	0321	8	68	1	1
Newaukum Creek	AC322	8	34	22	65
Newaukum Creek	AK322	8	30	2	7
Newaukum Creek	B322	8	14	10	71
Newaukum Creek	D322	8	26	3	12
Newaukum Creek	I322B	8	22	2	9
Newaukum Creek	WH322	8	23	2	9
Newaukum Creek	0322	8	99	1	1
Upper Green River Outlet	E319	9.5	27	2	7

Mill Creek Sub-Basin

Dissolved oxygen was monitored at one station (A315) in the Mill Creek sub-basin. Concentrations of DO were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. Station A315 was found to have 57 (62%) measurements below the DO WQS (Table 5-2). Based on the available data, the results suggest that DO conditions in the Mill Creek sub-basin have the potential to impair salmon and trout spawning, noncore rearing and migration.

Overall conclusion:

- Low DO levels at Stations A315 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Soos Creek Sub-Basin

Dissolved oxygen was monitored at seven stations (A320, B320, G320, L320, Q320, and U320) in the Soos River sub-basin. Dissolved oxygen levels at each station were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. Stations G320, L320, Q320, U320, and Y320 were found to have 1 (2%), 33 (55%), 24 (36%), 8 (23%), and 3 (15%) measurements, respectively, below the DO WQS (Table 5-2). All measurements at stations A320 and B320 met the DO WQS.

Overall conclusion:

- Low DO levels at stations L320, Q320, U320, and Y320 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Jenkins Creek Sub-Basin

Dissolved oxygen was monitored at one station (D320) in the Jenkins Creek sub-basin. DO levels were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. All measurements from Jenkins Creek met the DO WQS (Table 5-2).

Overall conclusion:

- Dissolved oxygen levels in the Jenkins Creek sub-basin are always in compliance with WQS; suggesting minimal risk to salmon and trout spawning, noncore rearing and migration.

Covington Creek Sub-Basin

Dissolved oxygen was monitored at three stations (C320, R320, and S320) in the Covington Creek sub-basin. Dissolved oxygen levels were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. All measurements from Covington Creek met the DO WQS (see Table 5-2).

Overall conclusion:

- Dissolved oxygen levels in the Jenkins Creek sub-basin are always in compliance with WQS, suggesting minimal risk to salmon and trout spawning, noncore rearing and migration.

Middle Green River Sub-Basin

Dissolved oxygen was monitored at six stations (0321, A319, B319, F321, A341, and EC09A190) in the Middle Green River sub-basin; concentrations were compared to the WQS of 8 mg/L or 9.5 mg/L, as appropriate (see Section 4.1.1.2). Station 0321 had 1 (1%) measurement below the DO WQS (see Table 5-2). All measurements at stations A319, B319, F321, and A341 met the DO WQS.

Overall conclusion:

- Dissolved oxygen levels in the Middle Green River sub-basin are almost always in compliance with WQS, suggesting minimal risk to salmon and trout spawning, noncore/core rearing and migration.

Newaukum Creek Sub-Basin

Dissolved oxygen was monitored at twenty stations (0322, AA322, AB322, AC322, AD322, AE322, AF322, AG322, AH322, AI322, AJ322, AK322, B322, D322, F322, H322, I322B, J322, N322, S322) in the Newaukum Creek sub-basin. Concentrations of DO at each station were compared to the WQS of 8 mg/L, as described in Section 4.1.1.2. Stations AC322 and B322 had the highest number of measurements (22 and 10, respectively) that fell below the DO standard (see Table 5-2). Stations 0322, AK322, D322, I322B, and WH322 had less than 3 measurements below the DO standard. Stations AA322, AB322, AD322, AE322, AF322, AG322, AH322, AI322, AJ322, F322, H322, J322, N322, and S322 met the DO WQS.

Overall conclusion:

- Low DO levels at stations AC322 and B322 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Upper Green River Outlet

Dissolved oxygen was monitored at one station (E319) at the outlet of the Upper Green River sub-basin. Dissolved oxygen levels were compared to the WQS of 9.5 mg/L, as described in Section 4.1.1.2. Two of twenty-seven measurements (7%) were below the DO WQS (see Table 5-2). The results suggest that DO levels in this sub-basin would minimally affect salmon spawning, core rearing and migration.

Overall conclusion:

- Dissolved oxygen levels at Station E319 are almost always in compliance with WQS, suggesting a low potential for impacts on salmon spawning, core rearing, and migration.

5.2.1.3 Temperature

As discussed previously, temperature was not independently evaluated in this SLRA as Taylor Associates and King County (2004) recently completed a thorough temperature evaluation for the watershed. The following briefly summarizes the methods for the evaluation conducted by Taylor Associates and King County; the results from their evaluation are then summarized by sub-basin throughout the following sections. Temperature measurements were based on data collected between July 2001 and September 2003 at 93 surface water monitoring stations (representing 86 discrete locations) distributed throughout the watershed. Data for each monitoring station were organized by major river section or sub-basin, with the appropriate temperature standard being applied to each section or sub-basin. For each month, average minimum, mean, 1-day maximum and 7-day average daily maximum values (7-DADMax) were calculated and summarized. Additionally, total days exceeding selected WQS and average number of degrees Celsius above WQS were calculated for each water year. Temperature measurements were summarized for potential risks by estimating the magnitude of exceedance of the temperature standards.

A summary of temperature exceedances by sub-basin is provided in Table 5-3. On a sub-basin basis, the percentage of sites exceeding its respective temperature WQS ranged from 33 (Jenkins Creek and Newaukum Creek) to 100% (Green Mainstem). Maximum temperatures exceeded WQS by 0.1°C (Jenkins Creek) or up to 5.6°C (Soos Creek). As discussed in Taylor Associates and King County (2004), the average numbers of days that WQS were exceeded (considering all sites with temperature WQS exceedances) were 12.9, 22.1, and 20.2 days for water years 2001, 2002, and 2003, respectively.

In addition to comparisons to WQS, risk categories for impacts to salmonid migration were developed as follows:

- Presumably no impairment <18°C
- Potential for impairment 18°C to 21°C
- Potential for blockage 21°C to 23°C
- Potential lethality >23°C

The potential migration impacts observed for the Green-Duwamish Watershed are relatively low level for most locations, with 37 of the 86 monitoring locations posing some level of risk to salmonid migration. Of the 37 locations that exceeded WQS, only three have some level of risk associated with blockage of migration or lethality to salmonids. Of the remaining 48 locations monitored, no current temperature related risk to salmonid migration was indicated based on monitoring results. The elevated summer surface water temperatures observed at many of the monitoring locations are reflective of the surrounding land use and alteration of the river, creek, and/or associated riparian area. Temperature exceedances are further described by sub-basin in the following sections.

Duwamish River Sub-Basin

The Duwamish River sub-basin had three temperature monitoring stations (HA5, GRT01, and GRT31) as described by Taylor Associates and King County (2004). Two sites

(GRT01 and GRT31) had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 1.1-2.7°C (Table 5-3).

Overall conclusion:

- Temperature levels at stations GRT01 and GRT31 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Longfellow Creek Sub-Basin

The Taylor Associates and King County (2004) report did not include an evaluation of temperature in the Longfellow Creek sub-basin.

Lower Green River Sub-Basin

The Lower Green River sub-basin had eight monitoring stations (GRT18, tm-27, GRT22, tm-25, tm-24, GRT20, GRT35, and GRT03) as described by Taylor Associates and King County (2004). Five sites had 7-DADMax values above the standard of 17.5 °C. The average range above the standard was 0.1-3.3°C (see Table 5-3). Based on the assessment of migration suitability, Taylor Associates and King County (2004) determined that temperature conditions at Stations tm-27, tm-25, tm-24, and GRT03 demonstrated no impairment to migration while temperature conditions at Stations GRT18, GRT22, GRT20, and GRT35 demonstrated potential impairment to migration.

Overall conclusion:

- Temperature levels at stations GRT18, GRT22, GRT20, and GRT35 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Black River (Springbrook Creek) Sub-Basin

The Black River (Springbrook Creek) sub-basin had twelve monitoring stations (tm-11, tm-12, tm-16, tm-17, tm-18, tm-19, tm-20, tm-21, GRT19, GRT34, GRT33, and GRT02) as described by Taylor Associates and King County (2004). Ten sites had 7-DADMax values above the WQS of 17.5 °C. The average range above the standard was 0.1-4.7°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Stations tm-20, tm-19, tm-17, and tm-11 demonstrated no impairment to migration; Stations GRT19, GRT34, GRT33, tm-18, tm-21, tm-16, and tm-12 demonstrated potential impairment to migration; and conditions at Station GRT02 demonstrated potential blockage to migration.

Overall conclusion:

- Temperature levels at stations GRT19, GRT34, GRT33, tm-18, tm-21, tm-16, tm-12, and GRT03 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Mill Creek Sub-Basin

The Mill Creek sub-basin had three monitoring stations (mf1, GRT21 and GRT05) as described by Taylor Associates and King County (2004). Two sites (67%) had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 0.6-

1.8°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Station mf1 demonstrated no impairment to migration; however, Stations GRT21 and GRT05 demonstrated potential impairment to migration.

Overall conclusion:

- Temperature levels at stations GRT21 and GRT05 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Soos Creek Sub-Basin

The Soos Creek sub-basin had 17 monitoring stations (54A, ST1, 54H, tm-2, tm-10, 54C, BS3, 54I, LS2, BS2, tm-1.5, tm-1, tm-7, tm-8, tm-9, BS1.5, and BS1) as described by Taylor Associates and King County (2004). Ten sites (59%) had 7-DADMax values above the WQS of 17.5°C. The average range above the WQS was 0.1-5.6°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Stations ST1, 54H, tm-10, BS3, BS2, tm-1.5, tm-1, tm-9, BS1.5, and BS1 demonstrated no impairment to migration; temperature conditions at Stations 54A, 54C, 54I, tm-2, LS2, and tm-8 demonstrated potential impairment to migration; and temperature conditions at Station tm-7 demonstrated potential lethality.

Overall conclusion:

- Temperature levels at stations 54A, 54C, 54I, tm-2, LS2, tm-7, and tm-8 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Jenkins Creek Sub-Basin

The Jenkins Creek sub-basin had three monitoring stations (26A, JE1, and JE2) as described by Taylor Associates and King County (2004). One site (33%) had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 0.1°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at all stations would not impair migration.

Overall conclusion:

- Temperature levels at all stations are not expected to impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Covington Creek Sub-Basin

The Covington Creek sub-basin had four monitoring stations (09A, CT1, CO2, and CO1) as described by Taylor Associates and King County (2004). Three sites (75%) had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 0.3-4.2°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Station 09A demonstrated no impairment to migration; however, temperature conditions

at Stations CT1 and CO2 demonstrated potential impairment to migration; while temperature conditions at Station CO1 demonstrated potential blockage to migration.

Overall conclusion:

- Temperature levels at stations CT1, CO1 and CO2 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Middle Green River Sub-Basin

The Middle Green River sub-basin had thirteen monitoring stations (GRT04, GRT06, GRT07, 40D, GRT10, GRT36, GR5, GRT13, GRT14, GRT16, GRT23, GR7, and TPU_481) as described by Taylor Associates and King County (2004). This sub-basin was separated into an upper and lower section for each WQS. Two of five sites (40%) in the lower section had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 0.9-2.8°C (see Table 5-3). Five of eight stations (63%) in the upper section had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS in the upper section was 0.5-3.5°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Stations GRT06, GRT07, 40D, GR5, GRT13, GRT14, GRT23, GR7, and TPU_481 demonstrated no impairment to migration while temperature conditions at Stations GRT04, GRT10, GRT36, and GRT16 demonstrated potential impairment to migration.

Overall conclusion:

- Temperature levels at stations GRT04, GRT10, GRT36, and GRT16 may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Newaukum Creek Sub-Basin

The Newaukum Creek sub basin had 12 monitoring stations (GRT09, 44G, GRT24, GRT11, GRT25, GRT26, 44F, GRT27, GRT29, GRT12, GRT28, and 44H) as described by Taylor Associates and King County (2004). Four stations (33%) had 7-DADMax values above the WQS of 17.5 °C. The average range above the WQS was 0.1-1.7°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Stations 44G, GRT24, GRT11, GRT25, GRT26, GRT27, GRT29, and GRT12 demonstrated no impairment to migration; while conditions at Stations GRT09, GRT11, 44F, GRT28, and 44H demonstrated potential impairment to migration.

Overall conclusion:

- Temperature levels at stations GRT09, GRT11, 44F, GRT28, and 44H may impair salmon and trout spawning, noncore rearing and migration; site-specific studies would be required to confirm this conclusion.

Table 5-3.
Summary of Temperature Exceedances by Sub-basin

Subwatershed	Subbasin	# of Sites	2003 Criterion (°C)	# Sites Above Criterion	% Sites Above Criterion	Range Above Criterion
Green Mainstem only		17	12-17.5	17	100	0.1-3.5
Lower Green/Duwamish	Mill Creek	3	17.5	2	67	0.6-1.8
Lower Green/Duwamish	Duwamish	3	17.5	2	67	1.1-2.7
Lower Green/Duwamish	Lower Green	8	17.5	5	67	0.1-3.3
Lower Green/Duwamish	Black River / Springbrook Creek	12	17.5	10	83	0.1-4.7
Middle Green	Upper Middle Green	8	16	5	63	0.5-3.5
Middle Green	Lower Middle Green	5	17.5	2	40	0.9-2.8
Middle Green	Soos Creek	17	17.5	10	59	0.1-5.6
Middle Green	Covington Creek	4	17.5	3	75	0.3-4.2
Middle Green	Jenkins Creek	3	17.5	1	33	0.1
Middle Green	Newaukum Creek	12	17.5	4	33	0.1-1.7
Upper Green	Upper Green	2	12	2	100	0.1-2.9
		7	16	4	57	0.1-4.3

Note: Table re-created from Taylor Associates and King County (2004) (Table 18).

Upper Green River Outlet

The Upper Green River subbasin had nine monitoring stations (GRT17, TPU_480, TPU_479, TPU_475, TPU_483, TPU_478, TPU_484, TPU_482, and TPU_477) as described by Taylor Associates and King County (2004). Two of the nine stations were compared to the WQS of 12°C due to the presence of char. Both stations had 7-DADMax values above the WQS of 12°C. The average range above the WQS was 0.1-2.9°C (see Table 5-3). Temperature data from the other seven stations were compared to the WQS of 16°C for salmon migration and rearing. Four stations (57%) had 7-DADMax values above the criterion of 16°C. The average range above the WQS was 0.1-4.3°C (see Table 5-3). Based on the assessment of migration suitability described above, Taylor Associates and King County (2004) determined that temperature conditions at Stations GRT17, TPU_480, TPU_475, TPU_478, TPU_484, TPU_482, and TPU_477 demonstrated no impairment to salmonid migration and rearing, while temperature conditions at Stations TPU_479 and TPU_483 demonstrated some potential impairment to migration and rearing. However, temperature conditions at Stations TPU_482, and TPU_477 did exceed the temperature criterion of 12°C for char.

Overall conclusion:

- Temperature levels at stations TPU_479 and TPU_483 may impair salmon and trout spawning, noncore rearing and migration and impair char spawning and rearing; site-specific studies would be required to confirm this conclusion.

5.2.1.4 pH

The stations and associated sub-basins where pH levels did not fall within the WQS of 6.5 to 8.5 are summarized in Table 5-4 and below; comparison of all pH data to WQS are summarized in Table A-11 in Appendix A. The stations with the highest frequency of not meeting WQS were Station 0317 in the Black River (Springbrook Creek) (pH in 6 of 81 samples [7%] were less than 6.5), Station Q320 in Soos Creek (pH in 5 of 66 samples [8%] were less than 6.5), and Station AA322 in Newaukum Creek (pH in 2 of 33 samples [6%] were greater than 8.5). Otherwise, the percentage of pH measurements not meeting the WQS ranged from 0-3.8 percent at the remaining stations. Overall, low pH may pose a risk to aquatic life in selected water bodies, but the risk is estimated to be low given the low frequency of samples that are out of compliance with WQS. Additional field studies and more frequent sampling would be required to further determine the actual pH risk posed to aquatic life. A summary of the pH results by sub-basin is presented in the following sections.

Table 5-4.
Summary of pH Measurements Not Meeting WQS by Sub-basin

Sub-Basin	Locator	n	Min pH	Median pH	Max pH	# of Samples With pH < 6.5	# of Samples With pH > 8.5
Black River / Springbrook Creek	317	81	6.2	6.8	7.3	6	0
Black River / Springbrook Creek	A310_3106	203	6.2	7	7.6	2	0
Duwamish River	307	116	6.6	7.6	8.6	0	2
Duwamish River	309	54	6.2	7.1	7.8	2	0
Longfellow Creek	C370	87	6.9	7.9	8.7	0	2
Lower Green River	311	59	6.2	7.1	7.5	1	0
Lower Green River	G319	26	5.7	6.8	7.4	1	0
Middle Green River	B319	93	6.4	7.4	8	1	0
Mill Creek	A315	104	6.2	6.9	7.6	3	0
Newaukum Creek	AA322	33	7.2	7.7	8.6	0	2
Newaukum Creek	AD322	34	6.5	7.4	9.8	0	1
Newaukum Creek	F322	59	6	7.4	8.4	1	0
Soos Creek	G320	55	6.3	7.3	7.7	1	0
Soos Creek	Q320	66	6.1	7	7.5	5	0
Soos Creek	Y320	73	6.2	7.2	7.4	1	0
Upper Green River Outlet	E319	76	6.1	7.4	7.9	1	0

Duwamish River Sub-Basin

There are 303(d) listings for pH in the Duwamish River. The database used in the SLRA contained pH data for four stations. At Station 0307 the pH exceeded the upper limit of the WQS of 8.5 in two of 116 samples and at Station 0309 the pH was less than the lower limit of the WQS of 6.5 in 2 of 54 samples. All pH measurements at the remaining Duwamish stations fell between 6.5 and 8.5.

Longfellow Creek Sub-Basin

In Longfellow Creek, pH data were available for five stations. The pH exceeded 8.5 in two of 87 samples at Station C370, but all pH measurements were between 6.5 and 8.5 at the remaining four stations.

Lower Green River Sub-Basin

pH data were available for 13 stations in the Lower Green River sub-basin, although data at the eight Mullen Slough stations were limited to two samples. At Stations 0311 and G319 the pH level in one of 59 and one of 26 samples, respectively, was less than 6.5. Otherwise, all other pH measurements were between 6.5 and 8.5.

Black River (Springbrook Creek) Sub-Basin

In the Black River (Springbrook Creek), pH has been monitored at six stations. At Station 0317 pH levels below 6.5 were measured in six of 81 samples and at Station A310_3106 pH levels below 6.5 were measured in two of 203 samples. The pH was between 6.5 and 8.5 at all other stations.

Mill Creek Sub-Basin

For Mill Creek, pH data were available for a single station. The measured pH level was less than 6.5 in three of 104 samples, with a minimum pH of 6.2.

Soos Creek Sub-Basin

In the Soos Creek sub-basin, pH data were available for seven stations. pH levels below 6.5 were measured at three stations: in one if 55 samples at Station B320, in five of 66 samples at Station Q320, and in one of 73 samples at Station Y320. All pH measurements at the remaining four stations were between 6.5 and 8.5.

Jenkins Creek Sub-Basin

pH has been monitored at a single station in Jenkins Creek and all measured pH levels have ranged between 6.5 and 8.5 (minimum pH of 6.7 and maximum pH of 7.9).

Covington Creek Sub-Basin

In Covington Creek, pH has been monitored at three stations and all pH levels have been between 6.5 and 8.5. The minimum and maximum pH levels across all three stations have ranged from 6.5 to 7.8.

Middle Green River Sub-Basin

In the Middle Green River sub-basin, pH has been monitored at seven stations. At Station B319, one of 93 pH measurements fell below 6.5. Otherwise, all other pH measurements in the sub-basin were between 6.5 and 8.5.

Newaukum Creek Sub-Basin

pH data were available for 22 stations and all measured pH levels were between 6.5 and 8.5 at 21 of these stations. At Station F322, the pH was less than 6.5 in one of 59 samples.

Upper Green River Outlet

At Station E319 at the outlet of the Upper Green River, the measured pH was less than 6.5 in one of 76 samples.

5.2.1.5 Overview of Potential Water Quality-Related Risks Across All Sub-Basins

The water quality stressors with HQs greater than 1.0 are limited to ammonia, nitrite+nitrate, five metals, and TSS[9]. As suspected due to their 303(d) listings in several stream reaches, temperature and DO levels do not always meet WQS, suggesting a potential risk to salmon under existing conditions. The potential risks posed by chemicals, TSS, DO, and temperature were discussed above by sub-basin. To further facilitate interpretation of the risk estimates, the following summarizes the potential risks by parameter.

Cadmium

For cadmium, within the entire study area only the chronic HQs exceeded 1.0 (acute HQs were always less than 1.0). The sub-basins with at least one HQ greater than 1.0 were the Black River (Springbrook Creek), Middle Green River, and Newaukum Creek. For those stations with HQs greater than 1.0, the maximum HQs ranged from 1.1 to 2.8. Although HQs greater than 1.0 suggest a potential for cadmium risks to aquatic biota, the low magnitude of maximum HQs suggest potential cadmium risks are low. Additional considerations also suggest potential cadmium risks are low. For example, grab samples were compared to chronic WQS so it is uncertain whether organisms could have been exposed to measured cadmium concentrations for a chronic exposure duration (four days as defined in Ecology [2003]). In addition, site-specific factors other than hardness can influence cadmium bioavailability. Brooks et al. (2004) reported an acute EC50 of 38.3 µg/L for *Ceriodaphnia dubia* in reconstituted hard laboratory water. Using data for a variety of water quality parameters in stream samples with similar hardness, Brooks et al. (2004) derived an EC50 of 280 µg/L for *C. dubia* using the biotic ligand model (BLM). The BLM is a tool for estimating site-specific toxicity values that accounts for a variety of water quality parameters that may influence metal bioavailability (e.g., pH, cations, anions, bicarbonate). The BLM is discussed in more detail under the copper discussion below. In the Brooks et al. study, therefore, the site water EC50 was approximately an order of magnitude greater than the EC50 in lab water. If the site waters in the Green River watershed even reduced bioavailability by a factor of three, all cadmium HQs would be less than 1.0, thereby suggesting negligible cadmium risks to aquatic life.

Copper

For copper, both acute and chronic HQs were greater than 1.0 in some samples at multiple stations. These exceedances were observed in the following sub-basins: Black River (Springbrook Creek) (acute and chronic), Mill Creek (chronic only), and Newaukum Creek (acute and chronic). Like cadmium, the magnitude of the HQs was not large. For those stations with at least one HQ greater than 1.0, maximum acute HQs ranged from 1.0-1.8 and maximum chronic HQs ranged from 1.1-2.5. Comparison of grab sample concentrations to chronic WQS may overestimate the chronic exposure

[9] Selenium and simazine also had HQs greater than 1.0, but these were based strictly on the magnitudes of the detection limits for these parameters. Accordingly, selenium and simazine are not discussed further in this section.

concentration; such data are more likely to be relevant for comparison to acute WQS. As briefly discussed in the cadmium discussion above, the BLM is a tool for estimating toxicity values based on site-specific water quality characteristics that influence metal bioavailability. Because the USEPA has incorporated the BLM into the latest draft AWQC document for copper (USEPA 2003a), the BLM is further discussed here and the draft BLM-based criteria are used to derive HQs more reflective of site water conditions.

The toxicity of metals to aquatic biota is assumed to result from free metal ion (e.g., Cu^{2+}) reacting with physiological active binding sites at the site of action (Di Toro et al. 2001). The amount of free metal ion that reaches the site of action depends on competing cations (e.g., Ca^{2+}, Na^{+}, H^{+}) and complexation with other ligands in the water (e.g., dissolved organic carbon [DOC]). Ambient water quality criteria and WQS for certain metals account for competition from calcium and magnesium ions, as the AWQC and WQS are hardness-dependent (see Section 4). The biotic ligand model (BLM) is a tool for accounting for all factors that influence metal bioavailability in a natural water. All of the details associated with BLM development will not be summarized here, but good descriptions of the BLM can be found in Di Toro et al. (2001) and Paquin et al. (2002). The latest draft copper AWQC document incorporates the BLM for derivation of the acute criterion (USEPA 2003a). Derivation of a chronic BLM has generally received less attention to date than acute BLMs and a chronic BLM was not incorporated into the USEPA's draft AWQC document (USEPA 2003a); however, some chronic BLMs are in development (e.g., De Schamphelaere and Janssen 2004).

Acute copper HQs greater than 1.0 were observed in samples collected from Mill Creek (Station B317) and Newaukum Creek (Stations B322, D322, I322B, and S322) sub-basins. In general, temperature, pH, calcium, magnesium, sodium, potassium, alkalinity, and DOC data were available for samples with HQ exceedance or could be estimated from other samples collected during a similar time period. These data were entered into the Biotic Ligand Model, Version 2.0.0 (Hydroqual 2003) to estimate acute AWQC for copper in samples with acute HQs greater than 1.0. As shown in Table 5-5, the HQs based on AWQC derived using the BLM are substantially lower than those based on hardness-adjusted WQS. This is largely due to the elevated DOC levels in most site waters, which ranged from approximately 5.0-25 mg/L (Table 5-5).

Chronic copper HQs greater than 1.0 were calculated in samples collected at 10 stations (0317, A317, B317, C317, A315, 0322, B322, D322, I322B, and S322). Because chronic BLMs have not been fully developed for copper, the current draft AWQC document for copper supports use of an acute-chronic ratio (ACR) to estimate the chronic criterion from the BLM-derived acute criterion. As its name suggests, for any given species, an ACR is simply the ratio of the acute toxicity value (LC50) divided by the chronic toxicity value (typically expressed as the chronic value, which is the geometric mean of the NOEC and LOEC); thus, an ACR is defined as the acute LC50 divided by the chronic value. The USEPA recommended an ACR of 3.23 for copper (USEPA 2003a). For those samples where chronic copper HQs exceeded 1.0, Table 5-6 compares the hardness-normalized chronic WQS and associated HQs with the BLM-based chronic criteria and associated HQs. As shown, accounting for additional site-specific factors, of which DOC appears to be most important, results in all chronic HQs being less than 1.0.

Overall, acute and chronic copper risks to aquatic life appear to be negligible when bioavailability is more thoroughly accounted for using the BLM.

Table 5-5.
Comparison of Acute Copper HQs Based on Hardness-Normalized WQS and BLM-Derived AWQC.

Station	Date[1]	DOC (mg/L)[2]	Diss. Cu (µg/L)	Hardness-Normalized WQS	Acute HQ	BLM-Derived CMC	Acute HQ
B317	11/6/02	13.0	6.37	5.56	1.1	23.7	0.27
	11/7/02	10.3	5.61	5.44	1.0	18.5	0.30
	10/16/03	5.5	3.03	2.73	1.1	9.8	0.31
	11/18/03	5.5	2.59	2.38	1.1	10.2	0.25
B322	11/14/01	19.9	8.67	8.58	1.0	56.8	0.15
	3/9/03	25.0	6	5.85	1.0	85.5	0.07
	3/10/03	23.4	5.9	5.79	1.0	79.7	0.07
D322	11/13/01	17.1	11	9.84	1.1	49.7	0.22
	11/14/01	17.1	6.3	5.94	1.1	42.8	0.15
	12/13/01	15.0	9.28	5.17	1.8	49.3	0.19
I322B	6/28/02	4.9	2.49	2.40	1.0	16.2	0.15
S322	3/9/03	6.4	5.1	3.69	1.4	-	-

WQS = Water Quality Standard BLM = Biotic Ligand Model
HQ = Hazard Quotient CMC = Criterion Maximum Concentration (Acute Criterion)
[1]Date refers to the dissolved copper concentrations in the 4th column.
[2]DOC concentrations shown are from samples collected on or near the date shown in the previous column. If multiple DOC concentrations were available for a given date, the average DOC concentration is shown.

Table 5-6.
Comparison of Chronic Copper HQs Based on Hardness-Normalized WQS and BLM-Derived AWQC.

Station	Date	Diss. Cu (µg/L)	Hardness-Normalized WQS	HQ	BLM-Derived FAV	CCC[1]	Chronic HQ
0317	6/12/00	2.55	2.37	1.1	42.7	13.2	0.19
	4/30/01	4.09	3.42	1.2	20.5	6.3	0.65
	11/14/01	2.33	2.29	1.0	49.9	15.5	0.15
A317	11/18/03	3.36	2.65	1.3	21.2	6.6	0.51
	11/19/03	3.59	3.20	1.1	32.5	10.1	0.36
B317	6/28/02	4.02	3.50	1.1	37.1	11.5	0.35
	11/6/02	6.37	4.02	1.6	47.3	14.6	0.44
	11/7/02	5.61	3.94	1.4	37.0	11.4	0.49
	12/11/02	2.62	2.52	1.0	18.1	5.6	0.47
	12/12/02	2.58	2.29	1.1	18.1	5.6	0.46
	1/21/03	2.65	2.63	1.0	17.1	5.3	0.50
	1/22/03	2.79	2.65	1.1	20.8	6.5	0.43
	10/16/03	3.03	2.11	1.4	19.6	6.1	0.50
	10/17/03	2.83	2.80	1.0	21.5	6.7	0.42
	11/17/03	2.53	2.20	1.2	19.2	5.9	0.43
	11/18/03	2.59	1.86	1.4	20.3	6.3	0.41

Table 5-6.
Comparison of Chronic Copper HQs Based on Hardness-Normalized WQS and BLM-Derived AWQC (continued)

Station	Date	Diss. Cu (µg/L)	Hardness-Normalized WQS	HQ	BLM-Derived FAV	CCC[1]	Chronic HQ
C317	11/18/03	2.80	2.23	1.3	19.8	6.1	0.46
A315	12/6/99	7.24	5.40	1.3	45.6	14.1	0.51
	6/12/00	4.89	3.96	1.2	38.7	12.0	0.41
0322	11/14/01	4.11	3.77	1.1	80.0	24.8	0.17
B322	11/14/01	8.67	5.96	1.5	113.6	35.2	0.25
	12/14/01	4.81	4.41	1.1	86.7	26.9	0.18
	3/8/03	6.06	5.15	1.2	150.0	46.4	0.13
	3/9/03	6.00	4.22	1.4	170.9	52.9	0.11
	3/10/03	5.90	4.17	1.4	159.3	49.3	0.08
	4/28/03	6.98	5.83	1.2	150.6	46.6	0.13
D322	11/13/01	11.00	6.75	1.6	99.3	30.7	0.22
	11/14/01	5.92	3.88	1.5	85.6	26.5	0.15
	11/28/01	5.55	4.60	1.2	116.8	36.2	0.15
	11/29/01	5.55	4.41	1.3	113.6	35.2	0.16
	12/13/01	9.28	3.77	2.5	98.5	30.5	0.30
	12/14/01	4.21	3.67	1.1	49.0	15.2	0.28
	2/22/02	4.05	3.87	1.0	-	-	-
I322B	11/13/01	1.90	1.57	1.2	39.0	12.1	0.16
	11/14/01	2.77	2.66	1.0	36.6	11.3	0.25
	6/28/02	2.49	1.88	1.3	32.3	10.0	0.25
	8/6/02	4.57	4.27	1.1	-	-	-
	12/11/02	1.40	1.26	1.1	23.3	7.2	0.19
S322	3/9/03	5.1	2.78	1.8	-	-	-

WQS = Water Quality Standard
HQ = Hazard Quotient
BLM = Biotic Ligand Model
FAV = Final Acute Value
CCC = Criterion Continuous Concentration (Chronic Criterion)
1The CCC is calculated as the BLM-derived FAV divided by an acute-chronic ratio (ACR) of 3.23 (USEPA 2003a).

Lead

Chronic lead HQs exceeded 1.0 in at least one sample collected from two stations. At Station 0317 in the Black River (Springbrook Creek) sub-basin the maximum HQ was 1.2 and at Station D322 in Newaukum Creek the maximum HQ was 1.1. Otherwise, chronic lead HQs for all other samples collected throughout the watershed were less than 1.0. As discussed above for cadmium and copper, the USEPA is considering the BLM for future revisions to the AWQC for lead (USEPA 1999a). Given that a lead BLM is likely to predict reduced bioavailability than the current WQS that only accounts for hardness and considering the very low frequency of samples with HQs greater than 1.0 in addition to the low magnitude of the HQs (maximum HQ across the watershed of 1.2), potential risk associated with aquatic life exposure to lead appears to be negligible.

Manganese

Chronic manganese HQs slightly exceeded 1.0 in limited samples collected at Stations A317 and C317 in the Black River (Springbrook Creek) sub-basin and Station A315 in the Mill Creek sub-basin. The maximum HQ for these three stations was just 1.2, suggesting a low potential risk. No WQS or AWQC are available, so the chronic SV was based on the lowest available toxicity value identified in the literature (based on the guidelines defined in Section 4). The chronic SV is based on an acute LC50 of 4,700 µg/L for the cladoceran *Daphnia magna* (from Baird et al. 1991), divided by a generic ACR of 10, resulting in an SV of 470 µg/L. However, application of a generic ACR of 10 may be overly conservative for estimating chronic sensitivity of *D. magna* to manganese. For example, Biesinger and Christensen (1972) observed an acute manganese LC50 of 9,800 µg/L and chronic EC16 (16% reproductive impairment) of 4,100 µg/L, which results in an ACR on the order of 2.4. The differences in the acute *D magna* acute toxicity values reported by Baird et al. (1991) and Biesinger and Christensen (1972) may just be due to random variability, different tolerances of the tests populations, or differences in water quality characteristics (e.g., hardness, pH). Nevertheless, applying the ACR of 2.4 from Biesinger and Christensen (1972) to the acute LC50 of 4,700 µg/L from Baird et al. (1991) would result in a chronic SV of 1,958 µg/L. Use of this SV would result in all chronic HQs being well below 1.0.

For further consideration, Stubblefield et al. (1997) evaluated the chronic sensitivity of brown trout (*Salmo trutta*) to manganese at varying hardness levels. Based on 62-day early life stage tests that evaluated embryo-larval survival and growth, chronic toxicity values (reported as IC25s[10]) were 4,670, 5,590, and 8,680 µg/L at hardness levels of approximately 30, 150, and 450 mg/L as $CaCO_3$. The chronic IC25 for brown trout in soft water is similar to the chronic EC16 for *D. magna* derived by Biesinger and Christensen (1972) and within a factor of 2-3 of the estimated chronic toxicity value for *D. magna* based on the acute LC50 from Baird et al. (1991) and the manganese ACR from Biesinger and Christensen (1972). Considering all lines of evidence, manganese appears to be posing negligible chronic risk to aquatic life in the Black River (Springbrook Creek) or Mill Creek sub-basins.

Zinc

For zinc, both acute and chronic HQs were greater than 1.0 in some samples at multiple stations. These exceedances were observed in the following sub-basins: Lower Green River (acute and chronic) and the Black River (Springbrook Creek) (acute and chronic). In the Lower Green River, only one of 24 samples had an HQ greater than 1.0. The maximum acute and chronic HQs were 7.8-7.9, but the 95th percentile HQs were just 0.03. Consequently, the sample associated with the maximum HQ was likely very unique. The maximum zinc concentration was 557 µg/L at Station A330, compared to maximum zinc concentrations ranging from 0.92-58.9 µg/L at all other stations[11]. The maximum concentration appears to be an anomaly. In the Black River (Springbrook Creek), acute

[10] The IC25 is the inhibition concentration estimated to cause a 25% reduction in organism performance relative to the control.
[11] The QA/QC results for the sample associated with the zinc concentration of 557 µg/L had slight blank contamination (2.3 µg/L), but nothing to explain why the zinc concentration would be this high.

and chronic HQs were only slightly above 1.0 (and less than 1.1). Although a BLM has yet to be incorporated into USEPA's zinc AWQC, acute BLMs for zinc have been developed (e.g., Heijerick et al. 2002; Santore et al. 2002). Undoubtedly, incorporation of the BLM to further account for site-specific bioavailability of zinc would reduce the limited zinc HQs that are greater than 1.0 to below 1.0 in the Black River (Springbrook Creek) sub-basin and potential zinc risks to aquatic life would be negligible.

Ammonia and Nitrite+Nitrate

Ammonia and nitrite+nitrate levels exceeded SVs in some samples collected in the Newaukum Creek sub-basin. At Station B322, ammonia concentrations exceeded the chronic SV in four of 56 samples with a maximum HQ of 3.1. Also at Station B322, nitrite+nitrate concentrations exceeded the chronic SV in 21 of 56 samples with a maximum HQ of 2.4. In addition, at Station D322, the nitrite+nitrate concentration in a single sample (out of 92) exceeded its chronic SV and an HQ of 1.2. Overall, the ammonia and nitrite+nitrate HQs suggest a low potential risk to aquatic life in the Newaukum Creek sub-basin, and negligible potential risk in any of the other sub-basins evaluated.

Total Suspended Solids

Assessing potential TSS risks to aquatic life is challenging since TSS is a natural and required component of aquatic systems. According to USEPA (2003b), four states have adopted TSS WQS. The WQS adopted by Hawaii, which apply to the dry season, are the most stringent. The geometric mean TSS concentration cannot exceed 10 mg/L, less than 10 percent of the measurements cannot exceed 30 mg/L, and less than 2 percent of the measurements cannot exceed 55 mg/L. For coldwater streams, Utah, North Dakota, and South Dakota have TSS WQS ranging from 30-35 mg/L as a 30-day average or 58 mg/L as a daily maximum. For another example, Environment Canada criteria for clear flows state that induced increases in suspended sediments should not exceed background levels by more than 25 mg/L during a 24-hour period, and for sediment inputs lasting between one and 30 days the average suspended sediment concentration should not exceed background by more than 5 mg/L (USEPA 2003b). For comparison, the chronic and acute TSS SVs used in this SLRA were 22 and 244 mg/L, respectively.

Acute and chronic TSS HQs exceeded 1.0 at most sub-basins: Duwamish River, Longfellow Creek, Lower Green River, Black River (Springbrook Creek), Mill Creek, Middle Green River, Newaukum Creek, and the Upper Green River outlet. For comparative purposes between sub-basins, based on those stations with chronic TSS HQs greater than 1.0, maximum chronic HQs ranged from 1.2-29 in the Duwamish, 1.8-20.4 in Longfellow Creek, 1.3-15 in the Lower Green, 1.7-5.4 in the Black River (Springbrook Creek), 2.3 in Mill Creek (single station), 1.1-4.5 in the Middle Green River, 1.1-18 in Newaukum Creek, and 6.7 in the Upper Green River outlet (single station). However, 95th percentile chronic TSS HQs were less than 5.0 in all sub-basins, with the exception of Longfellow Creek (95th percentile HQs up to 19.3). Overall, potential TSS risks appear to be greatest in Longfellow Creek, the Duwamish, the Lower Green River, and Newaukum Creek. If any additional TSS evaluations are conducted for the watershed, effort should focus on identifying the reasonable background TSS level for each sub-basin, under both dry and wet weather events. As discussed in USEPA (2003b), the background or

reference TSS concentration does not necessarily mean pristine, but may refer to the desired state of the stream. In addition, more frequent TSS sampling (e.g., daily) would be required to help refine the risk estimates further.

Dissolved Oxygen

As previously discussed in Section 2, low DO is a concern for several water bodies in the Green-Duwamish watershed. The Duwamish River, Green River, Little Soos Creek, Soosette Creek, Mullen Slough, Newaukum Creek, Soos Creek, and Mill Creek are all on the 2002/2004 303(d) list for DO. The DO analyses in this SLRA are consistent with these listings, and also suggest that low DO levels in Longfellow Creek and the Black River (Springbrook Creek) may pose a risk to salmonids. More than 50 percent of the measurements at stations in Mullen Slough, the Black River (Springbrook Creek), Mill Creek, Soos Creek, and Newaukum Creek were out of compliance with WQS for DO.

Temperature

The Green River and Little Soos Creek are on the 2002/2004 303(d) list for temperature. The Taylor Associates and King County (2004) study identified several sub-basins with temperatures exceeding the WQS. The highest exceedances were observed in Soos Creek and the Black River (Springbrook Creek), which exceeded the temperature WQS by as much as 5.6 and 4.7°C, respectively.

pH

The Duwamish River is on the 2002/2004 303(d) list for pH. Overall, the pH level in at least one sample is either below the minimum pH standard of 6.5 or above the maximum pH standard of 8.5 for nine of the 11 sub-basins for which pH data are available and 17 of the 70 stations evaluated watershed-wide. The stations with the highest frequency of not meeting WQS were Station 0317 in the Black River (Springbrook Creek) (pH in 6 of 81 samples [7%] were less than 6.5), Station Q320 in Soos Creek (pH in 5 of 66 samples [8%] were less than 6.5), and Station AA322 in Newaukum Creek (pH in 2 of 33 samples [6%] were greater than 8.5). Otherwise, the percentage of pH measurements not meeting the WQS ranged from 0-3.8 percent at the remaining stations. Therefore, pH-related risks are likely negligible.

5.2.2 Additional Lines of Evidence: Macroinvertebrate Surveys

As discussed previously, B-IBI data were used as an additional line-of-evidence in the aquatic life SLRA. The primary water quality stressors of potential concern appear to be elevated temperature and reduced DO, with other water quality parameters sometimes exceeding toxicity-based SVs (most frequently TSS and metals, such as cadmium, copper, zinc). It should be emphasized that reduced water quality is only one factor that may impact benthic macroinvertebrates. Other factors, such as changes in flow and riparian conditions, which can adversely affect habitat, also results in adverse impacts on benthos and can often be more important than reductions in water quality. A full review of the 2002 and 2003 B-IBI data can be found in EVS (2004, 2005). The analyses in the EVS report tended to be based on data pooled for both the Green-Duwamish and Greater Lake Washington watersheds. Consequently, the conclusions in the EVS (2004, 2005)

report are not based entirely on the Green-Duwamish watershed data. The following focuses on B-IBI data specific to the Green-Duwamish watershed, and many of the analyses specifically focus on the B-IBI stations that can be paired with the water quality stations evaluated in the risk characterization above. The following first provides a general overview of the B-IBI results from 2002 and 2003.

5.2.2.1 General Overview of B-IBI Results

The mean total B-IBI scores for the Green-Duwamish watershed from 2002 (as summarized from EVS [2004]) and 2003 (EVS 2005) are summarized in Table 5-7. Scores ranged from fair to very poor in 2002 and poor-very poor to good in 2003.

Table 5-7.
Summary of Mean Sub-Basin B-IBI scores in the Green-Duwamish watershed (2002-2003)

Sub-basin	2002			2003		
	Mean B-IBI (±SD)	B-IBI Range	Average B-IBI Ranking	Mean B-IBI (±SD)	B-IBI Range	Average B-IBI Ranking
Black / Springbrook	15.8±4.8	10-24	Very Poor	18.9±3.2	14-24	Poor
Covington	28.3±4.4	22-34	Fair	35.0±4.2	32-38	Fair
Deep/Coal	35.3±5.5	30-44	Fair	42.0±5.4	38-50	Good
Duwamish	14.8±5.0	10-22	Very Poor	17.5±3.0	14-20	Poor-Very Poor
Jenkins	24.0±5.3	20-30	Poor	24.0±7.2	18-32	Poor
Lower Green	18.8±9.5	10-34	Poor	23.8±7.5	16-34	Poor
Middle Green	30.2±9.1	16-42	Fair	31.8±9.0	14-40	Fair
Mill Creek	22.0±6.0	14-28	Poor	31.3±1.2	30-32	Fair
Newaukum	30.4±8.3	20-40	Fair	34.6±7.1	24-43	Fair
Soos	26.6±8.5	12-38	Fair-Poor	30.6±7.8	18-40	Fair

B-IBI = Benthic Index of Biotic Integrity
SD = Standard deviation
[1] = Average score may be based on more than one station..
[2] = Average score is between ranking.

The assessment concluded that the B-IBI score at a given site is closely correlated with land use practices within the site's watershed. EVS (2004) also reported that B-IBI scores tend to decrease as mean base flow conductivity, alkalinity, turbidity, TSS, total phosphorus, total zinc, and total copper in a stream increase. However, EVS (2004) noted that these parameters are often significantly correlated with each other, which makes it difficult to determine causal relationships between B-IBI scores and individual water quality parameters.

5.2.2.2 Comparison of B-IBI Data with HQ Results

For those B-IBI stations co-located with water quality sampling stations, correlations between chemical and physical parameter HQs and B-IBI scores (either total or individual metrics) were evaluated. No parameter HQs were observed to correlate strongly ($r \geq 0.70$) with the B-IBI. There were only two parameters, TSS HQs and manganese HQs, that were weakly correlated with the B-IBI. The median HQ for TSS had a relatively weak significant negative correlation ($r = -0.62$, $p = 0.004$) with B-IBI, as

did the median manganese HQ (r = -0.64, p =0.03). No other parameter had a correlation coefficient >0.6 with the B-IBI.

Because elevated TSS levels associated with storm events may have affected the macroinvertebrate communities, TSS HQs before the macroinvertebrate sample events were also evaluated. The TSS HQs from the two months before the macroinvertebrate sample event were evaluated. This analysis, however, did not suggest that TSS levels in the two months prior correlated with TSS HQs. In 2002, the correlation was significant and strong (r = -0.81), but the HQs were low. In 2003 the HQs were high, but the correlation was poor (r = -0.21). The above analysis could also be confounded by limited TSS data that did not adequately characterize TSS levels over the two month period considered.

To evaluate if any one parameter was associated with one of the B-IBI metrics, the influence of the parameters on certain metrics was evaluated. For sites with low B-IBI scores (poor or very poor), Ephemeroptera taxa, Plecoptera taxa, Trichoptera taxa, clinger taxa, and intolerant taxa are generally the low scoring metrics. However, no single parameter negatively correlates strongly ($r \geq 0.70$) with any of these metrics. Furthermore, there were no significant correlations between any parameters and Ephemeroptera taxa, Plecoptera taxa, and intolerant taxa where correlation coefficients were >0.6. For Trichoptera taxa and clinger taxa, there were significant correlations between some parameters, where correlation coefficients were >0.6. Copper correlated significantly with Trichoptera taxa and clinger taxa, yet the median HQs for this metal were <0.4 at stations co-located with B-IBI stations. Lead correlated significantly with Trichoptera taxa yet the median HQs for this metal were <0.3 at stations co-located with B-IBI stations. Finally, median TSS HQs correlated significantly with clinger taxa, but most HQs were <0.4 at stations co-located with B-IBI stations. Therefore, it is very unlikely that copper, lead or TSS concentrations are affecting the macroinvertebrate communities.

There were significant and strong positive correlations between percent tolerant taxa and median HQs for iron (r = 0.87), manganese (r = 0.81) and zinc (r = 0.80). In this case, a positive correlation between a parameter and percent tolerant taxa indicates the parameter may contribute to an increase in tolerant taxa. However, the metric percent tolerant taxa was not scored low for most sites; therefore, it did not strongly influence the B-IBI score. There also was a strong negative correlation (r = -0.70) between mean dissolved oxygen and percent tolerant taxa. These findings suggest that these four parameters influence the percent tolerant taxa, yet this metric did not have much influence on the B-IBI scores as the individual metric score was five (five being the best score) for 16 of 23 scored stations. Therefore, these correlations are likely spurious or irrelevant.

Although aluminum (r = -0.49) and iron (r = -0.56) did not have strong correlations with B-IBI scores, these parameters also had relatively high HQs. A stepwise regression was used to evaluate if aluminum and iron jointly correlated with TSS to affect the macroinvertebrate community as measured by the B-IBI. Aluminum and iron were rejected in the step-wise regression, as neither had a significant influence on B-IBI scores. Only TSS had some predictive ability with B-IBI, but the r was only -0.59 (r^2 = 0.35).

To further investigate the relationship between B-IBI and TSS, the mean, median and geometric mean HQs were compared as predictors of B-IBI outcome. The HQ statistic did not change the outcome of the TSS and B-IBI relationship at all. The median still has the best fit.

The caveat is that there is one station that appears to be an outlier. In 2003, the Newaukum station, 09NEW2128, had a relatively good B-IBI score (32) with variable TSS levels for the year. TSS levels ranged from 0.66 to 308 mg/L. The higher TSS levels at the site resulted in a median TSS HQ of 0.39, the highest for the Green-Duwamish in 2003 (for sites with co-located BIBI data). When this outlier is dropped, the correlation coefficient for TSS and B-IBI for 2002 and 2003 data is r = -0.76 and the r^2 is 0.57. This is a relatively good fit for one parameter predicting the outcome for a macroinvertebrate community index.

Overall TSS is only one parameter that may be affecting the community and there may be covariates to TSS that have not been identified. The uncertainty is why there are relatively high TSS level at the Newaukum station yet relatively good B-IBI scores when this is not the case at some other Green-Duwamish sites. It may be that the TSS increases at the Newaukum station are very short in duration thus not affecting the macroinvertebrate community.

5.2.2.3 Do B-IBI Data Corroborate the HQ Results?

Overall the HQ analysis of chemical and physical stressors suggested negligible risks to aquatic life (although elevated temperature and reduced DO at some sites appear to pose a risk). The number of parameters with concentrations exceeding their respective SV was fairly limited (generally TSS and five metals), the percentage of samples exceeding the SV was generally low, and when HQs were greater than 1.0 the magnitudes were typically quite low. Mean total-BIBI scores indicate that macroinvertebrate populations are ranked as “very poor” to “poor” in several sub-basins, yet the HQ analysis suggests low to negligible potential risks. Evaluating individual metrics expected to respond to elevated TSS or metals levels also did not identify strong correlations between the macroinvertebrate data and HQ results. Consequently, based on the water quality parameters evaluated, none seem to have a significant and strong influence on the macroinvertebrate community as measured by the B-IBI or the individual metrics.

A likely explanation for the low B-IBI scores yet poor correlation with chemical and physical water quality parameters is that habitat is very important in the Green-Duwamish. Using 2002 habitat data derived from the EVS Report (2004), percent forest positively correlates (r= 0.79) with B-IBI scores. Furthermore, percent medium intensity developed land negatively correlates (r= -0.77) with B-IBI scores. Therefore, the amount of development is also important. These habitat factors[12] are likely much more important for the aquatic community than water quality parameters, such as individual metals. These findings are consistent with previous studies of basin impervious surface that have found aquatic life to initially be more affected by changes in habitat than chemical pollutants (e.g., Brabec et al. 2002).

[12] These two habitat factors were evaluated as they correlated the best with B-IBI scores in the EVS report (2004).

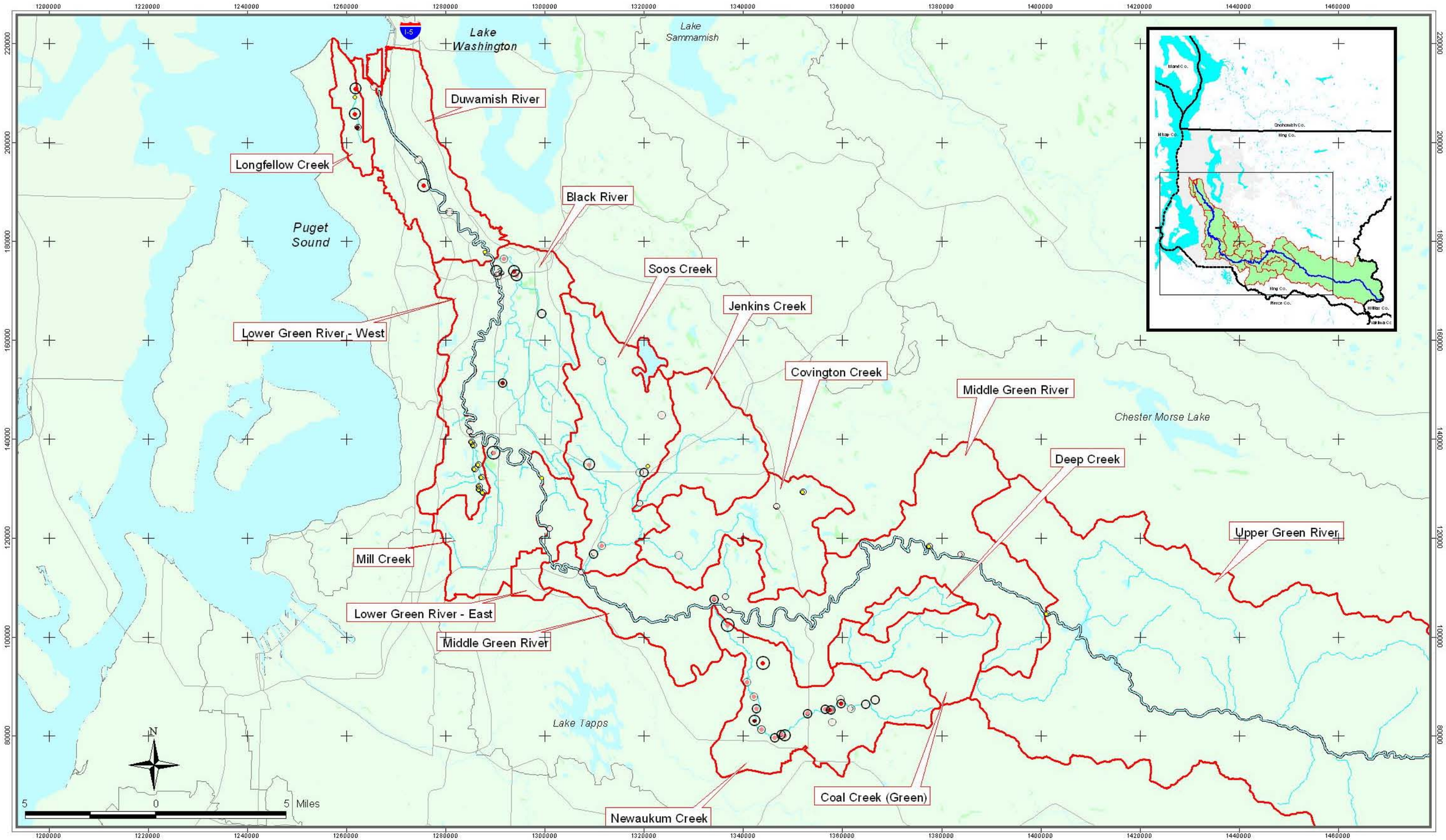
5.2.3 Human Health

Human health was evaluated by comparing measured concentrations of biological stressors to human-health based water quality criteria. Fecal coliform and *E. coli* measurements were assessed on a seasonal basis as described in Section 4.1.1.2. For each sampling station, annual measurements were grouped by season (i.e., winter, spring, summer, and fall) (see Table A-12 in Appendix A for measurements by station). The data were then compared to the WQS on a sample-by-sample basis, in addition to the geometric mean concentration. Table 5-8 provides a summary of available data by season and by sub-basin. The number of seasons exceeding the geometric mean WQS and the sample-by-sample WQS are shown in Table 5-8.

Table 5-8.
Summary of Biological Stressors by Basin

Basin	*E. Coli*			Fecal Coliforms		
	# of Seasons with Measure-ments (all stations)	# of Seasons Exceeding Geometric Mean Criterion (126/100 ml)	# of Seasons Exceeding Individual Sample Criterion (≥10% above 235/100 ml)	# of Seasons with Measure-ments (all stations)	# of Seasons Exceeding Geometric Mean Criterion (50/100 ml)	# of Seasons Exceeding Individual Sample Criterion (≥10% above 100/100 ml)
Duwamish River	20	1	9	20	6	11
Longfellow Creek	20	18	20	20	20	20
Lower Green River (East)	8	1	3	8	4	4
Lower Green River (West)	20	3	9	20	11	15
Black River / Springbrook Creek	20	17	18	20	19	19
Mill Creek	20	19	19	20	20	20
Soos Creek	20	7	15	20	17	20
Jenkins Creek	20	0	2	20	6	5
Covington Creek	20	1	2	20	3	6
Middle Green River	20	0	4	20	2	11
Newaukum Creek	20	12	19	20	19	20
Upper Green Outlet	9	0	0	9	0	0

All sub-basins were found to exceed at least one of the WQS for biological stressors, except for the Upper Green River outlet. These results are also presented in Figures 5-2 and 5-3 for fecal coliform and *E. coli*, respectively. The results from this analysis are in agreement with 303(d) listings for fecal coliform throughout the watershed as reported in Section 2.2. It is assumed that recreation in the Green River watershed occurs during the warmer months of the year (late spring to early fall). Thus, potential exposure to bacteria may be elevated during the months of increased recreational activities. However, exceedances by season (winter, spring, summer, fall) were variable throughout the watershed. Therefore, while recreation may be more prevalent in the warmer months, the potential risks are not restricted to the summer season.



Fecal Coliform

Rivers & Streams
Green River
Green River Basin

Green River Sampling Stations Without Exceedences

Number of Samples Above WQS (100/100ml)
- ≤ 8
- 8 - 18
- 19 - 30
- 31 - 64
- 65 - 93

Mean Difference Above WQS (50/100ml)
- < 200
- 200 - 500
- 501 - 1200
- 1201 - 3300
- 3301 - 8841

Figure 5-2
Fecal Coliform
Green River Watershed

Project: C:\Projects\GRBENRA\Greenriverpjr Layout: Study Area Layout - Fecal Coliform Fig 5-2 Date: August 17, 2006

Figure 5-3
E. coli
Green River Watershed

Thus, fecal coliform and *E. coli* measurements throughout the watershed exceed human health-based WQS and pose a potential risk to people using this area for recreational activities (e.g., swimming). However, it is uncertain whether the measured biological stressors are due to natural or human sources. King County is currently conducting a study to determine the sources of biological stressors throughout the Green River. This will assist in determining the origin of biological contaminants and possibly indicate a link to the land use in the various sub-basins.

5.3 Risk Characterization Uncertainties

5.3.1 Parameters Not Detected in Any Sample

As discussed in Section 2.2.2, parameters were not evaluated in the SLRA if they were never detected in any sample. To understand the uncertainty of evaluating these parameters in detail, the maximum MDL for each parameter, based on all samples, was compared to the chemical's chronic SV. Of the 92 parameters analyzed for, but never detected, the maximum MDL was greater than the chronic SV for 13 (Table 5-9). For most of these parameters, the maximum MDL was less than a factor of two greater than the chronic SV and never more than a factor of 6.8 greater than the chronic SV (Table A-13 in Appendix A). Consequently, the detection limits for most of these non-detected parameters appear to be sufficiently low that they can be confidently removed from consideration in the SLRA.

Table 5-9.
Chemicals Never Detected With the Maximum MDL > Chronic SV

2,4-Dichlorophenol	Hexachlorobenzene	Phorate
Aroclor 1254	Parathion-ethyl	Silver (dissolved)
Benzo(g,h,i)perylene	Parathion-methyl	Thallium (total)
Chlorpyrifos	Permethrin	Toxaphene
Debenzo(a,h)anthracene		

5.3.2 Relevance of Risk Estimates to Salmonids

The SVs used in this SLRA were based on WQS, AWQC, or appropriate toxicity studies identified in the USEPA's AQUIRE database or the scientific literature. As discussed, both WQS and AWQC are assumed to be protective of salmonids, as these values are lowered in the WQS development process in order to protect such species (e.g., ammonia, cyanide). Further, the SVs identified from the AQUIRE database or the scientific literature are based on the lowest appropriate toxicity value identified (not just a mean for the most sensitive species, but the lowest toxicity value for the most sensitive species). Thus, if toxicity data are available for a salmonid species, and that toxicity value is the lowest available, the SV was based on that salmonid. There is uncertainty as to whether the WQS for metals are protective of salmonids since most of these values were derived in the mid-1980s and toxicity data for salmonids have been published since this time. The following focuses on whether the SVs for metals (i.e., cadmium, copper, lead, manganese, zinc) are protective of salmonids, as these were the parameters with HQs close to, or greater than, 1.0.

5.3.2.1 Cadmium

The acute and chronic WQS for cadmium are based on the 1984 cadmium AWQC document (USEPA 1985a). The USEPA has recently released a revised final AWQC document (USEPA 2001). The acute and chronic cadmium WQS at a hardness of 25 mg/L as $CaCO_3$ are 0.82 and 0.37 µg/L, respectively. For comparison, Table 5-10 summarizes acute and chronic toxicity data for salmonids from USEPA (2001) (normalized to a hardness of 25 mg/L). There are five salmonid species that appear to be inadequately protected by the current acute WQS (brown trout, bull trout, brook trout, rainbow trout, and Chinook salmon). The species mean acute value (SMAV), divided by two[13], for the most sensitive of these is approximately 50 percent of the acute WQS.

Table 5-10.
Cadmium: Acute and Chronic Toxicity Data for Salmonids

Exposure Type	Species	Duration/Life Stage	Value Type	Value (µg/L)	Reference
Acute	Brown trout (*S. trutta*)	96 hr	SMAV/2	0.40	USEPA 2001 (Table 1a)
	Bull trout (*S. confluentus*)	96 hr	SMAV/2	0.43	USEPA 2001 (Table 1a)
	Brook trout (*S. fontinalis*)	96 hr	SMAV/2	<0.44	USEPA 2001 (Table 1a)
	Rainbow trout (*O.mykiss*)	200 hr	LC10	0.45	USEPA 2001 (Table 6)
	Rainbow trout (*O.mykiss*)	96 hr	SMAV/2	0.52	USEPA 2001 (Table 1a)
	Chinook salmon (*O. tshawytscha*)	200 hr	LC10	0.72	USEPA 2001 (Table 6)
	Chinook salmon (*O. tshawytscha*)	96 hr	SMAV/2	1.06	USEPA 2001 (Table 1a)
	Coho salmon (*O. kisutch*)	96 hr	SMAV/2	1.54	USEPA 2001 (Table 1a)
	Sockeye salmon (*O. nerka*)	168 hr	SMAV/2	2.28	USEPA 2001 (Table 6)
	Pink salmon (*O. gorbuscha*)	168 hr	SMAV/2	462	USEPA 2001 (Table 6)
Chronic	Rainbow trout (*O.mykiss*)	LC	ChV	0.78	USEPA 2001 (Table 2a)
	Chinook salmon (*O. tshawytscha*)	ELS	ChV	1.56	USEPA 2001 (Table 2a)
	Brook trout (*S. fontinalis*)	LC	ChV	1.58	USEPA 2001 (Table 2a)
	Coho salmon (*O. kisutch*)	ELS	ChV	2.55	USEPA 2001 (Table 2a)
	Brown trout (*S. trutta*)	LC	ChV	2.99	USEPA 2001 (Table 2a)
	Atlantic salmon (*S. salar*)	ELS	ChV	4.74	USEPA 2001 (Table 2a)
	Lake trout (*S. namaycush*)	ELS	ChV	4.84	USEPA 2001 (Table 2a)

SMAV = Species Mean Acute Value
LC10 = Concentration lethal to 10 percent of the species tested
ChV = Chronic Value
LC = Life Cycle
ELS = Early Life Stage

[13] The species mean acute value, or SMAV, is the geometric mean of acute LC50 values for a species. SMAVs were divided by two for consistency with how acute AWQC and WQS are developed.

The maximum acute cadmium HQ throughout the study area was 0.57 and the second highest acute cadmium HQ was 0.28. Consequently, only a single sample would be expected to have an acute cadmium HQ slightly greater than 1.0 if the acute SV were based on the most sensitive salmonid. As discussed above, HQs slightly above 1.0 are highly unlikely to be of concern if cadmium bioavailability is more completely considered using a BLM. The available chronic cadmium toxicity data for salmonids presented in Table 5-10 suggest the chronic WQS (0.37 µg/L) is likely protective for salmonids. Considering this and the above factors, potential cadmium risks to salmonids appear to be low.

5.3.2.2 Copper

The acute and chronic WQS for copper are based on the 1984 copper AWQC document (USEPA 1985b). As discussed above, the USEPA has since released a revised draft AWQC document (USEPA 2003a) that incorporates the BLM to derive acute AWQC. The acute and chronic copper WQS at a hardness of 25 mg/L as $CaCO_3$ are 4.6 and 3.5 µg/L, respectively. For comparison, Table 5-11 summarizes acute and chronic toxicity data for salmonids from USEPA (2003a) (normalized to a hardness of 25 mg/L). As shown, all acute and chronic toxicity values for salmonids are above the current acute and chronic WQS. Accordingly, HQs for salmonids would be less than those calculated based on the acute and chronic WQS, which suggests that potential copper risks to salmonids are low.

Table 5-11.
Copper: Acute and Chronic Toxicity Data for Salmonids

Exposure Type	Species	Duration/Life Stage	Value Type	Value (µg/L)	Reference
Acute	Apache trout (*O. apache*)	96 hr	SMAV/2	5.61	USEPA 2003a (Table 1a)
	Chinook salmon (*O. tshwytscha*)	96 hr	SMAV/2	7.47	USEPA 2003a (Table 1a)
	Rainbow trout (*O.mykiss*)	96 hr	SMAV/2	8.01	USEPA 2003a (Table 1a)
	Bull trout (*S. confluentus*)	96 hr	SMAV/2	10.38	USEPA 2003a (Table 1a)
	Cutthroat trout (*O. clarki*)	96 hr	SMAV/2	13.80	USEPA 2003a (Table 1a)
	Pink salmon (*O. gorbuscha*)	96 hr	SMAV/2	21.39	USEPA 2003a (Table 1a)
	Sockeye salmon (*O. nerka*)	96 hr	SMAV/2	25.78	USEPA 2003a (Table 1a)
	Coho salmon (*O. kisutch*)	96 hr	SMAV/2	30.90	USEPA 2003a (Table 1a)
Chronic	Rainbow trout (*O.mykiss*)	ELS	ChV	4.47	USEPA 2003a (Table 2a)
	Chinook salmon (*O. tshwytscha*)	ELS	ChV	4.60	USEPA 2003a (Table 2a)
	Brook trout (*S. fontinalis*)	ELS, PLC	ChV	<7.98	USEPA 2003a (Table 2a)
	Brown trout (*S. trutta*)	ELS	ChV	16.88	USEPA 2003a (Table 2a)
	Lake trout (*S. namaycush*)	ELS	ChV	17.47	USEPA 2003a (Table 2a)

SMAV = Species Mean Acute Value LC = Life Cycle ChV = Chronic Value
LC10 = Concentration lethal to 10 percent of the species tested ELS = Early Life Stage

5.3.2.3 Lead

The acute and chronic lead WQS are based on the 1984 lead AWQC document (USEPA 1985c). Although the lead AWQC document is currently being revised by the USEPA, a more recent version has not yet been released. Accordingly, the AQUIRE database was searched to identify toxicity data for salmonids. The acute and chronic lead WQS at a hardness of 25 mg/L as $CaCO_3$ are 13.9 and 0.54 µg/L, respectively. For comparison, Table 5-12 summarizes available acute and chronic salmonid toxicity data identified in the AQUIRE database (normalized to a hardness of 25 mg/L). As shown, all acute and chronic salmonid toxicity values are over an order of magnitude greater than acute and chronic WQS, respectively. Accordingly, the WQS used in this SLRA are sufficiently protective of salmonids, and HQs based on these salmonid-specific toxicity values would be much less than those calculated based on the acute and chronic WQS, which suggests that potential lead risks to salmonids are low.

Table 5-12.
Lead: Acute and Chronic Toxicity Data for Salmonids

Exposure Type	Species	Duration/Life Stage	Value Type	Value (µg/L)	Reference
Acute	Chinook salmon (*O. tshwytscha*)	96 hr	SMAV/2	353	Chapman 1975
	Rainbow trout (*O.mykiss*)	96 hr	SMAV/2	427	USEPA 1985c
	Atlantic salmon (*S. salar*)	96 hr	SMAV/2	995	Grande and Anderson 1983
	Brook trout (*S. fontinalis*)	96 hr	SMAV/2	998	USEPA 1985c
Chronic	Rainbow trout (*O.mykiss*)	ELS	ChV	16.3	USEPA 1985c
	Brook trout (*S. fontinalis*)	LC	ChV	40.5	USEPA 1985c
	Rainbow trout (*O.mykiss*)	ELS	ChV	66.3	USEPA 1985c

SMAV = Species Mean Acute Value LC = Life Cycle
ChV = Chronic Value ELS = Early Life Stage

5.3.2.4 Manganese

The acute and chronic SVs for manganese were derived based on a review of the AQUIRE database and the scientific literature. The lowest acute LC50 identified was 4,700 µg/L for the cladoceran *Daphnia magna*. Division of this value by two resulted in an acute SV of 2,350 µg/L and division by an ACR of 10 resulted in a chronic SV of 470. Manganese toxicity data for salmonids are generally limited. Stubblefield et al. (1997) evaluated the chronic sensitivity of brown trout (*Salmo trutta*) to manganese at varying hardness levels. Based on 62-day early life stage tests that evaluated embryo-larval survival and growth, chronic toxicity values (reported as IC25s[14]) were 4,670, 5,590, and 8,680 µg/L at hardness levels of approximately 30, 150, and 450 mg/L as $CaCO_3$. Thus, both the acute and chronic SVs were well below the chronic values for brown trout, suggesting that salmonids are likely to be adequately protected by the SVs used.

[14] The IC25 is the inhibition concentration estimated to cause a 25% reduction in organism performance relative to the control.

5.3.2.5 Zinc

The acute and chronic zinc WQS are based on the 1987 zinc AWQC document (USEPA 1987). Although the zinc AWQC document is currently being revised by the USEPA, a more recent version has not been released. Accordingly, the AQUIRE database was searched to identify salmonid toxicity data. The acute and chronic zinc WQS at a hardness of 25 mg/L as $CaCO_3$ are 35.4 and 32.3 µg/L, respectively. For comparison, Table 5-13 summarizes acute and chronic toxicity data for salmonids identified in USEPA (1987) and the AQUIRE database (normalized to a hardness of 25 mg/L). All salmonid acute and chronic toxicity values are above the acute and chronic WQS. Accordingly, the WQS used in this SLRA are sufficiently protective of salmonids (although just barely for bull trout), and HQs based on these salmonid-specific toxicity values would all be less than 1.0 with the exception of the maximum HQ measured at A330. Recall at this station that the maximum zinc concentration was 557 µg/L, and all other zinc concentrations were much lower. Accordingly, it seems unlikely that zinc is a metal of concern for salmonids in the watershed.

Table 5-13.
Zinc: Acute and Chronic Toxicity Data for Salmonids

Exposure Type	Species	Duration/Life Stage	Value Type	Value (µg/L)	Reference
Acute	Bull trout (*S. confluentus*)	120-hr	SMAV/2	36.1	Hansen et al. 2002
	Chinook salmon (*O. tshwytscha*)	96-hr	SMAV/2	125	USEPA 1987, AQUIRE
	Rainbow trout (*O.mykiss*)	96-hr	SMAV/2	133	USEPA 1987, AQUIRE
	Sockeye salmon (*O. nerka*)	96-hr	SMAV/2	417	USEPA 1987
	Coho salmon (*O. kisutch*)	96-hr	SMAV/2	452	USEPA 1987
	Brook trout (*S. fontinalis*)	96-hr	SMAV/2	584	USEPA 1987
	Atlantic salmon (*S. salar*)	96-hr	SMAV/2	605	USEPA 1987
Chronic	Rainbow trout (*O.mykiss*)	ELS	ChV	268	USEPA 1987
	Chinook salmon (*O. tshwytscha*)	ELS	ChV	371	USEPA 1987
	Brook trout (*S. fontinalis*)	LC	ChV	511	USEPA 1987
	Rainbow trout (*O.mykiss*)	ELS	ChV	603	USEPA 1987

SMAV = Species Mean Acute Value
ChV = Chronic Value
LC = Life Cycle
ELS = Early Life Stage

5.3.3 Total Suspended Solids

There are two alternate approaches to the HQ approach for estimating risk to aquatic life based on exposure to TSS. The first would be to estimate risks using a probabilistic approach using the stress index and an exposure index as described in Section 4.1.1.2. The second approach would be to use a severity of ill effects approach as presented by Newcombe and Jenson (1996). The following briefly describes each approach.

The probabilistic approach would estimate the number of potentially affected species based on an exposure distribution and a stress index distribution. The exposure distribution would be estimated by using the extant TSS data (monthly, weekly) and using extrapolation techniques to estimate daily concentrations. The estimated daily data could then be normalized to an hourly level, ln (24, hours x TSS concentration, mg/L). This would be the exposure index. The exposure index could also be estimated assuming a 96-hour average for the daily data. This would be estimated accordingly, ln (96, hours x 96-hour average SS concentration, mg/L). The effects data would be normalized to a stress index following Newcombe and McDonald (1991). Cumulative distributions of the stress index and exposure index two values would be compared for the risk estimate.

The second approach would be to use a severity of ill effects (SEV) estimate as described by Newcombe and Jenson (1996). This approach could be salmon specific or use salmonids and non-salmonid species. With this approach, the predictive models used by Newcombe and Jensen (1996) to estimate SEV would be used. The SEV model follows the general form,

$$SEV = intercept + b(\ln\ Exposure\ \ Duration) + c(\ln\ TSS/L) \qquad \textbf{Equation 1}$$

Where: b= ln slope for exposure duration

c=ln slope for effects data.

In this application, the intercept and slopes for exposure and effects data are described by Newcombe and Jenson (1996) and two examples are summarized in Table 5-14. An example of this application at a few Green-Duwamish stations is presented in Table 5-15. The Newcombe and Jenson approach appears to be more conservative than the HQ approach as there is stress predicted when HQs are less than one.

Table 5-14.
Channel Sediment Assessment Parameters.

Model Term[1]	Salmon Only	Non-salmonids
Intercept	1.0642	4.0815
Slope of lnx(b)	0.6068	0.7126
Slope of lny(c)	0.7384	0.2829
R2	0.6173	0.5516

[1]= From Newcombe and Jenson (1996)

Table 5-15.
Application of Channel Sediment Assessment Parameters.

Location	Locator	Sample Period	HQ for Period	Salmon SEV, assume an average of one month (720 hours)	Description of SEV[1]
Black River/ Springbrook Creek	A326	January 2003	0.8	7.1	Moderate habitat impairment, impaired homing
Duwamish River	A307	January 2002	2.4	8.0	Long-term feeding rate and success impaired
Newaukum Creek	AJ322	January 2003	0.3	6.5	Moderate physiological stress.

[1]= From Newcombe and Jenson (1996)

6.0 SUMMARY AND CONCLUSIONS

This SLRA evaluated the potential risks to aquatic life posed by exposure to water quality stressors in the Green-Duwamish watershed[15]. Water quality data were available for several classes of parameters throughout multiple sub-basins, including metals, organic chemicals, TSS, DO, and temperature. With the exception of DO, temperature, pH and pathogen indicators, an HQ approach was used to evaluate the potential risks posed by stressors.

6.1 Stressors Posing Potential Risk

6.1.1 Metals

Metals with at least one HQ greater than 1.0 were: cadmium, copper, lead, manganese, and zinc. At stations where metal HQs exceeded 1.0, the percentages of samples resulting in HQs greater than 1.0 were always low. In general, the 95th percentile HQ for a station, and sometimes only the maximum HQ, exceeded 1.0. Furthermore, the magnitudes of even the maximum HQs were relatively low for all metals. Based on data collected throughout the study area, the maximum metal HQs were 2.8 for cadmium, 2.5 for copper, 1.2 for lead, 1.2 for manganese, and 7.9 for zinc (the second highest HQ for zinc was 1.0).

Current Washington State WQS for cadmium, copper, lead, and zinc account for metal bioavailability in site waters based on hardness. The BLM is a tool that further accounts for factors that influence metal bioavailability, including DOC, pH, anions, and additional cations, such as sodium. The BLM has been incorporated into the latest draft copper AWQC document (USEPA 2003a) and is being considered for future revisions to lead and zinc AWQC. When the copper BLM was used to develop SVs for this SLRA, all HQs greater than 1.0 were reduced to less than 1.0. This was largely due to the influence of DOC in water bodies throughout the study area. Based on BLM publications for other metals, it is likely that all metal HQs would be less than 1.0 if all water quality parameters that influence bioavailability are accounted for. Overall, the evidence suggests that metals in the study area are posing a negligible risk to aquatic life.

6.1.2 Ammonia and Nitrite+Nitrate

Hazard quotients for nitrogen compounds (ammonia and nitrite+nitrate) exceeded 1.0 in a limited number of samples collected in the Newaukum Creek sub-basin (Stations B322 and D322). The frequency with which HQs exceeded 1.0 was low, and the magnitudes of

[15] As noted in the introduction to this SLRA, sediment and biota tissue chemistry data are generally lacking for the study area and this represents a data gap. The lower Duwamish River is an exception, but sediment and biota tissue in this reach were previously evaluated in the Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay (King County 1999).

the HQs were relatively low, suggesting a low potential risk. Further, because ammonia and nitrite+nitrate HQs did not exceed 1.0 in the 19 other stations in the Newaukum Creek sub-basin, these compounds do not appear to be of concern basin-wide. If additional samples are collected at Stations B322 and D322 to monitor ammonia and nitrite+nitrate levels, it is recommended that daily samples be collected to better define the appropriate exposure duration. For example, in the ammonia AWQC document (USEPA 1999b), a 30-day averaging period is supported, so long as any 4-day average concentration during this period is not greater than two times the chronic criterion. However, given that the potential risks posed by ammonia and nitrite+nitrate are estimated to be low, daily sampling should not be considered critical.

6.1.3 Total Suspended Solids

Hazard quotients for TSS exceeded 1.0 throughout the study area. The chronic TSS SV was based on the influence of TSS on the population growth rates of several cladocerans species over a 21-day exposure period. The NOEC and LOEC from the study were 10 and 50 mg/L, resulting in an SV (geometric mean of the NOEC and LOEC) of 22 mg/L. The appropriateness of this SV to the TSS grab samples evaluated in the SLRA is uncertain, as daily TSS data are unavailable. Another uncertainty not accounted for in the SLRA is background TSS for the streams evaluated, under both wet weather and dry weather conditions. Given that the TSS HQs are likely based on conservative estimates of exposure and effects, TSS risks to aquatic life are assumed to be low, but should be evaluated further. If detailed TSS evaluations are conducted in the future, more frequent sampling should be considered to better reflect the true exposure conditions. In addition, although it can be difficult to determine, background TSS levels for the different sub-basins should be identified.

6.1.4 Dissolved Oxygen and Temperature

Low DO and elevated temperatures are a concern for several water bodies in the Green-Duwamish watershed. The Duwamish River, Green River, Little Soos Creek, Soosette Creek, Mullen Slough, Newaukum Creek, Soos Creek, and Mill Creek are all on the 2002/2004 303(d) list for DO, and the Green River and Little Soos Creek are on the 303(d) list for temperature. The DO analysis in this SLRA are consistent with these listings, and also suggest that low DO levels in Longfellow Creek and the Black River (Springbrook Creek) may pose a risk to salmonids. Greater than 50 percent of samples from stations in Mullen Slough, the Black River (Springbrook Creek), Mill Creek, Soos Creek, and Newaukum Creek were out of compliance with WQS for DO. For temperature, the highest exceedances were observed in Soos Creek and the Black River (Springbrook Creek), which exceeded the temperature WQS by as much as 5.6 and 4.7°C, respectively. Overall, this SLRA suggests that low DO and elevated temperature pose a greater risk to aquatic life in the study area than chemical stressors.

6.1.5 pH

The Duwamish is on the 2002/2004 303(d) list for pH. Overall, the pH level in at least one sample is either below the minimum pH standard of 6.5 or above the maximum pH

standard of 8.5 for nine of the 11 sub-basins with available pH data and 17 of the 70 stations evaluated watershed-wide. The stations with the highest frequency of not meeting WQS were Station 0317 in the Black River (Springbrook Creek) (pH in 6 of 81 samples [7%] were less than 6.5), Station Q320 in Soos Creek (pH in 5 of 66 samples [8%] were less than 6.5), and Station AA322 in Newaukum Creek (pH in 2 of 33 samples [6%] were greater than 8.5). Otherwise, the percentage of pH measurements not meeting the WQS ranged from 0-3.8% at the remaining stations. Overall, pH-related risks to aquatic life appear to be negligible.

6.1.6 Fecal Coliforms/*E. Coli*

Fecal coliform is on the 2002/2004 303(d) list for the Duwamish, Longfellow Creek, Mullen Slough, Mill Creek, Green River, Little Soos Creek, Newaukum Creek, Soos Creek, Soosette Creek, Covington Creek, and Jenkins Creek. This is consistent with the findings in this SLRA. Of the locations evaluated here, only the Upper Green River outlet never had fecal coliform or *E. coli* levels exceeding their respective standards/criteria. Although the frequency of exceeding standards/criteria was relatively high across the remaining sub-basins, the sub-basins with the highest frequency of exceedance were Longfellow Creek, Black River (Springbrook Creek), Mill Creek, Soos Creek, and Newaukum Creek. Overall, fecal coliform and *E. coli* measurements throughout the watershed exceed human health-based WQS and pathogen indicators suggest a potential risk to people using this area for recreational activities (e.g., swimming). As discussed above, it is uncertain whether the measured pathogen indicators are from natural or human sources. King County is currently conducting a study to determine the sources of biological stressors throughout the Green River. This will assist in determining the origin of biological contaminants and possibly indicate a link to the land use in the various sub-basins

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Appendix A

SUMMARY STATISTICS AND SCREENING VALUES

APPENDIX A REFERENCES

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Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
Biological	Chlorophyll a	Chlorophyll a	ug/L
Biological	Ecoli-present/absent	E. Coli	each
Biological	ENTEROCOCCI, ME MF METHOD, WATER, COLONI	Enterococci	COL/100 ML
Biological	Pheophytin a	Pheophytin a	ug/L
Conventionals	Ammonia Nitrogen	Ammonia-nitrogen	mg/L
Conventionals	Nitrite + Nitrate Nitrogen	Nitrite + Nitrate Nitrogen	mg/L
Conventionals	NITROGEN AMMONIA DISSOLVED (MG/L AS N)	Ammonia-nitrogen	MG/L AS N
Conventionals	NITROGEN NITRATE DISSOLVED (MG/L AS N)	Nitrate-nitrogen	MG/L AS N
Conventionals	NITROGEN NITRITE PLUS NITRATE DISSOLVED	Nitrite + Nitrate Nitrogen	MG/L AS N
Conventionals	NITROGEN, NITRITE, DISSOLVED, MG/L AS N	Nitrite-nitrogen	MG/L AS N
Conventionals	NITROGEN,AMMONIA, DISSOLVED (MG/L AS NH4	Ammonia-nitrogen	MG/L AS NH
Conventionals	NITROGEN,NITRATE, DISSOLVED (MG/L AS NO3	Nitrate-nitrogen	MG/L AS NO
Conventionals	NITROGEN,NITRITE, DISSOLVED (MG/L AS NO2	Nitrite-nitrogen	MG/L AS NO
Conventionals	Orthophosphate Phosphorus	Orthophosphate Phosphorus	mg/L
Conventionals	PHOSPHATE ORTHO DISSOLVED (MG/L AS PO4)	Orthophosphate Phosphorus	MG/L AS PO
Conventionals	PHOSPHORUS ORTHOPHOSPHATE DISSOLVED (MG/	Orthophosphate Phosphorus	MG/L AS P
Inorganics	Aluminum, Dissolved, ICP-MS	Aluminum, Dissolved, ICP-MS	mg/L
Inorganics	Aluminum, Total, ICP	Aluminum, Total, ICP	mg/L
Inorganics	Aluminum, Total, ICP-MS	Aluminum, Total, ICP-MS	mg/L
Inorganics	Antimony, Dissolved, ICP-MS	Antimony, Dissolved, ICP-MS	mg/L
Inorganics	Antimony, Total, ICP-MS	Antimony, Total, ICP-MS	mg/L
Inorganics	Arsenic, Dissolved, ICP-MS	Arsenic, Dissolved, ICP-MS	mg/L
Inorganics	Arsenic, Total, ICP-MS	Arsenic, Total, ICP-MS	mg/L
Inorganics	Barium, Dissolved, ICP-MS	Barium, Dissolved, ICP-MS	mg/L
Inorganics	Barium, Total, ICP-MS	Barium, Total, ICP-MS	mg/L
Inorganics	Beryllium, Dissolved, ICP-MS	Beryllium, Dissolved, ICP-MS	mg/L
Inorganics	Beryllium, Total, ICP-MS	Beryllium, Total, ICP-MS	mg/L
Inorganics	Cadmium, Dissolved, ICP-MS	Cadmium, Dissolved, ICP-MS	mg/L
Inorganics	Cadmium, Total, ICP-MS	Cadmium, Total, ICP-MS	mg/L
Inorganics	Chromium, Dissolved, ICP-MS	Chromium, Dissolved, ICP-MS	mg/L
Inorganics	Chromium, Total, ICP-MS	Chromium, Total, ICP-MS	mg/L
Inorganics	Cobalt, Dissolved, ICP-MS	Cobalt, Dissolved, ICP-MS	mg/L
Inorganics	Cobalt, Total, ICP-MS	Cobalt, Total, ICP-MS	mg/L
Inorganics	Copper, Dissolved, ICP-MS	Copper, Dissolved, ICP-MS	mg/L
Inorganics	Copper, Total, ICP-MS	Copper, Total, ICP-MS	mg/L
Inorganics	FLUORIDE DISSOLVED (MG/L AS F)	Fluoride, Dissolved	MG/L AS F
Inorganics	IRON DISSOLVED (UG/L AS FE)	Iron, Dissolved	UG/L AS FE
Inorganics	Iron, Dissolved, ICP	Iron, Dissolved, ICP	mg/L
Inorganics	Iron, Total, ICP	Iron, Total, ICP	mg/L
Inorganics	Lead, Dissolved, ICP-MS	Lead, Dissolved, ICP-MS	mg/L
Inorganics	Lead, Total, ICP-MS	Lead, Total, ICP-MS	mg/L
Inorganics	MANGANESE DISSOLVED (UG/L AS MN)	Manganese, Dissolved	UG/L AS MN
Inorganics	Manganese, Dissolved, ICP	Manganese, Dissolved, ICP	mg/L
Inorganics	Manganese, Dissolved, ICP-MS	Manganese, Dissolved, ICP-MS	mg/L
Inorganics	Manganese, Total, ICP	Manganese, Total, ICP	mg/L
Inorganics	Manganese, Total, ICP-MS	Manganese, Total, ICP-MS	mg/L
Inorganics	Mercury, Dissolved, CVAA	Mercury, Dissolved, CVAA	mg/L
Inorganics	Mercury, Dissolved, CVAF	Mercury, Dissolved, CVAF	mg/L
Inorganics	Mercury, Total, CVAA	Mercury, Total, CVAA	mg/L
Inorganics	Mercury, Total, CVAF	Mercury, Total, CVAF	mg/L
Inorganics	Molybdenum, Dissolved, ICP-MS	Molybdenum, Dissolved, ICP-MS	mg/L

Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
Inorganics	Molybdenum, Total, ICP-MS	Molybdenum, Total, ICP-MS	mg/L
Inorganics	Nickel, Dissolved, ICP-MS	Nickel, Dissolved, ICP-MS	mg/L
Inorganics	Nickel, Total, ICP-MS	Nickel, Total, ICP-MS	mg/L
Inorganics	Selenium, Dissolved, ICP-MS	Selenium, Dissolved, ICP-MS	mg/L
Inorganics	Selenium, Total, ICP-MS	Selenium, Total, ICP-MS	mg/L
Inorganics	Silver, Dissolved, ICP-MS	Silver, Dissolved, ICP-MS	mg/L
Inorganics	Silver, Total, ICP-MS	Silver, Total, ICP-MS	mg/L
Inorganics	Strontium, Dissolved, ICP-MS	Strontium, Dissolved, ICP-MS	mg/L
Inorganics	Strontium, Total, ICP-MS	Strontium, Total, ICP-MS	mg/L
Inorganics	Thallium, Dissolved, ICP-MS	Thallium, Dissolved, ICP-MS	mg/L
Inorganics	Thallium, Total, ICP-MS	Thallium, Total, ICP-MS	mg/L
Inorganics	Vanadium, Dissolved, ICP-MS	Vanadium, Dissolved, ICP-MS	mg/L
Inorganics	Vanadium, Total, ICP-MS	Vanadium, Total, ICP-MS	mg/L
Inorganics	Zinc, Dissolved, ICP	Zinc, Dissolved, ICP	mg/L
Inorganics	Zinc, Dissolved, ICP-MS	Zinc, Dissolved, ICP-MS	mg/L
Inorganics	Zinc, Total, ICP	Zinc, Total, ICP	mg/L
Inorganics	Zinc, Total, ICP-MS	Zinc, Total, ICP-MS	mg/L
Organic	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	ug/L
Organic	1,2-Dichlorobenzene	1,2-Dichlorobenzene	ug/L
Organic	1,3-Dichlorobenzene	1,3-Dichlorobenzene	ug/L
Organic	1,4-Dichlorobenzene	1,4-Dichlorobenzene	ug/L
Organic	2,4,5-Trichlorophenol	2,4,5-Trichlorophenol	ug/L
Organic	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	ug/L
Organic	2,4-Dichlorophenol	2,4-Dichlorophenol	ug/L
Organic	2,4-Dimethylphenol	2,4-Dimethylphenol	ug/L
Organic	2,4-Dinitrophenol	2,4-Dinitrophenol	ug/L
Organic	2,4-Dinitrotoluene	2,4-Dinitrotoluene	ug/L
Organic	2,6-Dinitrotoluene	2,6-Dinitrotoluene	ug/L
Organic	2-Chloronaphthalene	2-Chloronaphthalene	ug/L
Organic	2-Chlorophenol	2-Chlorophenol	ug/L
Organic	2-Methylnaphthalene	2-Methylnaphthalene	ug/L
Organic	2-Methylphenol	2-Methylphenol	ug/L
Organic	2-Nitroaniline	2-Nitroaniline	ug/L
Organic	2-Nitrophenol	2-Nitrophenol	ug/L
Organic	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	ug/L
Organic	3-Nitroaniline	3-Nitroaniline	ug/L
Organic	4,6-Dinitro-O-Cresol	4,6-Dinitro-o-cresol	ug/L
Organic	4-Bromophenyl Phenyl Ether	4-Bromophenyl phenyl ether	ug/L
Organic	4-Chloro-3-Methylphenol	4-Chloro-3-methylphenol	ug/L
Organic	4-Chloroaniline	4-Chloroaniline	ug/L
Organic	4-Chlorophenyl Phenyl Ether	4-Chlorophenyl phenyl ether	ug/L
Organic	4-Methylphenol	4-Methylphenol	ug/L
Organic	4-Nitroaniline	4-Nitroaniline	ug/L
Organic	4-Nitrophenol	4-Nitrophenol	ug/L
Organic	Benzyl Butyl Phthalate	Butylbenzylphthalate	ug/L
Organic	Bis(2-Chloroethoxy)Methane	Bis(2-chloroethoxy)methane	ug/L
Organic	Bis(2-Chloroethyl)Ether	Bis(2-chloroethyl)ether	ug/L
Organic	Bis(2-Chloroisopropyl)Ether	Bis(2-chloroisopropyl)ether	ug/L
Organic	Bis(2-ethylhexyl)adipate	Bis(2-ethylhexyl)adipate	ug/L
Organic	Bis(2-Ethylhexyl)Phthalate	Bis(2-ethylhexyl)phthalate	ug/L

Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
Organic	Bisphenol A	Bisphenol A	ug/L
Organic	Dibenzofuran	Dibenzofuran	ug/L
Organic	Diethyl Phthalate	Diethyl phthalate	ug/L
Organic	Dimethyl Phthalate	Dimethyl phthalate	ug/L
Organic	Di-N-Butyl Phthalate	Di-n-butyl phthalate	ug/L
Organic	Di-N-Octyl Phthalate	Di-n-octyl phthalate	ug/L
Organic	Estradiol	Estradiol	ug/L
Organic	Estrone	Estrone	ug/L
Organic	Ethynyl estradiol	Ethynyl estradiol	ug/L
Organic	Hexachlorobutadiene	Hexachlorobutadiene	ug/L
Organic	Hexachloroethane	Hexachloroethane	ug/L
Organic	Isophorone	Isophorone	ug/L
Organic	Methyltestosterone	Methyltestosterone	ug/L
Organic	Naphthalene	Naphthalene	ug/L
Organic	Nitrobenzene	Nitrobenzene	ug/L
Organic	N-Nitrosodimethylamine	N-Nitrosodimethylamine	ug/L
Organic	N-Nitrosodi-N-Propylamine	N-Nitrosodi-n-propylamine	ug/L
Organic	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine	ug/L
Organic	Pentachlorophenol	Pentachlorophenol	ug/L
Organic	Phenol	Phenol	ug/L
Organic	Progesterone	Progesterone	ug/L
Organic	Testosterone	Testosterone	ug/L
Organic	Total 4-Nonylphenol	4-Nonylphenol, total	ug/L
Organic	Vinclozolin	Vinclozolin	ug/L
Other	ALKALINITY, WATER, DISSOLVED, TOTAL, INC	Alkalinity	MG/L AS CA
Other	Biochemical Oxygen Demand	Biochemical Oxygen Demand	mg/L
Other	Caffeine	Caffeine	ug/L
Other	CHLORIDE DISSOLVED (MG/L AS CL)	Chloride, Dissolved	MG/L AS CL
Other	Conductivity	Conductivity	umhos/cm
Other	Conductivity, Field	Conductivity	umhos/cm
Other	Dissolved Organic Carbon	Dissolved Organic Carbon	mg/L
Other	PHOSPHORUS DISSOLVED (MG/L AS P)	Phosphorus, Dissolved	MG/L AS P
Other	PHOSPHORUS TOTAL (MG/L AS P)	Phosphorus, Total	MG/L AS P
Other	POTASSIUM DISSOLVED (MG/L AS K)	Potassium, Dissolved	MG/L AS K
Other	Potassium, Dissolved, ICP	Potassium, Dissolved, ICP	mg/L
Other	Potassium, Total, ICP	Potassium, Total, ICP	mg/L
Other	Salinity	Salinity	PSS
Other	Sample Depth	Sample Depth	m
Other	Settleable Solids, Gravimetric	Settleable Solids	mg/L
Other	SILICA DISSOLVED (MG/L AS SIO2)	Silica, Dissolved	MG/L AS SI
Other	SODIUM DISSOLVED (MG/L AS NA)	Sodium, Dissolved	MG/L AS NA
Other	Sodium, Dissolved, ICP	Sodium, Dissolved, ICP	mg/L
Other	Sodium, Total, ICP	Sodium, Total, ICP	mg/L
Other	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (	Solids, Dissolved	MG/L
Other	SULFATE DISSOLVED (MG/L AS SO4)	Sulfate, Dissolved	MG/L AS SO
Other	Total Alkalinity	Alkalinity	mg CaCO3/L
Other	Total Organic Carbon	Organic Carbon, Total	mg/L
Other	Total Phosphorus	Phosphorus, Total	mg/L
Other	Turbidity	Turbidity	NTU
PAH	Acenaphthene	Acenaphthene	ug/L

Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
PAH	Acenaphthylene	Acenaphthylene	ug/L
PAH	Anthracene	Anthracene	ug/L
PAH	Benzo(a)anthracene	Benzo(a)anthracene	ug/L
PAH	Benzo(a)pyrene	Benzo(a)pyrene	ug/L
PAH	Benzo(b)fluoranthene	Benzo(b)fluoranthene	ug/L
PAH	Benzo(g,h,i)perylene	Benzo(g,h,i)perylene	ug/L
PAH	Benzo(k)fluoranthene	Benzo(k)fluoranthene	ug/L
PAH	Chrysene	Chrysene	ug/L
PAH	Dibenzo(a,h)anthracene	Dibenzo(a,h)anthracene	ug/L
PAH	Fluoranthene	Fluoranthene	ug/L
PAH	Fluorene	Fluorene	ug/L
PAH	Indeno(1,2,3-Cd)Pyrene	Indeno(1,2,3-cd)pyrene	ug/L
PAH	Phenanthrene	Phenanthrene	ug/L
PAH	Pyrene	Pyrene	ug/L
PCB	Aroclor 1016	Aroclor 1016	ug/L
PCB	Aroclor 1221	Aroclor 1221	ug/L
PCB	Aroclor 1232	Aroclor 1232	ug/L
PCB	Aroclor 1242	Aroclor 1242	ug/L
PCB	Aroclor 1248	Aroclor 1248	ug/L
PCB	Aroclor 1254	Aroclor 1254	ug/L
PCB	Aroclor 1260	Aroclor 1260	ug/L
Pesticide	2,4,5-T	2,4,5-T	ug/L
Pesticide	2,4,5-TP (Silvex)	2,4,5-TP (Silvex)	ug/L
Pesticide	2,4-D	2,4-D	ug/L
Pesticide	2,4-DB	2,4-DB	ug/L
Pesticide	2,6-DIETHYLANILINE, WATER, FILTERED, GLA	2,6-Diethylaniline	UG/L
Pesticide	4,4'-DDD	4,4'-DDD	ug/L
Pesticide	4,4'-DDE	4,4'-DDE	ug/L
Pesticide	4,4'-DDT	4,4'-DDT	ug/L
Pesticide	ACETOCHLOR, WATER, FILTERED, RECOVERABLE	Acetochlor	UG/L
Pesticide	ALACHLOR,WATER, DISSOLVED, RECOVERABLE,	Alachlor	UG/L
Pesticide	Aldrin	Aldrin	ug/L
Pesticide	ALPHA BHC(UG/L)	BHC, alpha-	UG/L
Pesticide	Alpha-BHC	BHC, alpha-	ug/L
Pesticide	Alpha-Chlordane	Chlordane, alpha-	ug/L
Pesticide	Atrazine	Atrazine	ug/L
Pesticide	ATRAZINE,WATER, DISSOLVED, RECOVERABLE,	Atrazine	UG/L
Pesticide	BENFLURALIN, WATER, FILTERED, GLASS FIBE	Benfluralin	UG/L
Pesticide	Beta-BHC	BHC, beta-	ug/L
Pesticide	BUTYLATE,WATER, DISSOLVED, RECOVERABLE,	Butylate	UG/L
Pesticide	CARBARYL,WATER, FILTERED, GLASS FIBER, 0	Carbaryl	UG/L
Pesticide	Carbazole	Carbazole	ug/L
Pesticide	CARBOFURAN, WATER, FILTERED, GLASS FIBER	Carbofuran	UG/L
Pesticide	Chlordane	Chlordane	ug/L
Pesticide	Chlorpyrifos	Chlorpyrifos	ug/L
Pesticide	CHLORPYRIFOS DISSOLVED, UG/L	Chlorpyrifos	UG/L
Pesticide	CYANAZINE, WATER, DISSOLVED, RECOVERABLE	Cyanazine	UG/L
Pesticide	Dalapon	Dalapon	ug/L
Pesticide	DCPA, WATER, FILTERED, LASS FIBER, 0.7 U	Dacthal (DCPA)	UG/L
Pesticide	Delta-BHC	BHC, delta-	ug/L

Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
Pesticide	DESULFINYLFIPRONIL, WATER, FILTERED, REC	Desulfinylfipronil	UG/L
Pesticide	Diazinon	Diazinon	ug/L
Pesticide	DIAZINON,DISSOLVED (UG/L)	Diazinon	UG/L
Pesticide	Dicamba	Dicamba	ug/L
Pesticide	Dichloroprop	Dichloroprop	ug/L
Pesticide	Dieldrin	Dieldrin	ug/L
Pesticide	DIELDRIN,DISSOLVED (UG/L)	Dieldrin	UG/L
Pesticide	Dinoseb	Dinoseb	ug/L
Pesticide	Disulfoton	Disulfoton	ug/L
Pesticide	DISULFOTON, WATER, FILTERED, GLASS FIBER	Disulfoton	UG/L
Pesticide	Endosulfan I	Endosulfan I	ug/L
Pesticide	Endosulfan II	Endosulfan II	ug/L
Pesticide	Endosulfan Sulfate	Endosulfan Sulfate	ug/L
Pesticide	Endrin	Endrin	ug/L
Pesticide	Endrin Aldehyde	Endrin aldehyde	ug/L
Pesticide	EPTC, WATER, FILTERED, LASS FIBER, 0.7 U	EPTC	UG/L
Pesticide	ETHALFLURALIN, WATER, FILTERED, GLASS FI	Ethalfluralin	UG/L
Pesticide	ETHOPROP,WATER, FILTERED, GLASS FIBER, 0	Ethoprop	UG/L
Pesticide	FIPRONIL SULFIDE, WATER, FILTERED, RECOV	Fipronil sulfide	UG/L
Pesticide	FIPRONIL SULFONE, WATER, FILTERED, RECOV	Fipronil sulfone	UG/L
Pesticide	FIPRONIL,WATER, FILTERED, RECOVERABLE, M	Fipronil	UG/L
Pesticide	FONOFOS, WATER, DISSOLVED, RECOVERABLE,	Fonofos	UG/L
Pesticide	Gamma-BHC (Lindane)	BHC, gamma- (Lindane)	ug/L
Pesticide	Gamma-Chlordane	Chlordane, gamma-	ug/L
Pesticide	Heptachlor	Heptachlor	ug/L
Pesticide	Heptachlor Epoxide	Heptachlor epoxide	ug/L
Pesticide	Hexachlorobenzene	Hexachlorobenzene	ug/L
Pesticide	LINDANE, DISSOLVED (UG/L)	BHC, gamma- (Lindane)	UG/L
Pesticide	LINURON, WATER, FILTERED, GLASS FIBER, 0	Linuron	UG/L
Pesticide	Malathion	Malathion	ug/L
Pesticide	MALATHION, DISSOLVED (UG/L)	Malathion	UG/L
Pesticide	MCPA	MCPA	ug/L
Pesticide	MCPP	MCPP	ug/L
Pesticide	Methoxychlor	Methoxychlor	ug/L
Pesticide	METHYL AZINPHOS, WATER, FILTERED, GLASS	Methyl azinphos	UG/L
Pesticide	METHYL PARATHION, WATER, FILTERED, GLASS	Parathion, methyl-	UG/L
Pesticide	METOLACHLOR, WATER, DISSOLVED, UG/L	Metolachlor	UG/L
Pesticide	METRIBUZIN, (SENCOR), WATER, DISSOLVED,	Metribuzin	UG/L
Pesticide	MOLINATE,WATER, FILTERED, GLASS FIBER, 0	Molinate	UG/L
Pesticide	NAPROPAMIDE, WATER, FILTERED, GLASS FIBE	Napromide	UG/L
Pesticide	P,P' DDE DISSOLVED (UG/L)	4,4'-DDE	UG/L
Pesticide	PARATHION, DISSOLVED (UG/L)	Parathion	UG/L
Pesticide	Parathion-Ethyl	Parathion	ug/L
Pesticide	Parathion-Methyl	Parathion, methyl-	ug/L
Pesticide	PEBULATE,WATER, FILTERED, GLASS FIBER, 0	Pebulate	UG/L
Pesticide	PENDIMETHALIN, WATER, FILTERED, GLASS FI	Pendimethalin	UG/L
Pesticide	PERMETHRIN, CIS, WATER, FILTERED, GLASS	Permethrin	UG/L
Pesticide	Phorate	Phorate	ug/L
Pesticide	PHORATE, WATER, FILTERED, GLASS FIBER, 0	Phorate	UG/L
Pesticide	PROMETON,WATER, DISSOLVED, RECOVERABLE,	Prometon	UG/L

Table A-1.
All Parameters Included in the Green River Screening-Level Risk Assessment Database

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit
Pesticide	PRONAMIDE, WATER, FILTERED, GLASS FIBER,	Pronamide	UG/L
Pesticide	PROPACHLOR, WATER, DISSOLVED, RECOVERABL	Propachlor	UG/L
Pesticide	PROPANIL,WATER, FILTERED, GLASS FIBER, 0	Propanil	UG/L
Pesticide	PROPARGITE, WATER, FILTERED, GLASS FIBER	Propargite	UG/L
Pesticide	SIMAZINE,WATER, DISSOLVED, RECOVERABLE,	Simazine	UG/L
Pesticide	TEBUTHIURON, WATER, FILTERED, GLASS FIBE	Tebuthiruron	UG/L
Pesticide	TERBACIL,WATER, FILTERED, GLASS FIBER, 0	Terbacil	UG/L
Pesticide	TERBUFOS,WATER, FILTERED, GLASS FIBER, 0	Terbufos	UG/L
Pesticide	THIOBENCARB, WATER, FILTERED, GLASS FIBE	Thiobencarb	UG/L
Pesticide	Toxaphene	Toxaphene	ug/L
Pesticide	TRIALLATE, WATER, FILTERED, GLASS FIBER,	Triallate	UG/L
Pesticide	TRIFLURALIN, WATER, FILTERED, GLASS FIBE	Trifluralin	UG/L

Table A-2.
Parameters Excluded from Evaluation in the Green River Screening-Level Risk Assessment

Category	Parameter Name (As Reported)	Standard Parameter Name	Unit	FOD	# of Detects	# of Samples	Reason for Exclusion
Biological	Chlorophyll a	Chlorophyll a	ug/L	98.2	56	57	Not a toxicant
Biological	Ecoli-present/absent	E. Coli	each	0	0	535	E. coli data expressed as col/100 mL or CFU/100 mL are being evaluated
Biological	ENTEROCOCCI, ME MF METHOD, WATER, COLONI	Enterococci	COL/100 ML	100.0	2	2	Limited data; generally a saltwater issue
Biological	Pheophytin a	Pheophytin a	ug/L	80.0	40	50	Not a toxicant
Conventionals	PHOSPHATE ORTHO DISSOLVED (MG/L AS PO4)	Orthophosphate Phosphorus	MG/L AS PO	100.0	31	31	Generally a eutrophication issue for lakes
Conventionals	Orthophosphate Phosphorus	Orthophosphate Phosphorus	mg/L	98.7	2746	2781	Generally a eutrophication issue for lakes
Conventionals	PHOSPHORUS ORTHOPHOSPHATE DISSOLVED (MG/	Orthophosphate Phosphorus	MG/L AS P	84.9	45	53	Generally a eutrophication issue for lakes
Inorganic	Beryllium, Total, ICP-MS	Beryllium, Total, ICP-MS	mg/L	0.6	6	959	Evaluating dissolved beryllium
Inorganic	Silver, Total, ICP-MS	Silver, Total, ICP-MS	mg/L	0.6	7	1143	Evaluating dissolved silver
Inorganics	Aluminum, Dissolved, ICP-MS	Aluminum, Dissolved, ICP-MS	mg/L	97.2	990	1018	Evaluating total recoverable aluminum
Inorganics	Antimony, Total, ICP-MS	Antimony, Total, ICP-MS	mg/L	26.0	264	1015	Evaluating dissolved antimony
Inorganics	Arsenic, Total, ICP-MS	Arsenic, Total, ICP-MS	mg/L	86.0	983	1143	Evaluating dissolved arsenic
Inorganics	Barium, Total, ICP-MS	Barium, Total, ICP-MS	mg/L	99.9	1042	1043	Evaluating dissolved barium
Inorganics	Cadmium, Total, ICP-MS	Cadmium, Total, ICP-MS	mg/L	21.4	245	1145	Evaluating dissolved cadmium
Inorganics	Chromium, Total, ICP-MS	Chromium, Total, ICP-MS	mg/L	79.4	909	1145	Evaluating dissolved chromium
Inorganics	Cobalt, Total, ICP-MS	Cobalt, Total, ICP-MS	mg/L	66.9	745	1113	Evaluating dissolved cobalt
Inorganics	Copper, Total, ICP-MS	Copper, Total, ICP-MS	mg/L	97.2	1113	1145	Evaluating dissolved copper
Inorganics	IRON DISSOLVED (UG/L AS FE)	Iron, Dissolved	UG/L AS FE	100.0	39	39	Evaluating total recoverable iron
Inorganics	Iron, Dissolved, ICP	Iron, Dissolved, ICP	mg/L	78.1	881	1128	Evaluating total recoverable iron
Inorganics	Lead, Total, ICP-MS	Lead, Total, ICP-MS	mg/L	74.7	855	1145	Evaluating dissolved lead
Inorganics	Manganese, Total, ICP	Manganese, Total, ICP	mg/L	100.0	679	679	Evaluating dissolved manganese
Inorganics	Manganese, Total, ICP-MS	Manganese, Total, ICP-MS	mg/L	100.0	342	342	Evaluating dissolved manganese
Inorganics	Molybdenum, Total, ICP-MS	Molybdenum, Total, ICP-MS	mg/L	42.0	462	1099	Evaluating dissolved molybdenum
Inorganics	Nickel, Total, ICP-MS	Nickel, Total, ICP-MS	mg/L	92.9	1064	1145	Evaluating dissolved nickel
Inorganics	Selenium, Dissolved, ICP-MS	Selenium, Dissolved, ICP-MS	mg/L	0.2	2	1128	Evaluating total recoverable selenium
Inorganics	Strontium, Total, ICP-MS	Strontium, Total, ICP-MS	mg/L	100.0	34	34	Evaluating dissolved strontium
Inorganics	Thallium, Total, ICP-MS	Thallium, Total, ICP-MS	mg/L	4.9	54	1102	Evaluating dissolved thallium
Inorganics	Vanadium, Total, ICP-MS	Vanadium, Total, ICP-MS	mg/L	99.9	1059	1060	Evaluating dissolved vanadium
Inorganics	Zinc, Total, ICP	Zinc, Total, ICP	mg/L	100.0	25	25	Evaluating dissolved zinc
Inorganics	Zinc, Total, ICP-MS	Zinc, Total, ICP-MS	mg/L	98.0	1098	1120	Evaluating dissolved zinc
Other	ALKALINITY, WATER, DISSOLVED, TOTAL, INC	Alkalinity	MG/L AS CA	100.0	53	53	Not a toxicant
Other	Total Alkalinity	Alkalinity	mg CaCO3/L	100.0	2151	2151	Not a toxicant
Other	Biochemical Oxygen Demand	Biochemical Oxygen Demand	mg/L	22.2	24	108	Evaluating dissolved oxygen, for which a WQS exists
Other	CHLORIDE DISSOLVED (MG/L AS CL)	Chloride, Dissolved	MG/L AS CL	100.0	53	53	Not a toxicant at ambient levels
Other	Conductivity	Conductivity	umhos/cm	100.0	1623	1623	Not a toxicant at ambient levels
Other	Conductivity, Field	Conductivity	umhos/cm	98.4	1186	1205	Not a toxicant at ambient levels
Other	Dissolved Organic Carbon	Dissolved Organic Carbon	mg/L	100.0	1016	1016	Not a toxicant
Other	Total Organic Carbon	Organic Carbon, Total	mg/L	100.0	1016	1016	Not a toxicant
Other	PHOSPHORUS DISSOLVED (MG/L AS P)	Phosphorus, Dissolved	MG/L AS P	97.4	38	39	Generally a eutrophication issue for lakes
Other	Total Phosphorus	Phosphorus, Total	mg/L	99.5	2867	2881	Generally a eutrophication issue for lakes
Other	PHOSPHORUS TOTAL (MG/L AS P)	Phosphorus, Total	MG/L AS P	98.1	52	53	Generally a eutrophication issue for lakes
Other	POTASSIUM DISSOLVED (MG/L AS K)	Potassium, Dissolved	MG/L AS K	100.0	39	39	Not a toxicant at ambient levels
Other	Potassium, Dissolved, ICP	Potassium, Dissolved, ICP	mg/L	49.1	500	1018	Not a toxicant at ambient levels
Other	Potassium, Total, ICP	Potassium, Total, ICP	mg/L	52.7	538	1021	Not a toxicant at ambient levels
Other	Salinity	Salinity	PSS	90.6	173	191	Not a toxicant at ambient levels
Other	Sample Depth	Sample Depth	m	0.7	1	147	Sample measurements were considered representative of exposure concentrations, regardless of depth
Other	Settleable Solids, Gravimetric	Settleable Solids	mg/L	78.8	26	33	Not a toxicant at ambient levels
Other	SILICA DISSOLVED (MG/L AS SIO2)	Silica, Dissolved	MG/L AS SI	100.0	39	39	Not a toxicant at ambient levels
Other	SODIUM DISSOLVED (MG/L AS NA)	Sodium, Dissolved	MG/L AS NA	100.0	39	39	Not a toxicant at ambient levels
Other	Sodium, Dissolved, ICP	Sodium, Dissolved, ICP	mg/L	100.0	1018	1018	Not a toxicant at ambient levels
Other	Sodium, Total, ICP	Sodium, Total, ICP	mg/L	100.0	1021	1021	Not a toxicant at ambient levels
Other	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (	Solids, Dissolved	MG/L	100.0	39	39	Not a toxicant at ambient levels
Other	SULFATE DISSOLVED (MG/L AS SO4)	Sulfate, Dissolved	MG/L AS SO	100.0	53	53	Not a toxicant at ambient levels
Other	Turbidity	Turbidity	NTU	97.5	2838	2912	Total suspended solids (TSS) being evaluated; provides stronger correlation with adverse effects

FOD = Frequency of Detection

Table A-3.
Parameters Never Detected in Any Sample

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	# of Samples
Inorganic	Beryllium, Dissolved, ICP-MS	Beryllium, Dissolved, ICP-MS	980
Inorganic	Silver, Dissolved, ICP-MS	Silver, Dissolved, ICP-MS	1128
Organic	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	69
Organic	1,2-Dichlorobenzene	1,2-Dichlorobenzene	108
Organic	1,3-Dichlorobenzene	1,3-Dichlorobenzene	108
Organic	1,4-Dichlorobenzene	1,4-Dichlorobenzene	108
Organic	2,4,5-Trichlorophenol	2,4,5-Trichlorophenol	69
Organic	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	108
Organic	2,4-Dichlorophenol	2,4-Dichlorophenol	108
Organic	2,4-Dimethylphenol	2,4-Dimethylphenol	69
Organic	2,4-Dinitrophenol	2,4-Dinitrophenol	69
Organic	2,4-Dinitrotoluene	2,4-Dinitrotoluene	69
Organic	2,6-Dinitrotoluene	2,6-Dinitrotoluene	69
Organic	2-Chloronaphthalene	2-Chloronaphthalene	108
Organic	2-Chlorophenol	2-Chlorophenol	69
Organic	2-Methylnaphthalene	2-Methylnaphthalene	108
Organic	2-Methylphenol	2-Methylphenol	69
Organic	2-Nitroaniline	2-Nitroaniline	69
Organic	2-Nitrophenol	2-Nitrophenol	69
Organic	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	69
Organic	3-Nitroaniline	3-Nitroaniline	69
Organic	4,6-Dinitro-O-Cresol	4,6-Dinitro-o-cresol	69
Organic	4-Bromophenyl Phenyl Ether	4-Bromophenyl phenyl ether	69
Organic	4-Chloro-3-Methylphenol	4-Chloro-3-methylphenol	69
Organic	4-Chloroaniline	4-Chloroaniline	69
Organic	4-Chlorophenyl Phenyl Ether	4-Chlorophenyl phenyl ether	69
Organic	4-Nitroaniline	4-Nitroaniline	69
Organic	4-Nitrophenol	4-Nitrophenol	69
Organic	Bis(2-Chloroethoxy)Methane	Bis(2-chloroethoxy)methane	69
Organic	Bis(2-Chloroethyl)Ether	Bis(2-chloroethyl)ether	69
Organic	Bis(2-Chloroisopropyl)Ether	Bis(2-chloroisopropyl)ether	69
Organic	Dibenzofuran	Dibenzofuran	108
Organic	Estradiol	Estradiol	53
Organic	Estrone	Estrone	53
Organic	Ethynyl estradiol	Ethynyl estradiol	53
Organic	Hexachlorobutadiene	Hexachlorobutadiene	69
Organic	Hexachloroethane	Hexachloroethane	69
Organic	Methyltestosterone	Methyltestosterone	53
Organic	Nitrobenzene	Nitrobenzene	69
Organic	N-Nitrosodimethylamine	N-Nitrosodimethylamine	69
Organic	N-Nitrosodi-N-Propylamine	N-Nitrosodi-n-propylamine	69
Organic	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine	69
Organic	Progesterone	Progesterone	53
Organic	Testosterone	Testosterone	53
Organic	Vinclozolin	Vinclozolin	53
PAH	Acenaphthylene	Acenaphthylene	108
PAH	Benzo(a)anthracene	Benzo(a)anthracene	108
PAH	Benzo(g,h,i)perylene	Benzo(g,h,i)perylene	108
PAH	Dibenzo(a,h)anthracene	Dibenzo(a,h)anthracene	108
PAH	Fluorene	Fluorene	108
PAH	Indeno(1,2,3-Cd)Pyrene	Indeno(1,2,3-cd)pyrene	108
PCB	Aroclor 1016	Aroclor 1016	109
PCB	Aroclor 1221	Aroclor 1221	109
PCB	Aroclor 1232	Aroclor 1232	109
PCB	Aroclor 1242	Aroclor 1242	109
PCB	Aroclor 1248	Aroclor 1248	109

Table A-3.
Parameters Never Detected in Any Sample

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	# of Samples
PCB	Aroclor 1254	Aroclor 1254	109
PCB	Aroclor 1260	Aroclor 1260	109
Pesticide	2,4,5-T	2,4,5-T	108
Pesticide	2,4,5-TP (Silvex)	2,4,5-TP (Silvex)	108
Pesticide	2,4-DB	2,4-DB	108
Pesticide	2,6-DIETHYLANILINE, WATER, FILTERED, GLA	2,6-Diethylaniline	46
Pesticide	4,4'-DDD	4,4'-DDD	109
Pesticide	4,4'-DDE	4,4'-DDE	109
Pesticide	P,P' DDE DISSOLVED (UG/L)	4,4'-DDE	46
Pesticide	4,4'-DDT	4,4'-DDT	109
Pesticide	ACETOCHLOR, WATER, FILTERED, RECOVERABLE	Acetochlor	46
Pesticide	ALACHLOR,WATER, DISSOLVED, RECOVERABLE,	Alachlor	46
Pesticide	Aldrin	Aldrin	109
Pesticide	BENFLURALIN, WATER, FILTERED, GLASS FIBE	Benfluralin	46
Pesticide	ALPHA BHC(UG/L)	BHC, alpha-	46
Pesticide	Alpha-BHC	BHC, alpha-	109
Pesticide	Beta-BHC	BHC, beta-	109
Pesticide	Delta-BHC	BHC, delta-	109
Pesticide	Gamma-BHC (Lindane)	BHC, gamma- (Lindane)	109
Pesticide	LINDANE, DISSOLVED (UG/L)	BHC, gamma- (Lindane)	46
Pesticide	BUTYLATE,WATER, DISSOLVED, RECOVERABLE,	Butylate	46
Pesticide	CARBOFURAN, WATER, FILTERED, GLASS FIBER	Carbofuran	46
Pesticide	Chlordane	Chlordane	70
Pesticide	Alpha-Chlordane	Chlordane, alpha-	39
Pesticide	Gamma-Chlordane	Chlordane, gamma-	39
Pesticide	Chlorpyrifos	Chlorpyrifos	108
Pesticide	CHLORPYRIFOS DISSOLVED, UG/L	Chlorpyrifos	46
Pesticide	CYANAZINE, WATER, DISSOLVED, RECOVERABLE	Cyanazine	46
Pesticide	DCPA, WATER, FILTERED, LASS FIBER, 0.7 U	Dacthal (DCPA)	46
Pesticide	Dalapon	Dalapon	108
Pesticide	DESULFINYLFIPRONIL, WATER, FILTERED, REC	Desulfinylfipronil	1
Pesticide	Diazinon	Diazinon	108
Pesticide	Dicamba	Dicamba	108
Pesticide	Dieldrin	Dieldrin	109
Pesticide	DIELDRIN,DISSOLVED (UG/L)	Dieldrin	46
Pesticide	Dinoseb	Dinoseb	108
Pesticide	Disulfoton	Disulfoton	108
Pesticide	DISULFOTON, WATER, FILTERED, GLASS FIBER	Disulfoton	46
Pesticide	Endosulfan II	Endosulfan II	109
Pesticide	Endosulfan Sulfate	Endosulfan Sulfate	109
Pesticide	Endrin	Endrin	109
Pesticide	Endrin Aldehyde	Endrin aldehyde	109
Pesticide	EPTC, WATER, FILTERED, LASS FIBER, 0.7 U	EPTC	46
Pesticide	ETHALFLURALIN, WATER, FILTERED, GLASS FI	Ethalfluralin	46
Pesticide	ETHOPROP,WATER, FILTERED, GLASS FIBER, 0	Ethoprop	46
Pesticide	FIPRONIL,WATER, FILTERED, RECOVERABLE, M	Fipronil	1
Pesticide	FIPRONIL SULFIDE, WATER, FILTERED, RECOV	Fipronil sulfide	1
Pesticide	FIPRONIL SULFONE, WATER, FILTERED, RECOV	Fipronil sulfone	1
Pesticide	FONOFOS, WATER, DISSOLVED, RECOVERABLE,	Fonofos	46
Pesticide	Heptachlor	Heptachlor	109
Pesticide	Heptachlor Epoxide	Heptachlor epoxide	109
Pesticide	Hexachlorobenzene	Hexachlorobenzene	108
Pesticide	LINURON, WATER, FILTERED, GLASS FIBER, 0	Linuron	46
Pesticide	Malathion	Malathion	108
Pesticide	MALATHION, DISSOLVED (UG/L)	Malathion	46
Pesticide	MCPA	MCPA	108

Table A-3.
Parameters Never Detected in Any Sample

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	# of Samples
Pesticide	MCPP	MCPP	108
Pesticide	Methoxychlor	Methoxychlor	109
Pesticide	METHYL AZINPHOS, WATER, FILTERED, GLASS	Methyl azinphos	46
Pesticide	METRIBUZIN, (SENCOR), WATER, DISSOLVED,	Metribuzin	46
Pesticide	MOLINATE,WATER, FILTERED, GLASS FIBER, 0	Molinate	46
Pesticide	NAPROPAMIDE, WATER, FILTERED, GLASS FIBE	Napromide	46
Pesticide	PARATHION, DISSOLVED (UG/L)	Parathion	46
Pesticide	Parathion-Ethyl	Parathion	108
Pesticide	METHYL PARATHION, WATER, FILTERED, GLASS	Parathion, methyl-	46
Pesticide	Parathion-Methyl	Parathion, methyl-	108
Pesticide	PEBULATE,WATER, FILTERED, GLASS FIBER, 0	Pebulate	46
Pesticide	PENDIMETHALIN, WATER, FILTERED, GLASS FI	Pendimethalin	46
Pesticide	PERMETHRIN, CIS, WATER, FILTERED, GLASS	Permethrin	46
Pesticide	Phorate	Phorate	108
Pesticide	PHORATE, WATER, FILTERED, GLASS FIBER, 0	Phorate	46
Pesticide	PRONAMIDE, WATER, FILTERED, GLASS FIBER,	Pronamide	46
Pesticide	PROPACHLOR, WATER, DISSOLVED, RECOVERABL	Propachlor	46
Pesticide	PROPANIL,WATER, FILTERED, GLASS FIBER, 0	Propanil	46
Pesticide	PROPARGITE, WATER, FILTERED, GLASS FIBER	Propargite	46
Pesticide	TERBACIL,WATER, FILTERED, GLASS FIBER, 0	Terbacil	46
Pesticide	TERBUFOS,WATER, FILTERED, GLASS FIBER, 0	Terbufos	46
Pesticide	THIOBENCARB, WATER, FILTERED, GLASS FIBE	Thiobencarb	46
Pesticide	Toxaphene	Toxaphene	109
Pesticide	TRIALLATE, WATER, FILTERED, GLASS FIBER,	Triallate	46
Pesticide	TRIFLURALIN, WATER, FILTERED, GLASS FIBE	Trifluralin	46

Table A-4.
Parameters Detected at Least Once

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit	FOD	# of Detects	# of Samples
Conventional	Ammonia Nitrogen	Ammonia-nitrogen	mg/L	72.5	2088	2881
Conventional	Nitrite + Nitrate Nitrogen	Nitrite + Nitrate Nitrogen	mg/L	99.7	2873	2881
Conventional	NITROGEN AMMONIA DISSOLVED (MG/L AS N)	Ammonia-nitrogen	MG/L AS N	62.3	33	53
Conventional	NITROGEN NITRATE DISSOLVED (MG/L AS N)	Nitrate-nitrogen	MG/L AS N	100.0	5	5
Conventional	NITROGEN NITRITE PLUS NITRATE DISSOLVED	Nitrite + Nitrate Nitrogen	MG/L AS N	100.0	53	53
Conventional	NITROGEN, NITRITE, DISSOLVED, MG/L AS N	Nitrite-nitrogen	MG/L AS N	35.8	19	53
Conventional	NITROGEN,AMMONIA, DISSOLVED (MG/L AS NH4	Ammonia-nitrogen	MG/L AS NH	100.0	24	24
Conventional	NITROGEN,NITRATE, DISSOLVED (MG/L AS NO3	Nitrate-nitrogen	MG/L AS NO	100.0	5	5
Conventional	NITROGEN,NITRITE, DISSOLVED (MG/L AS NO2	Nitrite-nitrogen	MG/L AS NO	100.0	5	5
Inorganic	Aluminum, Total, ICP	Aluminum, Total, ICP	mg/L	100.0	646	646
Inorganic	Aluminum, Total, ICP-MS	Aluminum, Total, ICP-MS	mg/L	100.0	375	375
Inorganic	Antimony, Dissolved, ICP-MS	Antimony, Dissolved, ICP-MS	mg/L	24.4	254	1043
Inorganic	Arsenic, Dissolved, ICP-MS	Arsenic, Dissolved, ICP-MS	mg/L	72.4	816	1127
Inorganic	Barium, Dissolved, ICP-MS	Barium, Dissolved, ICP-MS	mg/L	100.0	1060	1060
Inorganic	Cadmium, Dissolved, ICP-MS	Cadmium, Dissolved, ICP-MS	mg/L	9.9	113	1136
Inorganic	Chromium, Dissolved, ICP-MS	Chromium, Dissolved, ICP-MS	mg/L	50.6	575	1136
Inorganic	Cobalt, Dissolved, ICP-MS	Cobalt, Dissolved, ICP-MS	mg/L	34.3	377	1098
Inorganic	Copper, Dissolved, ICP-MS	Copper, Dissolved, ICP-MS	mg/L	93.0	1057	1136
Inorganic	FLUORIDE DISSOLVED (MG/L AS F)	Fluoride, Dissolved	MG/L AS F	10.3	4	39
Inorganic	Iron, Total, ICP	Iron, Total, ICP	mg/L	98.9	1118	1131
Inorganic	Lead, Dissolved, ICP-MS	Lead, Dissolved, ICP-MS	mg/L	28.0	318	1136
Inorganic	MANGANESE DISSOLVED (UG/L AS MN)	Manganese, Dissolved	UG/L AS MN	100.0	39	39
Inorganic	Manganese, Dissolved, ICP	Manganese, Dissolved, ICP	mg/L	100.0	327	327
Inorganic	Manganese, Dissolved, ICP-MS	Manganese, Dissolved, ICP-MS	mg/L	100.0	692	692
Inorganic	Mercury, Dissolved, CVAA	Mercury, Dissolved, CVAA	mg/L	9.3	78	835
Inorganic	Mercury, Dissolved, CVAF	Mercury, Dissolved, CVAF	mg/L	99.3	299	301
Inorganic	Mercury, Total, CVAA	Mercury, Total, CVAA	mg/L	39.8	335	841
Inorganic	Mercury, Total, CVAF	Mercury, Total, CVAF	mg/L	100.0	301	301
Inorganic	Molybdenum, Dissolved, ICP-MS	Molybdenum, Dissolved, ICP-MS	mg/L	39.7	436	1098
Inorganic	Nickel, Dissolved, ICP-MS	Nickel, Dissolved, ICP-MS	mg/L	87.0	988	1136
Inorganic	Selenium, Total, ICP-MS	Selenium, Total, ICP-MS	mg/L	0.1	1	1143
Inorganic	Strontium, Dissolved, ICP-MS	Strontium, Dissolved, ICP-MS	mg/L	100.0	34	34
Inorganic	Thallium, Dissolved, ICP-MS	Thallium, Dissolved, ICP-MS	mg/L	3.0	33	1086
Inorganic	Vanadium, Dissolved, ICP-MS	Vanadium, Dissolved, ICP-MS	mg/L	97.0	1042	1074
Inorganic	Zinc, Dissolved, ICP	Zinc, Dissolved, ICP	mg/L	100.0	12	12
Inorganic	Zinc, Dissolved, ICP-MS	Zinc, Dissolved, ICP-MS	mg/L	91.0	1023	1124
Organic	4-Methylphenol	4-Methylphenol	ug/L	2.9	2	69
Organic	Benzyl Butyl Phthalate	Butylbenzylphthalate	ug/L	98.1	106	108
Organic	Bis(2-ethylhexyl)adipate	Bis(2-ethylhexyl)adipate	ug/L	56.6	30	53
Organic	Bis(2-Ethylhexyl)Phthalate	Bis(2-ethylhexyl)phthalate	ug/L	100.0	108	108
Organic	Bisphenol A	Bisphenol A	ug/L	52.8	28	53
Organic	Diethyl Phthalate	Diethyl phthalate	ug/L	97.2	105	108
Organic	Dimethyl Phthalate	Dimethyl phthalate	ug/L	15.9	11	69
Organic	Di-N-Butyl Phthalate	Di-n-butyl phthalate	ug/L	99.1	107	108
Organic	Di-N-Octyl Phthalate	Di-n-octyl phthalate	ug/L	18.8	13	69
Organic	Isophorone	Isophorone	ug/L	4.3	3	69
Organic	Naphthalene	Naphthalene	ug/L	7.4	8	108
Organic	Pentachlorophenol	Pentachlorophenol	ug/L	3.7	4	108
Organic	Phenol	Phenol	ug/L	15.7	17	108
Organic	Total 4-Nonylphenol	4-Nonylphenol, total	ug/L	58.5	31	53
Other organic	Caffeine	Caffeine	ug/L	53.7	58	108
PAH	Acenaphthene	Acenaphthene	ug/L	7.4	8	108
PAH	Anthracene	Anthracene	ug/L	1.9	2	108
PAH	Benzo(a)pyrene	Benzo(a)pyrene	ug/L	5.6	6	108
PAH	Benzo(b)fluoranthene	Benzo(b)fluoranthene	ug/L	10.2	11	108
PAH	Benzo(k)fluoranthene	Benzo(k)fluoranthene	ug/L	8.3	9	108
PAH	Chrysene	Chrysene	ug/L	5.6	6	108
PAH	Fluoranthene	Fluoranthene	ug/L	25.0	27	108

Table A-4.
Parameters Detected at Least Once

Chemical Class	Parameter Name (As Reported)	Standard Parameter Name	Unit	FOD	# of Detects	# of Samples
Conventional	Ammonia Nitrogen	Ammonia-nitrogen	mg/L	72.5	2088	2881
PAH	Phenanthrene	Phenanthrene	ug/L	24.1	26	108
PAH	Pyrene	Pyrene	ug/L	23.1	25	108
Pesticide	2,4-D	2,4-D	ug/L	6.5	7	108
Pesticide	Atrazine	Atrazine	ug/L	2.6	1	39
Pesticide	ATRAZINE,WATER, DISSOLVED, RECOVERABLE,	Atrazine	UG/L	32.6	15	46
Pesticide	CARBARYL,WATER, FILTERED, GLASS FIBER, 0	Carbaryl	UG/L	10.9	5	46
Pesticide	Carbazole	Carbazole	ug/L	1.9	2	108
Pesticide	DIAZINON,DISSOLVED (UG/L)	Diazinon	UG/L	8.7	4	46
Pesticide	Dichloroprop	Dichloroprop	ug/L	0.9	1	108
Pesticide	Endosulfan I	Endosulfan I	ug/L	0.9	1	109
Pesticide	METOLACHLOR, WATER, DISSOLVED, UG/L	Metolachlor	UG/L	8.7	4	46
Pesticide	PROMETON,WATER, DISSOLVED, RECOVERABLE,	Prometon	UG/L	12.8	5	39
Pesticide	SIMAZINE,WATER, DISSOLVED, RECOVERABLE,	Simazine	UG/L	26.1	12	46
Pesticide	TEBUTHIURON, WATER, FILTERED, GLASS FIBE	Tebuthiruron	UG/L	10.9	5	46

FOD = Frequency of Detection

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Black River	0317	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	81	0.2079	0.1397	0.0120	0.5230	0.0075	0.0004	0.0217	0.0015	0.0037	0.0062	0.0098	0.0181	0	0
Black River	0317	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	81	0.2079	0.1397	0.0120	0.5230	0.1066	0.0055	0.3040	0.0224	0.0553	0.0895	0.1346	0.2461	0	0
Black River	0317	Antimony, Dissolved	µg/L	88	Acute	None	0.0	15	0.2500	0.0000	0.2500	0.2500	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0	0
Black River	0317	Antimony, Dissolved	µg/L	30	Chronic	None	0.0	15	0.2500	0.0000	0.2500	0.2500	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0	0
Black River	0317	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	15	0.6400	0.1320	0.5100	0.9800	0.0018	0.0014	0.0027	0.0014	0.0015	0.0017	0.0019	0.0024	0	0
Black River	0317	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	15	0.6400	0.1320	0.5100	0.9800	0.0034	0.0027	0.0052	0.0027	0.0028	0.0033	0.0036	0.0045	0	0
Black River	0317	Barium, Dissolved	µg/L	7250	Acute	None	100.0	15	6.2920	1.4172	4.1600	8.4000	0.0009	0.0006	0.0012	0.0006	0.0007	0.0009	0.0010	0.0011	0	0
Black River	0317	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	15	6.2920	1.4172	4.1600	8.4000	0.0043	0.0029	0.0058	0.0030	0.0034	0.0046	0.0050	0.0057	0	0
Black River	0317	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	12.5	16	0.0606	0.0291	0.0500	0.1400	0.0891	0.0497	0.1932	0.0526	0.0611	0.0728	0.1071	0.1752	0	0
Black River	0317	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	12.5	16	0.0606	0.0291	0.0500	0.1400	0.5131	0.3218	1.1163	0.3351	0.3731	0.4230	0.5581	1.0568	0	2
Black River	0317	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	56.3	16	0.3531	0.1483	0.2000	0.5900	0.0015	0.0007	0.0028	0.0007	0.0010	0.0013	0.0019	0.0024	0	0
Black River	0317	Chromium, Dissolved	µg/L	14.7	Acute	None	56.3	16	0.3531	0.1483	0.2000	0.5900	0.0240	0.0136	0.0401	0.0136	0.0136	0.0276	0.0313	0.0391	0	0
Black River	0317	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	56.3	16	0.3531	0.1483	0.2000	0.5900	0.0116	0.0052	0.0217	0.0056	0.0080	0.0103	0.0149	0.0184	0	0
Black River	0317	Chromium, Dissolved	µg/L	9.62	Chronic	None	56.3	16	0.3531	0.1483	0.2000	0.5900	0.0367	0.0208	0.0613	0.0208	0.0208	0.0421	0.0478	0.0598	0	0
Black River	0317	Cobalt, Dissolved	µg/L	660	Acute	None	26.7	15	0.1353	0.0619	0.1000	0.2700	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	0.0004	0	0
Black River	0317	Cobalt, Dissolved	µg/L	132	Chronic	None	26.7	15	0.1353	0.0619	0.1000	0.2700	0.0010	0.0008	0.0020	0.0008	0.0008	0.0008	0.0012	0.0018	0	0
Black River	0317	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	16	2.5288	0.7317	1.0000	4.0900	0.5439	0.1567	0.8792	0.3027	0.4330	0.5147	0.7047	0.8369	0	0
Black River	0317	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	16	2.5288	0.7317	1.0000	4.0900	0.7375	0.2193	1.1953	0.4206	0.6079	0.6942	0.9501	1.1066	0	3
Black River	0317	Iron, Total	µg/L		Acute	None	100.0	16	4058.7500	2229.5586	1110	10000	-	-	-	-	-	-	-	-	0	0
Black River	0317	Iron, Total	µg/L	1000	Chronic	None	100.0	16	4058.7500	2229.5586	1110	10000	4.0588	1.1100	10.0000	1.2000	2.1700	4.0200	5.1850	7.1950	0	16
Black River	0317	Lead, Dissolved	µg/L		Acute	hardness-dependent	87.5	16	0.3225	0.1336	0.1000	0.5500	0.0182	0.0037	0.0480	0.0037	0.0120	0.0178	0.0189	0.0359	0	0
Black River	0317	Lead, Dissolved	µg/L		Chronic	hardness-dependent	87.5	16	0.3225	0.1336	0.1000	0.5500	0.4659	0.0948	1.2325	0.0951	0.3087	0.4572	0.4860	0.9217	0	1
Black River	0317	Mercury, Total	µg/L	2.1	Acute	None	0.0	16	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Black River	0317	Mercury, Total	µg/L	1.302	Chronic	None	0.0	16	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Black River	0317	Molybdenum, Dissolved	µg/L	35000	Acute	None	86.7	15	0.9993	0.7740	0.2500	3.5400	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	0317	Molybdenum, Dissolved	µg/L	2250	Chronic	None	86.7	15	0.9993	0.7740	0.2500	3.5400	0.0004	0.0001	0.0016	0.0001	0.0003	0.0004	0.0005	0.0009	0	0
Black River	0317	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	16	0.9288	0.2060	0.6500	1.3000	0.0050	0.0029	0.0071	0.0037	0.0044	0.0051	0.0057	0.0063	0	0
Black River	0317	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	16	0.9288	0.2060	0.6500	1.3000	0.0450	0.0263	0.0637	0.0331	0.0393	0.0458	0.0511	0.0571	0	0
Black River	0317	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	81	473.4568	137.0320	206.0000	786.0000	0.0006	0.0002	0.0009	0.0003	0.0005	0.0005	0.0007	0.0009	0	0
Black River	0317	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	81	473.4568	137.0320	206.0000	786.0000	0.0576	0.0250	0.0956	0.0317	0.0475	0.0550	0.0691	0.0860	0	0
Black River	0317	Selenium, Total	µg/L	20	Acute	None	0.0	16	0.7500	0.0000	0.7500	0.7500	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Black River	0317	Selenium, Total	µg/L	5	Chronic	None	0.0	16	0.7500	0.0000	0.7500	0.7500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Black River	0317	TSS	mg/L	244	Acute	None	100.0	81	14.1191	15.3893	2.5000	85.2000	0.0579	0.0102	0.3492	0.0172	0.0242	0.0336	0.0508	0.1893	0	0
Black River	0317	TSS	mg/L	22	Chronic	None	100.0	81	14.1191	15.3893	2.5000	85.2000	0.6418	0.1136	3.8727	0.1909	0.2682	0.3727	0.5636	2.1000	0	14
Black River	0317	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	15	0.4700	0.1343	0.3200	0.7500	0.0006	0.0004	0.0010	0.0005	0.0005	0.0006	0.0007	0.0010	0	0
Black River	0317	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	15	0.4700	0.1343	0.3200	0.7500	0.0012	0.0008	0.0019	0.0008	0.0009	0.0012	0.0013	0.0018	0	0
Black River	0317	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	16	14.6625	4.5374	1.1000	21.0000	0.3200	0.0183	0.4365	0.2143	0.3028	0.3279	0.3552	0.4229	0	0
Black River	0317	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	16	14.6625	4.5374	1.1000	21.0000	0.3174	0.0182	0.4329	0.2125	0.3003	0.3253	0.3523	0.4195	0	0
Black River	A317	2,4-D	µg/L	700	Acute	None	14.3	14	0.0441	0.0992	0.0080	0.3780	0.0001	0.0000	0.0005	0.0000	0.0000	0.0000	0.0000	0.0003	0	0
Black River	A317	2,4-D	µg/L	50	Chronic	None	14.3	14	0.0441	0.0992	0.0080	0.3780	0.0009	0.0002	0.0076	0.0002	0.0002	0.0002	0.0004	0.0040	0	0
Black River	A317	4-Methylphenol	µg/L	700	Acute	None	0.0	8	0.1294	0.0050	0.1250	0.1400	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Black River	A317	4-Methylphenol	µg/L	140	Chronic	None	0.0	8	0.1294	0.0050	0.1250	0.1400	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010	0	0
Black River	A317	Acenaphthene	µg/L	30	Acute	None	53.8	13	0.0137	0.0078	0.0050	0.0250	0.0005	0.0002	0.0008	0.0002	0.0002	0.0005	0.0007	0.0008	0	0
Black River	A317	Acenaphthene	µg/L	6	Chronic	None	53.8	13	0.0137	0.0078	0.0050	0.0250	0.0023	0.0008	0.0042	0.0008	0.0009	0.0023	0.0033	0.0040	0	0
Black River	A317	Aluminum, Total	µg/L	750	Acute	None	100.0	59	661.1898	753.8494	16.1000	3610.0000	0.8816	0.0215	4.8133	0.0473	0.1387	0.5600	1.3800	2.7667	0	20
Black River	A317	Aluminum, Total	µg/L	87	Chronic	None	100.0	59	661.1898	753.8494	16.1000	3610.0000	7.5999	0.1851	41.4943	0.4078	1.1954	4.8276	11.8966	23.8506	0	46
Black River	A317	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	64.0	50	0.0898	0.1170	0.0050	0.4220	0.0037	0.0002	0.0174	0.0002	0.0002	0.0020	0.0035	0.0141	0	0
Black River	A317	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	64.0	50	0.0898	0.1170	0.0050	0.4220	0.0436	0.0023	0.2329	0.0023	0.0024	0.0236	0.0459	0.1587	0	0
Black River	A317	Anthracene	µg/L	0.635	Acute	None	0.0	13	0.0066	0.0055	0.0048	0.0250	0.0104	0.0075	0.0394	0.0075	0.0076	0.0079	0.0087	0.0209	0	0
Black River	A317	Anthracene	µg/L	0.127	Chronic	None	0.0	13	0.0066	0.0055	0.0048	0.0250	0.0522	0.0374	0.1969	0.0376	0.0382	0.0394	0.0433	0.1047	0	0
Black River	A317	Antimony, Dissolved	µg/L	88	Acute	None	20.7	58	0.2475	0.0705	0.0919	0.5100	0.0028	0.0010	0.0058	0.0012	0.0028	0.0028	0.0028	0.0032	0	0
Black River	A317	Antimony, Dissolved	µg/L	30	Chronic	None	20.7	58	0.2475	0.0705	0.0919	0.5100	0.0082	0.0031	0.0170	0.0035	0.0083	0.0083	0.0083	0.0095	0	0
Black River	A317	Arsenic, Dissolved	µg/L	360	Acute	None	89.8	59	0.6625	0.1944	0.2500	1.1000	0.0018	0.0007	0.0031	0.0007	0.0016	0.0019	0.0022	0.0026	0	0
Black River	A317	Arsenic, Dissolved	µg/L	190	Chronic	None	89.8	59	0.6625	0.1944	0.2500	1.1000	0.0035	0.0013	0.0058	0.0013	0.0031	0.0035	0.0041	0.0050	0	0
Black River	A317	Barium, Dissolved	µg/L	7250	Acute	None	100.0	56	7.9536	1.9418	4.6600	11.8000	0.0011	0.0006	0.0016	0.0008	0.0009	0.0010	0.0013	0.0015	0	0
Black River	A317	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	56	7.9536	1.9418	4.6600	11.8000	0.0055	0.0032	0.0081	0.0038	0.0045	0.0051	0.0067	0.0077	0	0
Black River	A317	Benzo(a)pyrene	µg/L	0.75	Acute	None	7.7	13	0.0070	0.0056	0.0048	0.0250	0.0094	0.0063	0.0333	0.0064	0.0065	0.0067	0.0073	0.0213	0	0
Black River	A317	Benzo(a)pyrene	µg/L	0.15	Chronic	None	7.7	13	0.0070	0.0056	0.0048	0.0250	0.0468	0.0317	0.1667	0.0319	0.0323	0.0333	0.0367	0.1067	0	0
Black River	A317	Benzo(b)fluoranthene	µg/L	512	Acute	None	15.4	13	0.0092	0.0081	0.0048	0.0273	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	A317	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	15.4	13	0.0092	0.0081	0.0048	0.0273	0.0001	0.0000	0.0003	0.0000	0.0000	0.0001	0.0001	0.0003	0	0
Black River	A317	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	7.7	13	0.0072	0.0057	0.0048	0.0250	0.0102	0.0068	0.0357	0.0068	0.0069	0.0071	0.0079	0.0246	0	0
Black River	A317	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	7.7	13	0.0072	0.0057	0.0048	0.0250	0.0512	0.0339	0.1786	0.0341	0.0346	0.0357	0.0393	0.1229	0	0
Black River	A317	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	13	1.4669	1.3936	0.3470	5.8000	0.0037	0.0009	0.0145	0.0011	0.0020	0.0030	0.0037	0.0090	0	0
Black River	A317	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	13	1.4669	1.3936	0.3470	5.8000	0.0041	0.0010	0.0161	0.0012	0.0023	0.0034	0.0041	0.0100	0	0
Black River	A317	Butylbenzylphthalate	µg/L	390	Acute	None	100.0	13	0.0731	0.0378	0.0348	0.1430	0.0002	0.0001	0.0004	0.0001	0.0001	0.0002	0.0002	0.0004	0	0
Black River	A317	Butylbenzylphthalate	µg/L	60	Chronic	None	100.0	13	0.0731	0.0378	0.0348	0.1430	0.0012	0.0006	0.0024	0.0006	0.0008	0.0011	0.0013	0.0023	0	0
Black River	A317	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	15.3	59	0.0453	0.0116	0.0050	0.0534	0.0569	0.0020	0.1251	0.0069	0.0250	0.0619	0.0812	0.1003	0	0
Black River	A317	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	15.3	59	0.0453	0.0116	0.0050	0.0534	0.3366	0.0170	0.6240	0.0552	0.1906	0.3768	0.4578	0.5331	0	0
Black River	A317	Caffeine	µg/L	95000	Acute	None	92.3	13	0.2121	0.3961	0.0120	1.4100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Caffeine	µg/L	19000	Chronic	None	92.3	13	0.2121	0.3961	0.0120	1.4100	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Carbazole	µg/L	465	Acute	None	0.0	13	0.0167	0.0145	0.0120	0.0650	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Black River	A317	Carbazole	µg/L	93	Chronic	None	0.0	13	0.0167	0.0145	0.0120	0.0650	0.0002	0.0001	0.0007	0.0001	0.0001	0.0001	0.0001	0.0004	0	0
Black River	A317	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	71.2	59	0.3893	0.2438	0.0970	1.8000	0.0016	0.0001	0.0106	0.0002	0.0004	0.0016	0.0023	0.0030	0	0
Black River	A317	Chromium, Dissolved	µg/L	14.7	Acute	None	71.2	59	0.3893	0.2438	0.0970	1.8000	0.0265	0.0066	0.1224	0.0101	0.0136	0.0279	0.0344	0.0417	0	0
Black River	A317	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	71.2	59	0.3893	0.2438	0.0970	1.8000	0.0123	0.0011	0.0812	0.0019	0.0032	0.0124	0.0175	0.0233	0	0
Black River	A317	Chromium, Dissolved	µg/L	9.62	Chronic	None	71.2	59	0.3893	0.2438	0.0970	1.8000	0.0405	0.0101	0.1871	0.0155	0.0208	0.0426	0.0525	0.0637	0	0
Black River	A317	Chrysene	µg/L	0.35	Acute	None	15.4	13	0.0192	0.0151	0.0120	0.0650	0.0549	0.0343	0.1857	0.0343	0.0343	0.0371	0.0400	0.1257	0	0
Black River	A317	Chrysene	µg/L	0.07	Chronic	None	15.4	13	0.0192	0.0151	0.0120	0.0650	0.2747	0.1714	0.9286	0.1714	0.1714	0.1857	0.2000	0.6286	0	0
Black River	A317	Cobalt, Dissolved	µg/L	660	Acute	None	39.0	59	0.1997	0.2432	0.0772	1.7300	0.0003	0.0001	0.0026	0.0002	0.0002	0.0002	0.0003	0.0007	0	0
Black River	A317	Cobalt, Dissolved	µg/L	132	Chronic	None	39.0	59	0.1997	0.2432	0.0772	1.7300	0.0015	0.0006	0.0131	0.0008	0.0008	0.0008	0.0017	0.0033	0	0
Black River	A317	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	59	2.2379	0.8778	0.4600	3.7200	0.4421	0.0293	0.9593	0.0385	0.1122	0.5089	0.6505	0.8349	0	0
Black River	A317	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	59	2.2379	0.8778	0.4600	3.7200	0.6019	0.0446	1.2701	0.0587	0.1675	0.6880	0.8792	1.1246	0	5
Black River	A317	Diazinon	µg/L	0.0963	Acute	None	0.0	13	0.0234	0.0055	0.0205	0.0415	0.2432	0.2129	0.4309	0.2129	0.2233	0.2285	0.2336	0.3250	0	0
Black River	A317	Dichloroprop	µg/L	250	Acute	None	0.0	14	0.0109	0.0031	0.0055	0.0160	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Black River	A317	Dichloroprop	µg/L	50	Chronic	None	0.0	14	0.0109	0.0031	0.0055	0.0160	0.0002	0.0001	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0	0
Black River	A317	Diethyl Phthalate	µg/L	6000	Acute	None	92.3	13	0.0633	0.0623	0.0180	0.2360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Diethyl Phthalate	µg/L	1200	Chronic	None	92.3	13	0.0633	0.0623	0.0180	0.2360	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Black River	A317	Dimethyl Phthalate	µg/L	14500	Acute	None	12.5	8	0.0092	0.0076	0.0050	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Dimethyl Phthalate	µg/L	2900	Chronic	None	12.5	8	0.0092	0.0076	0.0050	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Di-N-Butyl Phthalate	µg/L	240	Acute	None	92.3	13	0.1064	0.0762	0.0055	0.3000	0.0004	0.0000	0.0013	0.0001	0.0002	0.0003	0.0005	0.0010	0	0
Black River	A317	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	92.3	13	0.1064	0.0762	0.0055	0.3000	0.0022	0.0001	0.0063	0.0006	0.0012	0.0017	0.0027	0.0048	0	0
Black River	A317	Di-N-Octyl Phthalate	µg/L	60	Acute	None	25.0	8	0.0192	0.0262	0.0050	0.0698	0.0003	0.0001	0.0012	0.0001	0.0001	0.0001	0.0003	0.0011	0	0
Black River	A317	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	25.0	8	0.0192	0.0262	0.0050	0.0698	0.0016	0.0004	0.0058	0.0004	0.0004	0.0005	0.0014	0.0053	0	0
Black River	A317	Endosulfan	µg/L	0.22	Acute	None	0.0	14	0.0025	0.0001	0.0024	0.0027	0.0114	0.0107	0.0120	0.0108	0.0111	0.0114	0.0116	0.0120	0	0
Black River	A317	Endosulfan	µg/L	0.056	Chronic	None	0.0	14	0.0025	0.0001	0.0024	0.0027	0.0446	0.0420	0.0473	0.0425	0.0438	0.0446	0.0455	0.0473	0	0
Black River	A317	Fluoranthene	µg/L	18	Acute	None	38.5	13	0.0129	0.0117	0.0048	0.0422	0.0007	0.0003	0.0023	0.0003	0.0003	0.0003	0.0009	0.0018	0	0
Black River	A317	Fluoranthene	µg/L	3.55	Chronic	None	38.5	13	0.0129	0.0117	0.0048	0.0422	0.0036	0.0013	0.0119	0.0013	0.0014	0.0015	0.0048	0.0093	0	0
Black River	A317	Iron, Total	µg/L		Acute	None	100.0	59	3374.6949	2696.1613	987.0000	18800.0000	-	-	-	-	-	-	-	-	0	0
Black River	A317	Iron, Total	µg/L	1000	Chronic	None	100.0	59	3374.6949	2696.1613	987.0000	18800.0000	3.3747	0.9870	18.8000	1.2160	1.8500	2.9600	3.8950	6.4330	0	58
Black River	A317	Isophorone	µg/L	60000	Acute	None	12.5	8	0.0094	0.0079	0.0050	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Isophorone	µg/L	12000	Chronic	None	12.5	8	0.0094	0.0079	0.0050	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A317	Lead, Dissolved	µg/L		Acute	hardness-dependent	50.8	59	0.1705	0.1015	0.0125	0.4400	0.0085	0.0002	0.0287	0.0002	0.0016	0.0066	0.0137	0.0214	0	0
Black River	A317	Lead, Dissolved	µg/L		Chronic	hardness-dependent	50.8	59	0.1705	0.1015	0.0125	0.4400	0.2174	0.0040	0.7355	0.0046	0.0410	0.1695	0.3509	0.5495	0	0
Black River	A317	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	59	151.1410	170.6939	1.9700	550.0000	0.0643	0.0008	0.2340	0.0046	0.0131	0.0263	0.1049	0.2052	0	0
Black River	A317	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	59	151.1410	170.6939	1.9700	550.0000	0.3216	0.0042	1.1702	0.0231	0.0654	0.1315	0.5245	1.0260	0	5
Black River	A317	Mercury, Total	µg/L	2.1	Acute	None	57.6	59	0.0053	0.0038	0.0006	0.0171	0.0025	0.0003	0.0081	0.0008	0.0012	0.0012	0.0040	0.0057	0	0
Black River	A317	Mercury, Total	µg/L	1.302	Chronic	None	57.6	59	0.0053	0.0038	0.0006	0.0171	0.0041	0.0004	0.0131	0.0013	0.0019	0.0019	0.0064	0.0092	0	0
Black River	A317	Molybdenum, Dissolved	µg/L	35000	Acute	None	98.3	59	1.4854	0.8868	0.2500	5.1500	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	A317	Molybdenum, Dissolved	µg/L	2250	Chronic	None	98.3	59	1.4854	0.8868	0.2500	5.1500	0.0007	0.0001	0.0023	0.0003	0.0004	0.0006	0.0008	0.0014	0	0
Black River	A317	Naphthalene	µg/L	500	Acute	None	23.1	13	0.0199	0.0148	0.0120	0.0650	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Black River	A317	Naphthalene	µg/L	100	Chronic	None	23.1	13	0.0199	0.0148	0.0120	0.0650	0.0002	0.0001	0.0007	0.0001	0.0001	0.0001	0.0003	0.0004	0	0
Black River	A317	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	59	1.0542	0.2831	0.6400	1.7100	0.0044	0.0015	0.0086	0.0017	0.0034	0.0045	0.0053	0.0073	0	0
Black River	A317	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	59	1.0542	0.2831	0.6400	1.7100	0.0400	0.0133	0.0772	0.0157	0.0308	0.0407	0.0480	0.0659	0	0
Black River	A317	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	50	384.2800	121.3617	119.0000	755.0000	0.0005	0.0001	0.0009	0.0002	0.0004	0.0005	0.0006	0.0007	0	0
Black River	A317	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	50	384.2800	121.3617	119.0000	755.0000	0.0467	0.0145	0.0918	0.0204	0.0386	0.0471	0.0565	0.0673	0	0
Black River	A317	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	23.1	13	0.2612	0.2006	0.0650	0.5500	0.0328	0.0061	0.0697	0.0065	0.0082	0.0242	0.0556	0.0678	0	0
Black River	A317	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	23.1	13	0.2612	0.2006	0.0650	0.5500	0.0428	0.0079	0.0909	0.0084	0.0107	0.0316	0.0725	0.0884	0	0
Black River	A317	Phenanthrene	µg/L	29.82	Acute	None	38.5	13	0.0110	0.0075	0.0048	0.0250	0.0004	0.0002	0.0008	0.0002	0.0002	0.0002	0.0006	0.0008	0	0
Black River	A317	Phenanthrene	µg/L	6.325	Chronic	None	38.5	13	0.0110	0.0075	0.0048	0.0250	0.0017	0.0008	0.0040	0.0008	0.0008	0.0009	0.0028	0.0036	0	0
Black River	A317	Phenol	µg/L	22.5	Acute	None	15.4	13	0.1646	0.1751	0.0500	0.6700	0.0073	0.0022	0.0298	0.0022	0.0022	0.0024	0.0107	0.0184	0	0
Black River	A317	Phenol	µg/L	4.5	Chronic	None	15.4	13	0.1646	0.1751	0.0500	0.6700	0.0366	0.0111	0.1489	0.0111	0.0111	0.0122	0.0533	0.0922	0	0
Black River	A317	Pyrene	µg/L	45.45	Acute	None	38.5	13	0.0136	0.0109	0.0048	0.0344	0.0003	0.0001	0.0008	0.0001	0.0001	0.0001	0.0006	0.0007	0	0
Black River	A317	Pyrene	µg/L	9.09	Chronic	None	38.5	13	0.0136	0.0109	0.0048	0.0344	0.0015	0.0005	0.0038	0.0005	0.0005	0.0006	0.0028	0.0033	0	0
Black River	A317	Selenium, Total	µg/L	20	Acute	None	0.0	59	0.6568	0.1964	0.2500	0.7500	0.0328	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Black River	A317	Selenium, Total	µg/L	5	Chronic	None	0.0	59	0.6568	0.1964	0.2500	0.7500	0.1314	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Black River	A317	Strontium, Dissolved	µg/L	80	Acute	None	100.0	2	150.0000	5.6569	146.0000	154.0000	1.8750	1.8250	1.9250	1.8300	1.8500	1.8750	1.9000	1.9200	0	2
Black River	A317	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	2	150.0000	5.6569	146.0000	154.0000	3.0612	2.9796	3.1429	2.9878	3.0204	3.0612	3.1020	3.1347	0	2
Black River	A317	TSS	mg/L	244	Acute	None	100.0	50	25.0990	24.4516	2.8000	118.0000	0.1029	0.0115	0.4836	0.0241	0.0355	0.0633	0.1306	0.3090	0	0
Black River	A317	TSS	mg/L	22	Chronic	None	100.0	50	25.0990	24.4516	2.8000	118.0000	1.1409	0.1273	5.3636	0.2668	0.3932	0.7023	1.4489	3.4275	0	21
Black River	A317	Vanadium, Dissolved	µg/L	725	Acute	None	89.7	58	0.4405	0.1937	0.1500	1.1000	0.0006	0.0002	0.0015	0.0002	0.0005	0.0006	0.0007	0.0011	0	0
Black River	A317	Vanadium, Dissolved	µg/L	400	Chronic	None	89.7	58	0.4405	0.1937	0.1500	1.1000	0.0011	0.0004	0.0028	0.0004	0.0009	0.0011	0.0013	0.0021	0	0
Black River	A317	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	59	10.5820	5.2883	0.9300	22.4000	0.2159	0.0065	0.5290	0.0109	0.0841	0.2200	0.3214	0.4977	0	0
Black River	A317	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	59	10.5820	5.2883	0.9300	22.4000	0.2141	0.0064	0.5247	0.0108	0.0835	0.2182	0.3188	0.4936	0	0
Black River	A326	Aluminum, Total	µg/L	750	Acute	None	100.0	52	930.3788	3094.2313	23.7000	22000.0000	1.2405	0.0316	29.3333	0.0486	0.0889	0.1773	0.9630	3.9987	0	12
Black River	A326	Aluminum, Total	µg/L	87	Chronic	None	100.0	52	930.3788	3094.2313	23.7000	22000.0000	10.6940	0.2724	252.8736	0.4191	0.7661	1.5287	8.3017	34.4713	0	38
Black River	A326	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	68.1	47	0.0233	0.0223	0.0050	0.0943	0.0013	0.0002	0.0049	0.0002	0.0005	0.0008	0.0015	0.0041	0	0
Black River	A326	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	68.1	47	0.0233	0.0223	0.0050	0.0943	0.0110	0.0023	0.0434	0.0024	0.0032	0.0067	0.0146	0.0342	0	0
Black River	A326	Antimony, Dissolved	µg/L	88	Acute	None	51.1	45	0.2788	0.0964	0.1520	0.5200	0.0032	0.0017	0.0059	0.0020	0.0028	0.0028	0.0028	0.0055	0	0
Black River	A326	Antimony, Dissolved	µg/L	30	Chronic	None	51.1	45	0.2788	0.0964	0.1520	0.5200	0.0093	0.0051	0.0173	0.0059	0.0082	0.0083	0.0083	0.0161	0	0
Black River	A326	Arsenic, Dissolved	µg/L	360	Acute	None	98.1	52	0.8899	0.2166	0.2500	1.2000	0.0025	0.0007	0.0033	0.0015	0.0021	0.0026	0.0031	0.0033	0	0
Black River	A326	Arsenic, Dissolved	µg/L	190	Chronic	None	98.1	52	0.8899	0.2166	0.2500	1.2000	0.0047	0.0013	0.0063	0.0029	0.0039	0.0049	0.0058	0.0063	0	0
Black River	A326	Barium, Dissolved	µg/L	7250	Acute	None	100.0	48	11.3883	3.1211	5.0700	17.2000	0.0016	0.0007	0.0024	0.0008	0.0013	0.0016	0.0018	0.0023	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Black River	A326	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	48	11.3883	3.1211	5.0700	17.2000	0.0079	0.0035	0.0119	0.0038	0.0064	0.0080	0.0092	0.0113	0	0
Black River	A326	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	34.6	52	0.0318	0.0195	0.0050	0.0500	0.0287	0.0019	0.1013	0.0038	0.0083	0.0205	0.0430	0.0691	0	0
Black River	A326	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	34.6	52	0.0318	0.0195	0.0050	0.0500	0.1863	0.0162	0.5362	0.0267	0.0605	0.1617	0.2899	0.4074	0	0
Black River	A326	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	84.6	52	0.5111	0.3716	0.1800	1.9000	0.0015	0.0003	0.0050	0.0003	0.0005	0.0014	0.0021	0.0034	0	0
Black River	A326	Chromium, Dissolved	µg/L	14.7	Acute	None	84.6	52	0.5111	0.3716	0.1800	1.9000	0.0348	0.0122	0.1293	0.0122	0.0141	0.0328	0.0429	0.0793	0	0
Black River	A326	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	84.6	52	0.5111	0.3716	0.1800	1.9000	0.0115	0.0021	0.0387	0.0021	0.0040	0.0109	0.0165	0.0262	0	0
Black River	A326	Chromium, Dissolved	µg/L	9.62	Chronic	None	84.6	52	0.5111	0.3716	0.1800	1.9000	0.0531	0.0187	0.1975	0.0187	0.0216	0.0501	0.0655	0.1212	0	0
Black River	A326	Cobalt, Dissolved	µg/L	660	Acute	None	50.0	52	0.0910	0.0268	0.0575	0.2300	0.0001	0.0001	0.0003	0.0001	0.0001	0.0002	0.0002	0.0002	0	0
Black River	A326	Cobalt, Dissolved	µg/L	132	Chronic	None	50.0	52	0.0910	0.0268	0.0575	0.2300	0.0007	0.0004	0.0017	0.0005	0.0006	0.0008	0.0008	0.0008	0	0
Black River	A326	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	52	1.7260	0.5536	0.7690	2.9600	0.2343	0.0482	0.6613	0.0604	0.1385	0.2166	0.3127	0.4660	0	0
Black River	A326	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	52	1.7260	0.5536	0.7690	2.9600	0.3300	0.0735	0.8743	0.0922	0.2027	0.3132	0.4390	0.6454	0	0
Black River	A326	Iron, Total	µg/L		Acute	None	100.0	52	1126.1154	3469.9526	75.0000	24800.0000	-	-	-	-	-	-	-	-	0	0
Black River	A326	Iron, Total	µg/L	1000	Chronic	None	100.0	52	1126.1154	3469.9526	75.0000	24800.0000	1.1261	0.0750	24.8000	0.1100	0.1775	0.3115	0.8225	3.1405	0	10
Black River	A326	Lead, Dissolved	µg/L		Acute	hardness-dependent	71.2	52	0.2105	0.1219	0.0125	0.4590	0.0070	0.0001	0.0224	0.0005	0.0017	0.0077	0.0102	0.0161	0	0
Black River	A326	Lead, Dissolved	µg/L		Chronic	hardness-dependent	71.2	52	0.2105	0.1219	0.0125	0.4590	0.1798	0.0037	0.5742	0.0137	0.0438	0.1967	0.2616	0.4133	0	0
Black River	A326	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	52	8.7137	3.2185	2.3700	22.1000	0.0037	0.0010	0.0094	0.0019	0.0027	0.0036	0.0045	0.0057	0	0
Black River	A326	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	52	8.7137	3.2185	2.3700	22.1000	0.0185	0.0050	0.0470	0.0094	0.0135	0.0182	0.0226	0.0284	0	0
Black River	A326	Mercury, Total	µg/L	2.1	Acute	None	65.3	49	0.0063	0.0108	0.0009	0.0710	0.0030	0.0004	0.0338	0.0005	0.0012	0.0012	0.0030	0.0107	0	0
Black River	A326	Mercury, Total	µg/L	1.302	Chronic	None	65.3	49	0.0063	0.0108	0.0009	0.0710	0.0048	0.0007	0.0545	0.0009	0.0019	0.0019	0.0048	0.0173	0	0
Black River	A326	Molybdenum, Dissolved	µg/L	35000	Acute	None	71.2	52	0.4766	0.3259	0.1170	1.4000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	A326	Molybdenum, Dissolved	µg/L	2250	Chronic	None	71.2	52	0.4766	0.3259	0.1170	1.4000	0.0002	0.0001	0.0006	0.0001	0.0001	0.0002	0.0003	0.0005	0	0
Black River	A326	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	52	1.2091	0.3069	0.7190	2.2800	0.0038	0.0020	0.0059	0.0026	0.0031	0.0040	0.0046	0.0053	0	0
Black River	A326	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	52	1.2091	0.3069	0.7190	2.2800	0.0346	0.0176	0.0528	0.0230	0.0278	0.0356	0.0410	0.0481	0	0
Black River	A326	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	47	434.6383	168.2796	205.0000	955.0000	0.0005	0.0002	0.0012	0.0003	0.0004	0.0004	0.0007	0.0009	0	0
Black River	A326	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	47	434.6383	168.2796	205.0000	955.0000	0.0528	0.0249	0.1161	0.0292	0.0389	0.0452	0.0660	0.0883	0	0
Black River	A326	Selenium, Total	µg/L	20	Acute	None	1.9	52	0.5208	0.2534	0.2500	0.8300	0.0260	0.0125	0.0415	0.0125	0.0125	0.0375	0.0375	0.0375	0	0
Black River	A326	Selenium, Total	µg/L	5	Chronic	None	1.9	52	0.5208	0.2534	0.2500	0.8300	0.1042	0.0500	0.1660	0.0500	0.0500	0.1500	0.1500	0.1500	0	0
Black River	A326	Strontium, Dissolved	µg/L	80	Acute	None	100.0	1	179.0000	-	179.0000	179.0000	2.2375	2.2375	2.2375	2.2375	2.2375	2.2375	2.2375	2.2375	0	1
Black River	A326	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	1	179.0000	-	179.0000	179.0000	3.6531	3.6531	3.6531	3.6531	3.6531	3.6531	3.6531	3.6531	0	1
Black River	A326	TSS	mg/L	244	Acute	None	97.8	45	26.0098	105.3059	0.2500	698.0000	0.1066	0.0010	2.8607	0.0036	0.0073	0.0127	0.0422	0.2092	0	1
Black River	A326	TSS	mg/L	22	Chronic	None	97.8	45	26.0098	105.3059	0.2500	698.0000	1.1823	0.0114	31.7273	0.0402	0.0814	0.1405	0.4682	2.3200	0	6
Black River	A326	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	51	0.9492	0.3912	0.3880	2.3800	0.0013	0.0005	0.0033	0.0007	0.0009	0.0011	0.0016	0.0021	0	0
Black River	A326	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	51	0.9492	0.3912	0.3880	2.3800	0.0024	0.0010	0.0060	0.0012	0.0017	0.0021	0.0029	0.0039	0	0
Black River	A326	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	52	4.8660	2.7121	1.9000	14.6000	0.0749	0.0128	0.2598	0.0166	0.0283	0.0465	0.0978	0.2123	0	0
Black River	A326	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	52	4.8660	2.7121	1.9000	14.6000	0.0743	0.0127	0.2577	0.0165	0.0280	0.0461	0.0970	0.2106	0	0
Black River	B317	Aluminum, Total	µg/L	750	Acute	None	100.0	38	665.8053	716.1564	32.6000	2550.0000	0.8877	0.0435	3.4000	0.0618	0.1470	0.5753	1.1397	2.8407	0	13
Black River	B317	Aluminum, Total	µg/L	87	Chronic	None	100.0	38	665.8053	716.1564	32.6000	2550.0000	7.6529	0.3747	29.3103	0.5326	1.2672	4.9598	9.8247	24.4885	0	30
Black River	B317	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	93.3	30	0.1624	0.1448	0.0050	0.5150	0.0067	0.0002	0.0212	0.0003	0.0024	0.0046	0.0110	0.0172	0	0
Black River	B317	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	93.3	30	0.1624	0.1448	0.0050	0.5150	0.0800	0.0024	0.2885	0.0035	0.0267	0.0524	0.1222	0.2000	0	0
Black River	B317	Antimony, Dissolved	µg/L	88	Acute	None	52.8	36	0.4164	0.3128	0.1310	1.3000	0.0047	0.0015	0.0148	0.0017	0.0028	0.0028	0.0066	0.0126	0	0
Black River	B317	Antimony, Dissolved	µg/L	30	Chronic	None	52.8	36	0.4164	0.3128	0.1310	1.3000	0.0139	0.0044	0.0433	0.0050	0.0083	0.0083	0.0193	0.0371	0	0
Black River	B317	Arsenic, Dissolved	µg/L	360	Acute	None	92.1	38	0.7213	0.2303	0.2500	1.1000	0.0020	0.0007	0.0031	0.0007	0.0016	0.0021	0.0025	0.0028	0	0
Black River	B317	Arsenic, Dissolved	µg/L	190	Chronic	None	92.1	38	0.7213	0.2303	0.2500	1.1000	0.0038	0.0013	0.0058	0.0013	0.0029	0.0039	0.0048	0.0053	0	0
Black River	B317	Barium, Dissolved	µg/L	7250	Acute	None	100.0	35	9.7866	1.8080	6.2900	13.3000	0.0013	0.0009	0.0018	0.0009	0.0012	0.0013	0.0015	0.0017	0	0
Black River	B317	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	35	9.7866	1.8080	6.2900	13.3000	0.0067	0.0043	0.0092	0.0046	0.0060	0.0066	0.0077	0.0084	0	0
Black River	B317	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	36.8	38	0.0504	0.0289	0.0050	0.1600	0.0712	0.0028	0.2840	0.0064	0.0264	0.0568	0.1001	0.1569	0	0
Black River	B317	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	36.8	38	0.0504	0.0289	0.0050	0.1600	0.4062	0.0211	1.4039	0.0486	0.2043	0.3367	0.5319	0.9507	0	2
Black River	B317	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	68.4	38	0.3682	0.2237	0.1000	1.0000	0.0016	0.0002	0.0040	0.0003	0.0004	0.0014	0.0024	0.0039	0	0
Black River	B317	Chromium, Dissolved	µg/L	14.7	Acute	None	68.4	38	0.3682	0.2237	0.1000	1.0000	0.0250	0.0068	0.0680	0.0087	0.0136	0.0230	0.0327	0.0546	0	0
Black River	B317	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	68.4	38	0.3682	0.2237	0.1000	1.0000	0.0123	0.0014	0.0304	0.0020	0.0029	0.0111	0.0187	0.0297	0	0
Black River	B317	Chromium, Dissolved	µg/L	9.62	Chronic	None	68.4	38	0.3682	0.2237	0.1000	1.0000	0.0383	0.0104	0.1040	0.0134	0.0208	0.0352	0.0499	0.0835	0	0
Black River	B317	Cobalt, Dissolved	µg/L	660	Acute	None	47.4	38	0.1566	0.0955	0.0717	0.4200	0.0002	0.0001	0.0006	0.0002	0.0002	0.0002	0.0002	0.0005	0	0
Black River	B317	Cobalt, Dissolved	µg/L	132	Chronic	None	47.4	38	0.1566	0.0955	0.0717	0.4200	0.0012	0.0005	0.0032	0.0008	0.0008	0.0008	0.0012	0.0026	0	0
Black River	B317	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	38	2.1782	1.2591	0.7600	6.3700	0.4724	0.0638	1.1454	0.0681	0.0973	0.5444	0.7620	1.0931	0	4
Black River	B317	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	38	2.1782	1.2591	0.7600	6.3700	0.6366	0.0948	1.5833	0.1014	0.1432	0.7412	1.0115	1.4246	0	11
Black River	B317	Iron, Total	µg/L		Acute	None	100.0	38	2572.1579	1911.1006	471.0000	11700.0000	-	-	-	-	-	-	-	-	0	0
Black River	B317	Iron, Total	µg/L	1000	Chronic	None	100.0	38	2572.1579	1911.1006	471.0000	11700.0000	2.5722	0.4710	11.7000	0.7898	1.4850	2.3550	3.0325	5.1435	0	33
Black River	B317	Lead, Dissolved	µg/L		Acute	hardness-dependent	73.7	38	0.2507	0.1703	0.0910	0.8700	0.0131	0.0016	0.0388	0.0016	0.0021	0.0164	0.0222	0.0277	0	0
Black River	B317	Lead, Dissolved	µg/L		Chronic	hardness-dependent	73.7	38	0.2507	0.1703	0.0910	0.8700	0.3364	0.0404	0.9967	0.0420	0.0535	0.4216	0.5707	0.7116	0	0
Black River	B317	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	38	108.6537	112.5455	1.5700	362.0000	0.0462	0.0007	0.1540	0.0042	0.0123	0.0229	0.0733	0.1396	0	0
Black River	B317	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	38	108.6537	112.5455	1.5700	362.0000	0.2312	0.0033	0.7702	0.0209	0.0616	0.1145	0.3665	0.6978	0	0
Black River	B317	Mercury, Total	µg/L	2.1	Acute	None	76.3	38	0.0132	0.0330	0.0009	0.2040	0.0063	0.0004	0.0971	0.0006	0.0012	0.0033	0.0045	0.0141	0	0
Black River	B317	Mercury, Total	µg/L	1.302	Chronic	None	76.3	38	0.0132	0.0330	0.0009	0.2040	0.0101	0.0007	0.1567	0.0010	0.0019	0.0053	0.0073	0.0227	0	0
Black River	B317	Molybdenum, Dissolved	µg/L	35000	Acute	None	73.7	38	0.6396	0.5107	0.2500	2.4000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	B317	Molybdenum, Dissolved	µg/L	2250	Chronic	None	73.7	38	0.6396	0.5107	0.2500	2.4000	0.0003	0.0001	0.0011	0.0001	0.0001	0.0002	0.0003	0.0008	0	0
Black River	B317	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	38	0.8255	0.1968	0.5650	1.3000	0.0037	0.0013	0.0078	0.0015	0.0023	0.0039	0.0049	0.0063	0	0
Black River	B317	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	38	0.8255	0.1968	0.5650	1.3000	0.0337	0.0118	0.0701	0.0136	0.0207	0.0352	0.0444	0.0563	0	0
Black River	B317	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	30	537.5667	217.4910	186.0000	972.0000	0.0006	0.0002	0.0012	0.0003	0.0004	0.0006	0.0008	0.0011	0	0
Black River	B317	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	30	537.5667	217.4910	186.0000	972.0000	0.0654	0.0226	0.1182	0.0333	0.0430	0.0626	0.0831	0.1063	0	0
Black River	B317	Selenium, Total	µg/L	20	Acute	None	0.0	38	0.5921	0.2355	0.2500	0.7500	0.0296	0.0125	0.0375	0.0125	0.0125	0.0375	0.0375	0.0375	0	0
Black River	B317	Selenium, Total	µg/L	5	Chronic	None	0.0	38	0.5921	0.2355	0.2500	0.7500	0.1184	0.0500	0.1500	0.0500	0.0500	0.1500	0.1500	0.1500	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Black River	B317	Strontium, Dissolved	µg/L	80	Acute	None	100.0	2	96.2000	2.2627	94.6000	97.8000	1.2025	1.1825	1.2225	1.1845	1.1925	1.2025	1.2125	1.2205	0	2
Black River	B317	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	2	96.2000	2.2627	94.6000	97.8000	1.9633	1.9306	1.9959	1.9339	1.9469	1.9633	1.9796	1.9927	0	2
Black River	B317	TSS	mg/L	244	Acute	None	100.0	29	22.0748	22.4187	0.9300	106.0000	0.0905	0.0038	0.4344	0.0108	0.0287	0.0697	0.1336	0.2433	0	0
Black River	B317	TSS	mg/L	22	Chronic	None	100.0	29	22.0748	22.4187	0.9300	106.0000	1.0034	0.0423	4.8182	0.1198	0.3182	0.7727	1.4818	2.6982	0	10
Black River	B317	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	38	0.6266	0.2182	0.3350	1.4000	0.0009	0.0005	0.0019	0.0006	0.0007	0.0008	0.0009	0.0013	0	0
Black River	B317	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	38	0.6266	0.2182	0.3350	1.4000	0.0016	0.0008	0.0035	0.0010	0.0012	0.0014	0.0017	0.0024	0	0
Black River	B317	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	38	18.7953	11.3559	2.2000	52.0000	0.4238	0.0201	1.0181	0.0332	0.0994	0.4430	0.6273	1.0031	0	3
Black River	B317	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	38	18.7953	11.3559	2.2000	52.0000	0.4203	0.0200	1.0098	0.0330	0.0986	0.4394	0.6222	0.9949	0	2
Black River	C317	2,4-D	µg/L	700	Acute	None	14.3	14	0.0515	0.1013	0.0075	0.3160	0.0001	0.0000	0.0005	0.0000	0.0000	0.0000	0.0000	0.0004	0	0
Black River	C317	2,4-D	µg/L	50	Chronic	None	14.3	14	0.0515	0.1013	0.0075	0.3160	0.0010	0.0002	0.0063	0.0002	0.0002	0.0002	0.0004	0.0056	0	0
Black River	C317	4-Methylphenol	µg/L	700	Acute	None	0.0	8	0.1294	0.0078	0.1200	0.1400	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Black River	C317	4-Methylphenol	µg/L	140	Chronic	None	0.0	8	0.1294	0.0078	0.1200	0.1400	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010	0	0
Black River	C317	Acenaphthene	µg/L	30	Acute	None	7.1	14	0.0055	0.0019	0.0048	0.0120	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Black River	C317	Acenaphthene	µg/L	6	Chronic	None	7.1	14	0.0055	0.0019	0.0048	0.0120	0.0009	0.0008	0.0020	0.0008	0.0008	0.0008	0.0008	0.0013	0	0
Black River	C317	Aluminum, Total	µg/L	750	Acute	None	100.0	14	409.7000	431.3395	63.8000	1450.0000	0.5463	0.0851	1.9333	0.0969	0.1547	0.2960	0.7200	1.5953	0	3
Black River	C317	Aluminum, Total	µg/L	87	Chronic	None	100.0	14	409.7000	431.3395	63.8000	1450.0000	4.7092	0.7333	16.6667	0.8357	1.3333	2.5517	6.2069	13.7529	0	11
Black River	C317	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	92.9	14	0.1785	0.1297	0.0050	0.4050	0.0089	0.0002	0.0231	0.0019	0.0037	0.0080	0.0120	0.0194	0	0
Black River	C317	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	92.9	14	0.1785	0.1297	0.0050	0.4050	0.0869	0.0023	0.2037	0.0193	0.0362	0.0661	0.1287	0.1910	0	0
Black River	C317	Anthracene	µg/L	0.635	Acute	None	0.0	14	0.0049	0.0003	0.0047	0.0055	0.0078	0.0074	0.0087	0.0075	0.0075	0.0077	0.0079	0.0087	0	0
Black River	C317	Anthracene	µg/L	0.127	Chronic	None	0.0	14	0.0049	0.0003	0.0047	0.0055	0.0389	0.0370	0.0433	0.0373	0.0374	0.0384	0.0394	0.0433	0	0
Black River	C317	Antimony, Dissolved	µg/L	88	Acute	None	100.0	12	0.2321	0.1578	0.0730	0.4910	0.0026	0.0008	0.0056	0.0009	0.0012	0.0017	0.0040	0.0056	0	0
Black River	C317	Antimony, Dissolved	µg/L	30	Chronic	None	100.0	12	0.2321	0.1578	0.0730	0.4910	0.0077	0.0024	0.0164	0.0027	0.0035	0.0050	0.0119	0.0164	0	0
Black River	C317	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	14	0.6447	0.1308	0.4200	0.8060	0.0018	0.0012	0.0022	0.0013	0.0015	0.0018	0.0021	0.0022	0	0
Black River	C317	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	14	0.6447	0.1308	0.4200	0.8060	0.0034	0.0022	0.0042	0.0024	0.0028	0.0035	0.0040	0.0042	0	0
Black River	C317	Barium, Dissolved	µg/L	7250	Acute	None	100.0	11	8.9609	2.4277	5.6900	12.7000	0.0012	0.0008	0.0018	0.0008	0.0010	0.0012	0.0015	0.0016	0	0
Black River	C317	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	11	8.9609	2.4277	5.6900	12.7000	0.0062	0.0039	0.0088	0.0040	0.0048	0.0058	0.0075	0.0082	0	0
Black River	C317	Benzo(a)pyrene	µg/L	0.75	Acute	None	28.6	14	0.0072	0.0042	0.0047	0.0190	0.0096	0.0063	0.0253	0.0063	0.0064	0.0067	0.0118	0.0184	0	0
Black River	C317	Benzo(a)pyrene	µg/L	0.15	Chronic	None	28.6	14	0.0072	0.0042	0.0047	0.0190	0.0480	0.0313	0.1267	0.0316	0.0322	0.0333	0.0592	0.0920	0	0
Black River	C317	Benzo(b)fluoranthene	µg/L	512	Acute	None	42.9	14	0.0136	0.0110	0.0047	0.0335	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	C317	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	42.9	14	0.0136	0.0110	0.0047	0.0335	0.0001	0.0000	0.0003	0.0000	0.0000	0.0001	0.0002	0.0003	0	0
Black River	C317	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	42.9	14	0.0109	0.0085	0.0047	0.0301	0.0156	0.0067	0.0430	0.0068	0.0069	0.0079	0.0186	0.0389	0	0
Black River	C317	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	42.9	14	0.0109	0.0085	0.0047	0.0301	0.0780	0.0336	0.2150	0.0338	0.0346	0.0393	0.0929	0.1946	0	0
Black River	C317	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	14	1.2631	0.8224	0.3050	2.6300	0.0032	0.0008	0.0066	0.0011	0.0015	0.0023	0.0051	0.0062	0	0
Black River	C317	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	14	1.2631	0.8224	0.3050	2.6300	0.0035	0.0008	0.0073	0.0013	0.0017	0.0026	0.0057	0.0069	0	0
Black River	C317	Butylbenzylphthalate	µg/L	390	Acute	None	100.0	14	0.0942	0.0844	0.0210	0.3460	0.0002	0.0001	0.0009	0.0001	0.0001	0.0002	0.0003	0.0006	0	0
Black River	C317	Butylbenzylphthalate	µg/L	60	Chronic	None	100.0	14	0.0942	0.0844	0.0210	0.3460	0.0016	0.0004	0.0058	0.0004	0.0007	0.0011	0.0021	0.0036	0	0
Black River	C317	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	71.4	14	0.0281	0.0178	0.0050	0.0545	0.0356	0.0020	0.1321	0.0021	0.0051	0.0203	0.0490	0.1083	0	0
Black River	C317	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	71.4	14	0.0281	0.0178	0.0050	0.0545	0.2093	0.0169	0.6643	0.0172	0.0400	0.1472	0.2970	0.5747	0	0
Black River	C317	Caffeine	µg/L	95000	Acute	None	92.9	14	0.3128	0.4726	0.0120	1.7400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Caffeine	µg/L	19000	Chronic	None	92.9	14	0.3128	0.4726	0.0120	1.7400	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	C317	Carbazole	µg/L	465	Acute	None	0.0	14	0.0126	0.0007	0.0120	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Carbazole	µg/L	93	Chronic	None	0.0	14	0.0126	0.0007	0.0120	0.0140	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Black River	C317	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	100.0	14	0.2698	0.1114	0.1100	0.3930	0.0010	0.0002	0.0026	0.0002	0.0003	0.0007	0.0016	0.0022	0	0
Black River	C317	Chromium, Dissolved	µg/L	14.7	Acute	None	100.0	14	0.2698	0.1114	0.1100	0.3930	0.0184	0.0075	0.0267	0.0075	0.0111	0.0207	0.0248	0.0267	0	0
Black River	C317	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	100.0	14	0.2698	0.1114	0.1100	0.3930	0.0074	0.0013	0.0201	0.0013	0.0021	0.0054	0.0123	0.0168	0	0
Black River	C317	Chromium, Dissolved	µg/L	9.62	Chronic	None	100.0	14	0.2698	0.1114	0.1100	0.3930	0.0280	0.0114	0.0409	0.0114	0.0169	0.0317	0.0379	0.0408	0	0
Black River	C317	Chrysene	µg/L	0.35	Acute	None	28.6	14	0.0174	0.0080	0.0120	0.0360	0.0497	0.0343	0.1029	0.0343	0.0346	0.0371	0.0636	0.0917	0	0
Black River	C317	Chrysene	µg/L	0.07	Chronic	None	28.6	14	0.0174	0.0080	0.0120	0.0360	0.2485	0.1714	0.5143	0.1714	0.1732	0.1857	0.3179	0.4586	0	0
Black River	C317	Cobalt, Dissolved	µg/L	660	Acute	None	100.0	14	0.2187	0.1208	0.0862	0.4410	0.0003	0.0001	0.0007	0.0001	0.0002	0.0002	0.0005	0.0007	0	0
Black River	C317	Cobalt, Dissolved	µg/L	132	Chronic	None	100.0	14	0.2187	0.1208	0.0862	0.4410	0.0017	0.0007	0.0033	0.0007	0.0010	0.0012	0.0024	0.0033	0	0
Black River	C317	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	14	1.6422	0.8883	0.4500	2.9900	0.2936	0.0276	0.9674	0.0332	0.0621	0.2134	0.4386	0.7680	0	0
Black River	C317	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	14	1.6422	0.8883	0.4500	2.9900	0.4018	0.0421	1.2584	0.0505	0.0934	0.3024	0.5919	1.0228	0	1
Black River	C317	Diazinon	µg/L	0.0963	Acute	None	0.0	14	0.0230	0.0053	0.0205	0.0410	0.2388	0.2129	0.4258	0.2129	0.2142	0.2181	0.2323	0.3144	0	0
Black River	C317	Dichloroprop	µg/L	250	Acute	None	0.0	14	0.0106	0.0029	0.0055	0.0160	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Black River	C317	Dichloroprop	µg/L	50	Chronic	None	0.0	14	0.0106	0.0029	0.0055	0.0160	0.0002	0.0001	0.0003	0.0001	0.0002	0.0002	0.0002	0.0003	0	0
Black River	C317	Diethyl Phthalate	µg/L	6000	Acute	None	100.0	14	0.0717	0.0683	0.0220	0.2700	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Diethyl Phthalate	µg/L	1200	Chronic	None	100.0	14	0.0717	0.0683	0.0220	0.2700	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000	0.0001	0.0002	0	0
Black River	C317	Dimethyl Phthalate	µg/L	14500	Acute	None	37.5	8	0.0089	0.0057	0.0050	0.0200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Dimethyl Phthalate	µg/L	2900	Chronic	None	37.5	8	0.0089	0.0057	0.0050	0.0200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Di-N-Butyl Phthalate	µg/L	240	Acute	None	100.0	14	0.0886	0.0308	0.0379	0.1410	0.0004	0.0002	0.0006	0.0002	0.0003	0.0004	0.0005	0.0006	0	0
Black River	C317	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	100.0	14	0.0886	0.0308	0.0379	0.1410	0.0018	0.0008	0.0029	0.0010	0.0013	0.0019	0.0023	0.0028	0	0
Black River	C317	Di-N-Octyl Phthalate	µg/L	60	Acute	None	37.5	8	0.0623	0.1187	0.0050	0.3450	0.0010	0.0001	0.0058	0.0001	0.0001	0.0001	0.0008	0.0043	0	0
Black River	C317	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	37.5	8	0.0623	0.1187	0.0050	0.3450	0.0052	0.0004	0.0288	0.0004	0.0004	0.0005	0.0038	0.0216	0	0
Black River	C317	Endosulfan	µg/L	0.22	Acute	None	0.0	14	0.0025	0.0001	0.0024	0.0028	0.0115	0.0109	0.0127	0.0109	0.0109	0.0114	0.0116	0.0127	0	0
Black River	C317	Endosulfan	µg/L	0.056	Chronic	None	0.0	14	0.0025	0.0001	0.0024	0.0028	0.0450	0.0429	0.0500	0.0429	0.0429	0.0446	0.0455	0.0500	0	0
Black River	C317	Fluoranthene	µg/L	18	Acute	None	71.4	14	0.0212	0.0148	0.0047	0.0449	0.0012	0.0003	0.0025	0.0003	0.0004	0.0010	0.0019	0.0024	0	0
Black River	C317	Fluoranthene	µg/L	3.55	Chronic	None	71.4	14	0.0212	0.0148	0.0047	0.0449	0.0060	0.0013	0.0126	0.0013	0.0019	0.0051	0.0097	0.0121	0	0
Black River	C317	Iron, Total	µg/L		Acute	None	100.0	14	2626.4286	965.1752	1320.0000	4050.0000	-	-	-	-	-	-	-	-	0	0
Black River	C317	Iron, Total	µg/L	1000	Chronic	None	100.0	14	2626.4286	965.1752	1320.0000	4050.0000	2.6264	1.3200	4.0500	1.4695	1.9075	2.2050	3.6325	3.9655	0	14
Black River	C317	Isophorone	µg/L	60000	Acute	None	12.5	8	0.0068	0.0049	0.0048	0.0190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Isophorone	µg/L	12000	Chronic	None	12.5	8	0.0068	0.0049	0.0048	0.0190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Black River	C317	Lead, Dissolved	µg/L		Acute	hardness-dependent	78.6	14	0.1335	0.1044	0.0125	0.2560	0.0067	0.0002	0.0243	0.0002	0.0006	0.0037	0.0118	0.0177	0	0
Black River	C317	Lead, Dissolved	µg/L		Chronic	hardness-dependent	78.6	14	0.1335	0.1044	0.0125	0.2560	0.1713	0.0040	0.6228	0.0041	0.0155	0.0954	0.3036	0.4553	0	0
Black River	C317	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	14	253.2571	186.9119	42.7000	486.0000	0.1078	0.0182	0.2068	0.0195	0.0341	0.0787	0.1914	0.2035	0	0
Black River	C317	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	14	253.2571	186.9119	42.7000	486.0000	0.5388	0.0909	1.0340	0.0975	0.1704	0.3936	0.9569	1.0174	0	2
Black River	C317	Mercury, Total	µg/L	2.1	Acute	None	100.0	14	0.0036	0.0024	0.0007	0.0086	0.0017	0.0003	0.0041	0.0004	0.0011	0.0014	0.0021	0.0037	0	0
Black River	C317	Mercury, Total	µg/L	1.302	Chronic	None	100.0	14	0.0036	0.0024	0.0007	0.0086	0.0028	0.0005	0.0066	0.0006	0.0018	0.0022	0.0034	0.0060	0	0
Black River	C317	Molybdenum, Dissolved	µg/L	35000	Acute	None	100.0	14	1.6702	0.9756	0.5930	4.3400	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Black River	C317	Molybdenum, Dissolved	µg/L	2250	Chronic	None	100.0	14	1.6702	0.9756	0.5930	4.3400	0.0007	0.0003	0.0019	0.0003	0.0005	0.0007	0.0008	0.0015	0	0
Black River	C317	Naphthalene	µg/L	500	Acute	None	14.3	14	0.0143	0.0044	0.0120	0.0250	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Black River	C317	Naphthalene	µg/L	100	Chronic	None	14.3	14	0.0143	0.0044	0.0120	0.0250	0.0001	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Black River	C317	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	14	1.0124	0.2512	0.7040	1.5400	0.0035	0.0017	0.0072	0.0018	0.0024	0.0033	0.0043	0.0055	0	0
Black River	C317	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	14	1.0124	0.2512	0.7040	1.5400	0.0314	0.0152	0.0647	0.0166	0.0219	0.0297	0.0383	0.0499	0	0
Black River	C317	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	14	373.7143	110.7655	235.0000	684.0000	0.0005	0.0003	0.0008	0.0003	0.0004	0.0004	0.0005	0.0006	0	0
Black River	C317	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	14	373.7143	110.7655	235.0000	684.0000	0.0454	0.0286	0.0832	0.0298	0.0381	0.0438	0.0491	0.0645	0	0
Black River	C317	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	7.1	14	0.2368	0.1967	0.0600	0.4900	0.0287	0.0061	0.0687	0.0066	0.0081	0.0143	0.0548	0.0682	0	0
Black River	C317	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	7.1	14	0.2368	0.1967	0.0600	0.4900	0.0374	0.0079	0.0895	0.0086	0.0105	0.0186	0.0714	0.0889	0	0
Black River	C317	Phenanthrene	µg/L	29.82	Acute	None	71.4	14	0.0161	0.0109	0.0047	0.0393	0.0005	0.0002	0.0013	0.0002	0.0002	0.0005	0.0007	0.0012	0	0
Black River	C317	Phenanthrene	µg/L	6.325	Chronic	None	71.4	14	0.0161	0.0109	0.0047	0.0393	0.0026	0.0007	0.0062	0.0007	0.0010	0.0024	0.0033	0.0058	0	0
Black River	C317	Phenol	µg/L	22.5	Acute	None	21.4	14	0.1619	0.1394	0.0475	0.5400	0.0072	0.0021	0.0240	0.0022	0.0023	0.0049	0.0107	0.0155	0	0
Black River	C317	Phenol	µg/L	4.5	Chronic	None	21.4	14	0.1619	0.1394	0.0475	0.5400	0.0360	0.0106	0.1200	0.0108	0.0114	0.0244	0.0533	0.0774	0	0
Black River	C317	Pyrene	µg/L	45.45	Acute	None	78.6	14	0.0251	0.0167	0.0047	0.0628	0.0006	0.0001	0.0014	0.0001	0.0003	0.0005	0.0007	0.0011	0	0
Black River	C317	Pyrene	µg/L	9.09	Chronic	None	78.6	14	0.0251	0.0167	0.0047	0.0628	0.0028	0.0005	0.0069	0.0005	0.0015	0.0027	0.0037	0.0053	0	0
Black River	C317	Selenium, Total	µg/L	20	Acute	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0	0
Black River	C317	Selenium, Total	µg/L	5	Chronic	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0	0
Black River	C317	Strontium, Dissolved	µg/L	80	Acute	None	100.0	1	140.0000	-	140.0000	140.0000	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	0	1
Black River	C317	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	1	140.0000	-	140.0000	140.0000	2.8571	2.8571	2.8571	2.8571	2.8571	2.8571	2.8571	2.8571	0	1
Black River	C317	TSS	mg/L	244	Acute	None	100.0	14	11.9871	9.0576	4.6000	36.3000	0.0491	0.0189	0.1488	0.0228	0.0285	0.0340	0.0531	0.1256	0	0
Black River	C317	TSS	mg/L	22	Chronic	None	100.0	14	11.9871	9.0576	4.6000	36.3000	0.5449	0.2091	1.6500	0.2534	0.3161	0.3773	0.5886	1.3930	0	2
Black River	C317	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	14	0.3177	0.1104	0.1640	0.5650	0.0004	0.0002	0.0008	0.0002	0.0003	0.0004	0.0005	0.0007	0	0
Black River	C317	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	14	0.3177	0.1104	0.1640	0.5650	0.0008	0.0004	0.0014	0.0004	0.0006	0.0008	0.0009	0.0012	0	0
Black River	C317	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	14	10.1179	5.3556	1.7900	16.9000	0.1859	0.0132	0.5330	0.0145	0.0459	0.1379	0.2687	0.4490	0	0
Black River	C317	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	14	10.1179	5.3556	1.7900	16.9000	0.1844	0.0131	0.5287	0.0144	0.0455	0.1368	0.2665	0.4454	0	0
Covington Creek	C320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	53.3	75	0.0112	0.0107	0.0050	0.0702	0.0006	0.0002	0.0046	0.0002	0.0003	0.0004	0.0007	0.0013	0	0
Covington Creek	C320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	53.3	75	0.0112	0.0107	0.0050	0.0702	0.0053	0.0022	0.0320	0.0022	0.0024	0.0047	0.0060	0.0107	0	0
Covington Creek	C320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	75	907.1333	402.2804	309.0000	2040.0000	0.0011	0.0004	0.0025	0.0005	0.0007	0.0009	0.0014	0.0020	0	0
Covington Creek	C320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	75	907.1333	402.2804	309.0000	2040.0000	0.1103	0.0376	0.2480	0.0531	0.0729	0.0952	0.1410	0.2038	0	0
Covington Creek	C320	TSS	mg/L	244	Acute	None	86.7	75	2.1047	2.3625	0.2500	12.3000	0.0086	0.0010	0.0504	0.0010	0.0032	0.0057	0.0107	0.0250	0	0
Covington Creek	C320	TSS	mg/L	22	Chronic	None	86.7	75	2.1047	2.3625	0.2500	12.3000	0.0957	0.0114	0.5591	0.0114	0.0352	0.0636	0.1182	0.2773	0	0
Covington Creek	R320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	72.4	29	0.0206	0.0154	0.0050	0.0645	0.0012	0.0002	0.0033	0.0003	0.0004	0.0010	0.0020	0.0027	0	0
Covington Creek	R320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	72.4	29	0.0206	0.0154	0.0050	0.0645	0.0101	0.0022	0.0308	0.0022	0.0024	0.0083	0.0149	0.0253	0	0
Covington Creek	R320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	29	546.7241	242.9797	178.0000	1070.0000	0.0007	0.0002	0.0013	0.0003	0.0004	0.0006	0.0008	0.0012	0	0
Covington Creek	R320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	29	546.7241	242.9797	178.0000	1070.0000	0.0665	0.0216	0.1301	0.0270	0.0419	0.0614	0.0847	0.1162	0	0
Covington Creek	R320	TSS	mg/L	244	Acute	None	42.9	28	0.5711	0.4727	0.2500	2.4000	0.0023	0.0010	0.0098	0.0010	0.0010	0.0015	0.0030	0.0045	0	0
Covington Creek	R320	TSS	mg/L	22	Chronic	None	42.9	28	0.5711	0.4727	0.2500	2.4000	0.0260	0.0114	0.1091	0.0114	0.0114	0.0170	0.0328	0.0500	0	0
Covington Creek	S320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	15.2	33	0.0062	0.0031	0.0050	0.0170	0.0004	0.0003	0.0011	0.0003	0.0003	0.0003	0.0003	0.0007	0	0
Covington Creek	S320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	15.2	33	0.0062	0.0031	0.0050	0.0170	0.0029	0.0022	0.0080	0.0023	0.0023	0.0023	0.0024	0.0066	0	0
Covington Creek	S320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	33	541.6061	229.3755	233.0000	1040.0000	0.0007	0.0003	0.0013	0.0003	0.0004	0.0006	0.0008	0.0012	0	0
Covington Creek	S320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	33	541.6061	229.3755	233.0000	1040.0000	0.0658	0.0283	0.1264	0.0303	0.0410	0.0638	0.0790	0.1178	0	0
Covington Creek	S320	TSS	mg/L	244	Acute	None	87.5	32	1.5681	1.1420	0.2500	4.0000	0.0064	0.0010	0.0164	0.0010	0.0031	0.0043	0.0102	0.0141	0	0
Covington Creek	S320	TSS	mg/L	22	Chronic	None	87.5	32	1.5681	1.1420	0.2500	4.0000	0.0713	0.0114	0.1818	0.0114	0.0343	0.0477	0.1136	0.1566	0	0
Duwamish River	0305	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	91.5	118	0.0334	0.0173	0.0050	0.0787	0.0035	0.0002	0.0090	0.0005	0.0020	0.0031	0.0044	0.0076	0	0
Duwamish River	0305	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	91.5	118	0.0334	0.0173	0.0050	0.0787	0.0176	0.0023	0.0416	0.0024	0.0113	0.0169	0.0232	0.0357	0	0
Duwamish River	0305	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	118	331.1780	117.5777	145.0000	715.0000	0.0004	0.0002	0.0009	0.0002	0.0003	0.0004	0.0005	0.0007	0	0
Duwamish River	0305	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	118	331.1780	117.5777	145.0000	715.0000	0.0403	0.0176	0.0869	0.0213	0.0288	0.0378	0.0494	0.0660	0	0
Duwamish River	0305	TSS	mg/L	244	Acute	None	99.2	118	4.4452	3.3815	0.5500	25.9000	0.0182	0.0023	0.1061	0.0061	0.0111	0.0139	0.0209	0.0350	0	0
Duwamish River	0305	TSS	mg/L	22	Chronic	None	99.2	118	4.4452	3.3815	0.5500	25.9000	0.2021	0.0250	1.1773	0.0675	0.1227	0.1545	0.2318	0.3880	0	1
Duwamish River	0307	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	116	0.0441	0.0228	0.0110	0.1120	0.0043	0.0007	0.0203	0.0011	0.0018	0.0033	0.0061	0.0093	0	0
Duwamish River	0307	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	116	0.0441	0.0228	0.0110	0.1120	0.0240	0.0050	0.0911	0.0067	0.0128	0.0212	0.0333	0.0467	0	0
Duwamish River	0307	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	116	346.9052	128.7688	105.0000	765.0000	0.0004	0.0001	0.0009	0.0002	0.0003	0.0004	0.0005	0.0007	0	0
Duwamish River	0307	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	116	346.9052	128.7688	105.0000	765.0000	0.0422	0.0128	0.0930	0.0215	0.0318	0.0402	0.0498	0.0742	0	0
Duwamish River	0307	TSS	mg/L	244	Acute	None	100.0	116	14.4432	23.9828	1.0000	144.0000	0.0592	0.0041	0.5902	0.0086	0.0151	0.0281	0.0516	0.2157	0	0
Duwamish River	0307	TSS	mg/L	22	Chronic	None	100.0	116	14.4432	23.9828	1.0000	144.0000	0.6565	0.0455	6.5455	0.0955	0.1678	0.3120	0.5727	2.3920	0	17
Duwamish River	0309	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	88.9	54	0.0329	0.0238	0.0050	0.1110	0.0015	0.0002	0.0054	0.0002	0.0007	0.0012	0.0018	0.0043	0	0
Duwamish River	0309	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	88.9	54	0.0329	0.0238	0.0050	0.1110	0.0170	0.0023	0.0533	0.0026	0.0075	0.0132	0.0242	0.0458	0	0
Duwamish River	0309	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	54	392.4074	148.0522	115.0000	762.0000	0.0005	0.0001	0.0009	0.0002	0.0003	0.0004	0.0006	0.0008	0	0
Duwamish River	0309	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	54	392.4074	148.0522	115.0000	762.0000	0.0477	0.0140	0.0926	0.0240	0.0342	0.0450	0.0594	0.0787	0	0
Duwamish River	0309	TSS	mg/L	244	Acute	None	100.0	54	7.5376	7.2552	1.7000	42.5000	0.0309	0.0070	0.1742	0.0095	0.0150	0.0218	0.0372	0.0770	0	0
Duwamish River	0309	TSS	mg/L	22	Chronic	None	100.0	54	7.5376	7.2552	1.7000	42.5000	0.3426	0.0773	1.9318	0.1049	0.1659	0.2416	0.4125	0.8545	0	3
Duwamish River	A307	Aluminum, Total	µg/L	750	Acute	None	100.0	99	792.6909	2112.0452	13.8000	19800.0000	1.0569	0.0184	26.4000	0.0595	0.1241	0.3547	0.9280	4.0413	0	24
Duwamish River	A307	Aluminum, Total	µg/L	87	Chronic	None	100.0	99	792.6909	2112.0452	13.8000	19800.0000	9.1114	0.1586	227.5862	0.5125	1.0701	3.0575	8.0000	34.8391	0	76
Duwamish River	A307	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	94.5	91	0.0750	0.1838	0.0050	1.4600	0.0057	0.0004	0.1105	0.0006	0.0014	0.0021	0.0035	0.0205	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Duwamish River	A307	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	94.5	91	0.0750	0.1838	0.0050	1.4600	0.0345	0.0023	0.6683	0.0037	0.0086	0.0125	0.0216	0.1238	0	0
Duwamish River	A307	Antimony, Dissolved	µg/L	88	Acute	None	12.6	95	0.2362	0.0525	0.0440	0.3330	0.0027	0.0005	0.0038	0.0009	0.0028	0.0028	0.0028	0.0028	0	0
Duwamish River	A307	Antimony, Dissolved	µg/L	30	Chronic	None	12.6	95	0.2362	0.0525	0.0440	0.3330	0.0079	0.0015	0.0111	0.0027	0.0083	0.0083	0.0083	0.0083	0	0
Duwamish River	A307	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	98	1.0592	0.1735	0.5900	1.7000	0.0029	0.0016	0.0047	0.0024	0.0027	0.0028	0.0031	0.0039	0	0
Duwamish River	A307	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	98	1.0592	0.1735	0.5900	1.7000	0.0056	0.0031	0.0089	0.0046	0.0051	0.0053	0.0058	0.0074	0	0
Duwamish River	A307	Barium, Dissolved	µg/L	7250	Acute	None	100.0	97	7.9267	2.3995	4.4900	12.8000	0.0011	0.0006	0.0018	0.0007	0.0008	0.0010	0.0014	0.0017	0	0
Duwamish River	A307	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	97	7.9267	2.3995	4.4900	12.8000	0.0055	0.0031	0.0088	0.0033	0.0040	0.0051	0.0068	0.0085	0	0
Duwamish River	A307	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	6.1	98	0.0439	0.0146	0.0050	0.0500	0.0247	0.0022	0.0546	0.0023	0.0224	0.0237	0.0299	0.0409	0	0
Duwamish River	A307	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	6.1	98	0.0439	0.0146	0.0050	0.0500	0.1869	0.0180	0.3441	0.0183	0.1820	0.1892	0.2233	0.2796	0	0
Duwamish River	A307	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	54.1	98	0.3529	0.1990	0.0250	0.8000	0.0007	0.0000	0.0017	0.0002	0.0003	0.0005	0.0011	0.0016	0	0
Duwamish River	A307	Chromium, Dissolved	µg/L	14.7	Acute	None	54.1	98	0.3529	0.1990	0.0250	0.8000	0.0240	0.0017	0.0544	0.0066	0.0136	0.0136	0.0352	0.0464	0	0
Duwamish River	A307	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	54.1	98	0.3529	0.1990	0.0250	0.8000	0.0055	0.0003	0.0130	0.0012	0.0025	0.0040	0.0081	0.0123	0	0
Duwamish River	A307	Chromium, Dissolved	µg/L	9.62	Chronic	None	54.1	98	0.3529	0.1990	0.0250	0.8000	0.0367	0.0026	0.0832	0.0101	0.0208	0.0208	0.0538	0.0708	0	0
Duwamish River	A307	Cobalt, Dissolved	µg/L	660	Acute	None	15.3	98	0.0978	0.0206	0.0250	0.1680	0.0001	0.0000	0.0003	0.0001	0.0002	0.0002	0.0002	0.0002	0	0
Duwamish River	A307	Cobalt, Dissolved	µg/L	132	Chronic	None	15.3	98	0.0978	0.0206	0.0250	0.1680	0.0007	0.0002	0.0013	0.0004	0.0008	0.0008	0.0008	0.0010	0	0
Duwamish River	A307	Copper, Dissolved	µg/L		Acute	hardness-dependent	93.9	98	1.7146	1.0475	0.2000	3.5700	0.1549	0.0128	0.4272	0.0136	0.0455	0.1483	0.2429	0.3439	0	0
Duwamish River	A307	Copper, Dissolved	µg/L		Chronic	hardness-dependent	93.9	98	1.7146	1.0475	0.2000	3.5700	0.2279	0.0195	0.6133	0.0206	0.0687	0.2230	0.3643	0.4961	0	0
Duwamish River	A307	Iron, Total	µg/L		Acute	None	100.0	99	1433.4444	2851.7190	140.0000	26700.0000	-	-	-	-	-	-	-	-	0	0
Duwamish River	A307	Iron, Total	µg/L	1000	Chronic	None	100.0	99	1433.4444	2851.7190	140.0000	26700.0000	1.4334	0.1400	26.7000	0.3282	0.4085	0.7120	1.2900	4.3750	0	33
Duwamish River	A307	Lead, Dissolved	µg/L		Acute	hardness-dependent	33.7	98	0.1376	0.0798	0.0125	0.3600	0.0026	0.0002	0.0093	0.0002	0.0014	0.0017	0.0038	0.0063	0	0
Duwamish River	A307	Lead, Dissolved	µg/L		Chronic	hardness-dependent	33.7	98	0.1376	0.0798	0.0125	0.3600	0.0672	0.0043	0.2384	0.0045	0.0358	0.0433	0.0988	0.1606	0	0
Duwamish River	A307	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	98	56.2337	29.3012	10.7000	280.0000	0.0239	0.0046	0.1191	0.0117	0.0182	0.0215	0.0284	0.0374	0	0
Duwamish River	A307	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	98	56.2337	29.3012	10.7000	280.0000	0.1196	0.0228	0.5957	0.0587	0.0912	0.1076	0.1422	0.1871	0	0
Duwamish River	A307	Mercury, Total	µg/L	2.1	Acute	None	72.7	99	0.0206	0.0320	0.0008	0.2440	0.0098	0.0004	0.1162	0.0012	0.0012	0.0057	0.0110	0.0409	0	0
Duwamish River	A307	Mercury, Total	µg/L	1.302	Chronic	None	72.7	99	0.0206	0.0320	0.0008	0.2440	0.0159	0.0006	0.1874	0.0019	0.0019	0.0092	0.0177	0.0659	0	0
Duwamish River	A307	Molybdenum, Dissolved	µg/L	35000	Acute	None	35.7	98	0.3428	0.1372	0.2500	0.7400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Duwamish River	A307	Molybdenum, Dissolved	µg/L	2250	Chronic	None	35.7	98	0.3428	0.1372	0.2500	0.7400	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0002	0.0003	0	0
Duwamish River	A307	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	98	1.3983	0.6241	0.5300	3.9500	0.0034	0.0010	0.0098	0.0011	0.0018	0.0031	0.0050	0.0063	0	0
Duwamish River	A307	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	98	1.3983	0.6241	0.5300	3.9500	0.0308	0.0094	0.0882	0.0102	0.0160	0.0281	0.0452	0.0570	0	0
Duwamish River	A307	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	91	1647.8242	603.8296	668.0000	3010.0000	0.0020	0.0008	0.0036	0.0012	0.0014	0.0018	0.0024	0.0035	0	0
Duwamish River	A307	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	91	1647.8242	603.8296	668.0000	3010.0000	0.2003	0.0812	0.3660	0.1240	0.1453	0.1763	0.2462	0.3514	0	0
Duwamish River	A307	Selenium, Total	µg/L	20	Acute	None	0.0	99	0.6970	0.2532	0.2500	2.5000	0.0348	0.0125	0.1250	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Duwamish River	A307	Selenium, Total	µg/L	5	Chronic	None	0.0	99	0.6970	0.2532	0.2500	2.5000	0.1394	0.0500	0.5000	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Duwamish River	A307	Strontium, Dissolved	µg/L	80	Acute	None	100.0	4	76.2750	2.2780	74.7000	79.6000	0.9534	0.9338	0.9950	0.9341	0.9356	0.9425	0.9603	0.9881	0	0
Duwamish River	A307	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	4	76.2750	2.2780	74.7000	79.6000	1.5566	1.5245	1.6245	1.5251	1.5276	1.5388	1.5679	1.6132	0	4
Duwamish River	A307	TSS	mg/L	244	Acute	None	100.0	91	24.6257	68.1816	0.5400	627.0000	0.1009	0.0022	2.5697	0.0083	0.0164	0.0357	0.0783	0.3502	0	1
Duwamish River	A307	TSS	mg/L	22	Chronic	None	100.0	91	24.6257	68.1816	0.5400	627.0000	1.1194	0.0245	28.5000	0.0923	0.1823	0.3955	0.8682	3.8841	0	21
Duwamish River	A307	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	93	0.8449	0.1427	0.5400	1.4900	0.0012	0.0007	0.0021	0.0009	0.0010	0.0011	0.0013	0.0015	0	0
Duwamish River	A307	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	93	0.8449	0.1427	0.5400	1.4900	0.0021	0.0014	0.0037	0.0016	0.0019	0.0021	0.0023	0.0028	0	0
Duwamish River	A307	Zinc, Dissolved	µg/L		Acute	hardness-dependent	98.0	98	2.4903	1.4445	0.2500	5.2400	0.0255	0.0019	0.0746	0.0046	0.0091	0.0223	0.0360	0.0597	0	0
Duwamish River	A307	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	98.0	98	2.4903	1.4445	0.2500	5.2400	0.0253	0.0019	0.0740	0.0046	0.0090	0.0222	0.0357	0.0592	0	0
Jenkins Creek	D320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	31.6	57	0.0090	0.0088	0.0050	0.0610	0.0005	0.0002	0.0023	0.0002	0.0003	0.0004	0.0006	0.0012	0	0
Jenkins Creek	D320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	31.6	57	0.0090	0.0088	0.0050	0.0610	0.0042	0.0022	0.0282	0.0022	0.0023	0.0024	0.0052	0.0110	0	0
Jenkins Creek	D320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	57	1228.7544	271.2737	729.0000	2040.0000	0.0015	0.0009	0.0025	0.0010	0.0012	0.0015	0.0017	0.0019	0	0
Jenkins Creek	D320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	57	1228.7544	271.2737	729.0000	2040.0000	0.1494	0.0886	0.2480	0.1016	0.1205	0.1544	0.1690	0.1921	0	0
Jenkins Creek	D320	TSS	mg/L	244	Acute	None	100.0	57	2.6721	2.2457	0.9000	16.8000	0.0110	0.0037	0.0689	0.0041	0.0061	0.0090	0.0129	0.0208	0	0
Jenkins Creek	D320	TSS	mg/L	22	Chronic	None	100.0	57	2.6721	2.2457	0.9000	16.8000	0.1215	0.0409	0.7636	0.0454	0.0682	0.1000	0.1432	0.2309	0	0
Longfellow Creek	C370	Aluminum, Total	µg/L	750	Acute	None	100.0	12	213.4833	352.6881	40.1000	1300.0000	0.2846	0.0535	1.7333	0.0587	0.0662	0.1023	0.2413	1.0051	0	1
Longfellow Creek	C370	Aluminum, Total	µg/L	87	Chronic	None	100.0	12	213.4833	352.6881	40.1000	1300.0000	2.4538	0.4609	14.9425	0.5058	0.5710	0.8822	2.0805	8.6649	0	5
Longfellow Creek	C370	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	98.6	74	0.0413	0.0571	0.0050	0.5030	0.0057	0.0010	0.0930	0.0011	0.0025	0.0043	0.0062	0.0093	0	0
Longfellow Creek	C370	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	98.6	74	0.0413	0.0571	0.0050	0.5030	0.0251	0.0075	0.3132	0.0092	0.0145	0.0192	0.0279	0.0389	0	0
Longfellow Creek	C370	Arsenic, Dissolved	µg/L	360	Acute	None	0.0	8	25.0000	0.0000	25.0000	25.0000	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0	0
Longfellow Creek	C370	Arsenic, Dissolved	µg/L	190	Chronic	None	0.0	8	25.0000	0.0000	25.0000	25.0000	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0	0
Longfellow Creek	C370	Chromium, Dissolved	µg/L	14.7	Acute	None	0.0	8	2.5000	0.0000	2.5000	2.5000	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0	0
Longfellow Creek	C370	Chromium, Dissolved	µg/L	9.62	Chronic	None	0.0	8	2.5000	0.0000	2.5000	2.5000	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0	0
Longfellow Creek	C370	Iron, Total	µg/L		Acute	None	100.0	58	682.3276	406.8156	200.0000	2080.0000	-	-	-	-	-	-	-	-	0	0
Longfellow Creek	C370	Iron, Total	µg/L	1000	Chronic	None	100.0	58	682.3276	406.8156	200.0000	2080.0000	0.6823	0.2000	2.0800	0.2655	0.4188	0.5490	0.8298	1.4165	0	10
Longfellow Creek	C370	Mercury, Total	µg/L	2.1	Acute	None	0.0	66	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Longfellow Creek	C370	Mercury, Total	µg/L	1.302	Chronic	None	0.0	66	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Longfellow Creek	C370	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	74	1056.6351	362.2983	500.0000	2610.0000	0.0013	0.0006	0.0032	0.0007	0.0010	0.0013	0.0015	0.0017	0	0
Longfellow Creek	C370	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	74	1056.6351	362.2983	500.0000	2610.0000	0.1285	0.0608	0.3173	0.0671	0.1003	0.1283	0.1502	0.1754	0	0
Longfellow Creek	C370	Selenium, Total	µg/L	20	Acute	None	0.0	58	0.7500	0.0000	0.7500	0.7500	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Longfellow Creek	C370	Selenium, Total	µg/L	5	Chronic	None	0.0	58	0.7500	0.0000	0.7500	0.7500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Longfellow Creek	C370	Tin, Total	µg/L	10780	Acute	None	0.0	2	0.1500	0.0000	0.1500	0.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	C370	Tin, Total	µg/L	45	Chronic	None	0.0	2	0.1500	0.0000	0.1500	0.1500	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0	0
Longfellow Creek	C370	TSS	mg/L	244	Acute	None	100.0	79	16.8733	34.8762	0.8000	170.0000	0.0692	0.0033	0.6967	0.0049	0.0088	0.0152	0.0389	0.3697	0	0
Longfellow Creek	C370	TSS	mg/L	22	Chronic	None	100.0	79	16.8733	34.8762	0.8000	170.0000	0.7670	0.0364	7.7273	0.0545	0.0977	0.1682	0.4318	4.1000	0	12
Longfellow Creek	J370	Aluminum, Total	µg/L	750	Acute	None	100.0	10	77.4200	59.4675	20.0000	162.0000	0.1032	0.0267	0.2160	0.0335	0.0437	0.0688	0.1826	0.2160	0	0
Longfellow Creek	J370	Aluminum, Total	µg/L	87	Chronic	None	100.0	10	77.4200	59.4675	20.0000	162.0000	0.8899	0.2299	1.8621	0.2889	0.3767	0.5931	1.5744	1.8621	0	3
Longfellow Creek	J370	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	90.9	66	0.0779	0.2977	0.0050	1.7500	0.0109	0.0004	0.2769	0.0007	0.0011	0.0025	0.0036	0.0082	0	0
Longfellow Creek	J370	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	90.9	66	0.0779	0.2977	0.0050	1.7500	0.0478	0.0023	1.1661	0.0036	0.0077	0.0122	0.0181	0.0377	0	2

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Longfellow Creek	J370	Iron, Total	µg/L		Acute	None	100.0	52	512.7308	884.4957	120.0000	6460.0000	-	-	-	-	-	-	-	-	0	0
Longfellow Creek	J370	Iron, Total	µg/L	1000	Chronic	None	100.0	52	512.7308	884.4957	120.0000	6460.0000	0.5127	0.1200	6.4600	0.1400	0.1900	0.3595	0.4833	1.1565	0	4
Longfellow Creek	J370	Mercury, Total	µg/L	2.1	Acute	None	0.0	52	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Longfellow Creek	J370	Mercury, Total	µg/L	1.302	Chronic	None	0.0	52	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Longfellow Creek	J370	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	66	1202.2273	285.9165	505.0000	2580.0000	0.0015	0.0006	0.0031	0.0010	0.0012	0.0015	0.0016	0.0018	0	0
Longfellow Creek	J370	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	66	1202.2273	285.9165	505.0000	2580.0000	0.1462	0.0614	0.3137	0.1006	0.1212	0.1477	0.1650	0.1805	0	0
Longfellow Creek	J370	Selenium, Total	µg/L	20	Acute	None	1.9	52	0.7798	0.2149	0.7500	2.3000	0.0390	0.0375	0.1150	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Longfellow Creek	J370	Selenium, Total	µg/L	5	Chronic	None	1.9	52	0.7798	0.2149	0.7500	2.3000	0.1560	0.1500	0.4600	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Longfellow Creek	J370	Tin, Total	µg/L	10780	Acute	None	0.0	1	0.1500	-	0.1500	0.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	J370	Tin, Total	µg/L	45	Chronic	None	0.0	1	0.1500	-	0.1500	0.1500	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0	0
Longfellow Creek	J370	TSS	mg/L	244	Acute	None	100.0	66	6.0162	18.7749	0.5100	152.0000	0.0247	0.0021	0.6230	0.0029	0.0049	0.0078	0.0212	0.0593	0	0
Longfellow Creek	J370	TSS	mg/L	22	Chronic	None	100.0	66	6.0162	18.7749	0.5100	152.0000	0.2735	0.0232	6.9091	0.0318	0.0545	0.0864	0.2352	0.6580	0	1
Longfellow Creek	K370	Aluminum, Total	µg/L	750	Acute	None	100.0	4	12987.5000	4891.5531	6150.0000	16900.0000	17.3167	8.2000	22.5333	9.5300	14.8500	19.2667	21.7333	22.3733	0	4
Longfellow Creek	K370	Aluminum, Total	µg/L	87	Chronic	None	100.0	4	12987.5000	4891.5531	6150.0000	16900.0000	149.2816	70.6897	194.2529	82.1552	128.0172	166.0920	187.3563	192.8736	0	4
Longfellow Creek	K370	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	4	0.0523	0.0380	0.0190	0.0878	0.0056	0.0020	0.0094	0.0020	0.0021	0.0055	0.0090	0.0093	0	0
Longfellow Creek	K370	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	4	0.0523	0.0380	0.0190	0.0878	0.0249	0.0090	0.0418	0.0091	0.0093	0.0243	0.0399	0.0414	0	0
Longfellow Creek	K370	Arsenic, Dissolved	µg/L	360	Acute	None	0.0	2	25.0000	0.0000	25.0000	25.0000	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0.0694	0	0
Longfellow Creek	K370	Arsenic, Dissolved	µg/L	190	Chronic	None	0.0	2	25.0000	0.0000	25.0000	25.0000	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0.1316	0	0
Longfellow Creek	K370	Chromium, Dissolved	µg/L	14.7	Acute	None	0.0	2	2.5000	0.0000	2.5000	2.5000	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0.1701	0	0
Longfellow Creek	K370	Chromium, Dissolved	µg/L	9.62	Chronic	None	0.0	2	2.5000	0.0000	2.5000	2.5000	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0.2599	0	0
Longfellow Creek	K370	Iron, Total	µg/L		Acute	None	100.0	6	12673.3333	9287.8063	1080.0000	23000.0000	-	-	-	-	-	-	-	-	0	0
Longfellow Creek	K370	Iron, Total	µg/L	1000	Chronic	None	100.0	6	12673.3333	9287.8063	1080.0000	23000.0000	12.6733	1.0800	23.0000	2.0975	5.7150	12.6050	20.6500	22.6500	0	6
Longfellow Creek	K370	Mercury, Total	µg/L	2.1	Acute	None	0.0	8	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Longfellow Creek	K370	Mercury, Total	µg/L	1.302	Chronic	None	0.0	8	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Longfellow Creek	K370	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	4	550.0000	223.3846	329.0000	856.0000	0.0007	0.0004	0.0010	0.0004	0.0005	0.0006	0.0008	0.0010	0	0
Longfellow Creek	K370	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	4	550.0000	223.3846	329.0000	856.0000	0.0669	0.0400	0.1041	0.0425	0.0524	0.0617	0.0762	0.0985	0	0
Longfellow Creek	K370	Selenium, Total	µg/L	20	Acute	None	0.0	7	25.0000	0.0000	25.0000	25.0000	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500	7	7
Longfellow Creek	K370	Selenium, Total	µg/L	5	Chronic	None	0.0	7	25.0000	0.0000	25.0000	25.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	7	7
Longfellow Creek	K370	TSS	mg/L	244	Acute	None	100.0	8	236.7500	135.0045	19.0000	448.0000	0.9703	0.0779	1.8361	0.2572	0.7039	0.9139	1.2336	1.7414	0	4
Longfellow Creek	K370	TSS	mg/L	22	Chronic	None	100.0	8	236.7500	135.0045	19.0000	448.0000	10.7614	0.8636	20.3636	2.8523	7.8068	10.1364	13.6818	19.3136	0	7
Longfellow Creek	L370	1,2-Diphenylhydrazine	µg/L	125	Acute	None	0.0	16	0.0500	0.0015	0.0475	0.0550	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0	0
Longfellow Creek	L370	1,2-Diphenylhydrazine	µg/L	25	Chronic	None	0.0	16	0.0500	0.0015	0.0475	0.0550	0.0020	0.0019	0.0022	0.0019	0.0020	0.0020	0.0020	0.0021	0	0
Longfellow Creek	L370	2,4-D	µg/L	700	Acute	None	0.0	1	0.0075	-	0.0075	0.0075	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	2,4-D	µg/L	50	Chronic	None	0.0	1	0.0075	-	0.0075	0.0075	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Longfellow Creek	L370	3-Methylphenol	µg/L	4450	Acute	None	6.3	16	0.0316	0.0262	0.0240	0.1300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	3-Methylphenol	µg/L	890	Chronic	None	6.3	16	0.0316	0.0262	0.0240	0.1300	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Longfellow Creek	L370	4-Methylphenol	µg/L	700	Acute	None	37.5	16	0.0701	0.0619	0.0245	0.1800	0.0001	0.0000	0.0003	0.0000	0.0000	0.0000	0.0002	0.0002	0	0
Longfellow Creek	L370	4-Methylphenol	µg/L	140	Chronic	None	37.5	16	0.0701	0.0619	0.0245	0.1800	0.0005	0.0002	0.0013	0.0002	0.0002	0.0002	0.0009	0.0012	0	0
Longfellow Creek	L370	Acenaphthene	µg/L	30	Acute	None	0.0	17	0.0050	0.0001	0.0048	0.0055	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Longfellow Creek	L370	Acenaphthene	µg/L	6	Chronic	None	0.0	17	0.0050	0.0001	0.0048	0.0055	0.0008	0.0008	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009	0	0
Longfellow Creek	L370	Aluminum, Total	µg/L	750	Acute	None	100.0	17	4334.9412	3433.0940	111.0000	12700.0000	5.7799	0.1480	16.9333	1.0248	1.8000	4.8667	9.2800	12.3147	0	16
Longfellow Creek	L370	Aluminum, Total	µg/L	87	Chronic	None	100.0	17	4334.9412	3433.0940	111.0000	12700.0000	49.8269	1.2759	145.9770	8.8345	15.5172	41.9540	80.0000	106.1609	0	17
Longfellow Creek	L370	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	94.1	17	0.0352	0.0207	0.0050	0.0686	0.0038	0.0005	0.0073	0.0010	0.0023	0.0030	0.0053	0.0073	0	0
Longfellow Creek	L370	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	94.1	17	0.0352	0.0207	0.0050	0.0686	0.0171	0.0024	0.0333	0.0048	0.0103	0.0135	0.0241	0.0331	0	0
Longfellow Creek	L370	Aniline	µg/L	15	Acute	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.0667	0.0633	0.0733	0.0633	0.0667	0.0667	0.0667	0.0683	0	0
Longfellow Creek	L370	Aniline	µg/L	3	Chronic	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.3333	0.3167	0.3667	0.3167	0.3333	0.3333	0.3333	0.3417	0	0
Longfellow Creek	L370	Anthracene	µg/L	0.635	Acute	None	0.0	17	0.0097	0.0013	0.0050	0.0110	0.0153	0.0079	0.0173	0.0135	0.0157	0.0157	0.0157	0.0161	0	0
Longfellow Creek	L370	Anthracene	µg/L	0.127	Chronic	None	0.0	17	0.0097	0.0013	0.0050	0.0110	0.0764	0.0394	0.0866	0.0677	0.0787	0.0787	0.0787	0.0803	0	0
Longfellow Creek	L370	Antimony, Dissolved	µg/L	88	Acute	None	100.0	17	0.6507	0.1709	0.2240	0.8970	0.0074	0.0025	0.0102	0.0031	0.0071	0.0079	0.0083	0.0093	0	0
Longfellow Creek	L370	Antimony, Dissolved	µg/L	30	Chronic	None	100.0	17	0.6507	0.1709	0.2240	0.8970	0.0217	0.0075	0.0299	0.0092	0.0210	0.0230	0.0242	0.0272	0	0
Longfellow Creek	L370	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	17	1.4206	0.1529	1.1800	1.8500	0.0039	0.0033	0.0051	0.0035	0.0038	0.0039	0.0041	0.0046	0	0
Longfellow Creek	L370	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	17	1.4206	0.1529	1.1800	1.8500	0.0075	0.0062	0.0097	0.0065	0.0071	0.0073	0.0077	0.0086	0	0
Longfellow Creek	L370	Barium, Dissolved	µg/L	7250	Acute	None	100.0	17	12.3594	2.9741	9.2100	19.3000	0.0017	0.0013	0.0027	0.0013	0.0014	0.0017	0.0019	0.0023	0	0
Longfellow Creek	L370	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	17	12.3594	2.9741	9.2100	19.3000	0.0085	0.0064	0.0133	0.0065	0.0068	0.0083	0.0094	0.0117	0	0
Longfellow Creek	L370	Benzidine	µg/L	300	Acute	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.0033	0.0032	0.0037	0.0032	0.0033	0.0033	0.0033	0.0034	0	0
Longfellow Creek	L370	Benzidine	µg/L	60	Chronic	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.0167	0.0158	0.0183	0.0158	0.0167	0.0167	0.0167	0.0171	0	0
Longfellow Creek	L370	Benzo(a)pyrene	µg/L	0.75	Acute	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.0318	0.0067	0.0360	0.0269	0.0333	0.0333	0.0333	0.0344	0	0
Longfellow Creek	L370	Benzo(a)pyrene	µg/L	0.15	Chronic	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.1592	0.0333	0.1800	0.1347	0.1667	0.1667	0.1667	0.1720	0	0
Longfellow Creek	L370	Benzo(b)fluoranthene	µg/L	512	Acute	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Longfellow Creek	L370	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.0002	0.0000	0.0003	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Longfellow Creek	L370	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.0341	0.0071	0.0386	0.0289	0.0357	0.0357	0.0357	0.0369	0	0
Longfellow Creek	L370	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	0.0	17	0.0239	0.0049	0.0050	0.0270	0.1706	0.0357	0.1929	0.1443	0.1786	0.1786	0.1786	0.1843	0	0
Longfellow Creek	L370	Benzoic Acid	µg/L	645400	Acute	None	62.5	16	0.7356	0.4789	0.2500	1.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Benzoic Acid	µg/L	216500	Chronic	None	62.5	16	0.7356	0.4789	0.2500	1.9000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Benzyl Alcohol	µg/L	5000	Acute	None	75.0	16	0.3827	0.2701	0.0495	0.8050	0.0001	0.0000	0.0002	0.0000	0.0000	0.0001	0.0001	0.0002	0	0
Longfellow Creek	L370	Benzyl Alcohol	µg/L	1000	Chronic	None	75.0	16	0.3827	0.2701	0.0495	0.8050	0.0004	0.0000	0.0008	0.0000	0.0002	0.0004	0.0006	0.0008	0	0
Longfellow Creek	L370	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	17	0.9614	1.1321	0.2400	4.6100	0.0024	0.0006	0.0115	0.0006	0.0009	0.0016	0.0022	0.0082	0	0
Longfellow Creek	L370	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	17	0.9614	1.1321	0.2400	4.6100	0.0027	0.0007	0.0128	0.0007	0.0010	0.0018	0.0024	0.0091	0	0
Longfellow Creek	L370	Butylbenzylphthalate	µg/L	390	Acute	None	5.9	17	0.2396	0.0459	0.0630	0.2700	0.0006	0.0002	0.0007	0.0005	0.0006	0.0006	0.0006	0.0007	0	0
Longfellow Creek	L370	Butylbenzylphthalate	µg/L	60	Chronic	None	5.9	17	0.2396	0.0459	0.0630	0.2700	0.0040	0.0011	0.0045	0.0034	0.0042	0.0042	0.0042	0.0043	0	0
Longfellow Creek	L370	Caffeine	µg/L	95000	Acute	None	94.1	17	0.2777	0.2006	0.0270	0.8180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Longfellow Creek	L370	Caffeine	µg/L	19000	Chronic	None	94.1	17	0.2777	0.2006	0.0270	0.8180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Carbazole	µg/L	465	Acute	None	0.0	17	0.0101	0.0007	0.0095	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Carbazole	µg/L	93	Chronic	None	0.0	17	0.0101	0.0007	0.0095	0.0125	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Longfellow Creek	L370	Chromium, Dissolved	µg/L	14.7	Acute	None	100.0	17	0.4288	0.1321	0.1400	0.6000	0.0292	0.0095	0.0408	0.0139	0.0241	0.0306	0.0361	0.0396	0	0
Longfellow Creek	L370	Chromium, Dissolved	µg/L	9.62	Chronic	None	100.0	17	0.4288	0.1321	0.1400	0.6000	0.0446	0.0146	0.0624	0.0212	0.0369	0.0468	0.0551	0.0605	0	0
Longfellow Creek	L370	Chrysene	µg/L	0.35	Acute	None	5.9	17	0.0116	0.0058	0.0095	0.0340	0.0330	0.0271	0.0971	0.0271	0.0286	0.0286	0.0286	0.0480	0	0
Longfellow Creek	L370	Chrysene	µg/L	0.07	Chronic	None	5.9	17	0.0116	0.0058	0.0095	0.0340	0.1651	0.1357	0.4857	0.1357	0.1429	0.1429	0.1429	0.2400	0	0
Longfellow Creek	L370	Cobalt, Dissolved	µg/L	660	Acute	None	100.0	17	0.1080	0.0282	0.0490	0.1560	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0002	0	0
Longfellow Creek	L370	Cobalt, Dissolved	µg/L	132	Chronic	None	100.0	17	0.1080	0.0282	0.0490	0.1560	0.0008	0.0004	0.0012	0.0006	0.0007	0.0008	0.0009	0.0012	0	0
Longfellow Creek	L370	Dichloroprop	µg/L	250	Acute	None	0.0	1	0.0120	-	0.0120	0.0120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Dichloroprop	µg/L	50	Chronic	None	0.0	1	0.0120	-	0.0120	0.0120	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Longfellow Creek	L370	Diethyl Phthalate	µg/L	6000	Acute	None	11.8	17	0.2584	0.0855	0.0834	0.5500	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Longfellow Creek	L370	Diethyl Phthalate	µg/L	1200	Chronic	None	11.8	17	0.2584	0.0855	0.0834	0.5500	0.0002	0.0001	0.0005	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Longfellow Creek	L370	Dimethyl Phthalate	µg/L	14500	Acute	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Dimethyl Phthalate	µg/L	2900	Chronic	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Longfellow Creek	L370	Di-N-Butyl Phthalate	µg/L	240	Acute	None	5.9	17	0.2394	0.0468	0.0592	0.2700	0.0010	0.0002	0.0011	0.0008	0.0010	0.0010	0.0010	0.0011	0	0
Longfellow Creek	L370	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	5.9	17	0.2394	0.0468	0.0592	0.2700	0.0050	0.0012	0.0056	0.0042	0.0052	0.0052	0.0052	0.0054	0	0
Longfellow Creek	L370	Di-N-Octyl Phthalate	µg/L	60	Acute	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0042	0.0040	0.0045	0.0041	0.0042	0.0042	0.0042	0.0043	0	0
Longfellow Creek	L370	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0209	0.0200	0.0225	0.0203	0.0208	0.0208	0.0208	0.0216	0	0
Longfellow Creek	L370	Endosulfan	µg/L	0.22	Acute	None	0.0	1	0.0027	-	0.0027	0.0027	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120	0	0
Longfellow Creek	L370	Endosulfan	µg/L	0.056	Chronic	None	0.0	1	0.0027	-	0.0027	0.0027	0.0473	0.0473	0.0473	0.0473	0.0473	0.0473	0.0473	0.0473	0	0
Longfellow Creek	L370	Fluoranthene	µg/L	18	Acute	None	11.8	17	0.0264	0.0074	0.0180	0.0540	0.0015	0.0010	0.0030	0.0013	0.0014	0.0014	0.0014	0.0018	0	0
Longfellow Creek	L370	Fluoranthene	µg/L	3.55	Chronic	None	11.8	17	0.0264	0.0074	0.0180	0.0540	0.0074	0.0051	0.0152	0.0064	0.0070	0.0070	0.0070	0.0091	0	0
Longfellow Creek	L370	Hexachlorocyclopentadiene	µg/L	3.5	Acute	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.2857	0.2714	0.3143	0.2714	0.2857	0.2857	0.2857	0.2929	0	0
Longfellow Creek	L370	Hexachlorocyclopentadiene	µg/L	3.35	Chronic	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.2985	0.2836	0.3284	0.2836	0.2985	0.2985	0.2985	0.3060	0	0
Longfellow Creek	L370	Isophorone	µg/L	60000	Acute	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Isophorone	µg/L	12000	Chronic	None	0.0	16	0.2506	0.0060	0.2400	0.2700	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	17	47.6353	14.2846	28.5000	87.6000	0.0203	0.0121	0.0373	0.0123	0.0171	0.0191	0.0212	0.0292	0	0
Longfellow Creek	L370	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	17	47.6353	14.2846	28.5000	87.6000	0.1014	0.0606	0.1864	0.0615	0.0853	0.0955	0.1062	0.1459	0	0
Longfellow Creek	L370	Molybdenum, Dissolved	µg/L	35000	Acute	None	100.0	17	0.5241	0.0986	0.4110	0.8060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	L370	Molybdenum, Dissolved	µg/L	2250	Chronic	None	100.0	17	0.5241	0.0986	0.4110	0.8060	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0003	0.0003	0	0
Longfellow Creek	L370	Naphthalene	µg/L	500	Acute	None	23.5	17	0.0158	0.0061	0.0120	0.0290	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Longfellow Creek	L370	Naphthalene	µg/L	100	Chronic	None	23.5	17	0.0158	0.0061	0.0120	0.0290	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Longfellow Creek	L370	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	82.4	17	0.7135	0.2916	0.4000	1.1000	0.0398	0.0223	0.0613	0.0227	0.0240	0.0307	0.0557	0.0568	0	0
Longfellow Creek	L370	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	82.4	17	0.7135	0.2916	0.4000	1.1000	0.0518	0.0291	0.0799	0.0296	0.0312	0.0400	0.0726	0.0741	0	0
Longfellow Creek	L370	Phenanthrene	µg/L	29.82	Acute	None	35.3	17	0.0189	0.0146	0.0095	0.0510	0.0006	0.0003	0.0017	0.0003	0.0003	0.0003	0.0008	0.0017	0	0
Longfellow Creek	L370	Phenanthrene	µg/L	6.325	Chronic	None	35.3	17	0.0189	0.0146	0.0095	0.0510	0.0030	0.0015	0.0081	0.0016	0.0016	0.0016	0.0038	0.0080	0	0
Longfellow Creek	L370	Phenol	µg/L	22.5	Acute	None	88.2	17	0.5197	0.6036	0.0495	2.3700	0.0231	0.0022	0.1053	0.0022	0.0084	0.0135	0.0304	0.0740	0	0
Longfellow Creek	L370	Phenol	µg/L	4.5	Chronic	None	88.2	17	0.5197	0.6036	0.0495	2.3700	0.1155	0.0110	0.5267	0.0111	0.0422	0.0676	0.1520	0.3702	0	0
Longfellow Creek	L370	Pyrene	µg/L	45.45	Acute	None	47.1	17	0.0205	0.0127	0.0095	0.0460	0.0005	0.0002	0.0010	0.0002	0.0002	0.0002	0.0007	0.0009	0	0
Longfellow Creek	L370	Pyrene	µg/L	9.09	Chronic	None	47.1	17	0.0205	0.0127	0.0095	0.0460	0.0023	0.0010	0.0051	0.0011	0.0011	0.0012	0.0033	0.0045	0	0
Longfellow Creek	L370	Pyridine	µg/L	550	Acute	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.0018	0.0017	0.0020	0.0017	0.0018	0.0018	0.0018	0.0019	0	0
Longfellow Creek	L370	Pyridine	µg/L	110	Chronic	None	0.0	16	1.0000	0.0316	0.9500	1.1000	0.0091	0.0086	0.0100	0.0086	0.0091	0.0091	0.0091	0.0093	0	0
Longfellow Creek	L370	Selenium, Total	µg/L	20	Acute	None	0.0	17	0.2500	0.0000	0.2500	0.2500	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0	0
Longfellow Creek	L370	Selenium, Total	µg/L	5	Chronic	None	0.0	17	0.2500	0.0000	0.2500	0.2500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0	0
Longfellow Creek	L370	Simazine	µg/L	125	Acute	None	0.0	16	0.5003	0.0150	0.4750	0.5500	0.0040	0.0038	0.0044	0.0039	0.0040	0.0040	0.0040	0.0041	0	0
Longfellow Creek	L370	Simazine	µg/L	0.307	Chronic	None	0.0	16	0.5003	0.0150	0.4750	0.5500	1.6297	1.5472	1.7915	1.5717	1.6287	1.6287	1.6287	1.6694	16	16
Longfellow Creek	L370	TSS	mg/L	244	Acute	None	100.0	17	93.8294	75.8827	6.0000	243.0000	0.3845	0.0246	0.9959	0.0626	0.1426	0.2607	0.6025	0.9697	0	0
Longfellow Creek	L370	TSS	mg/L	22	Chronic	None	100.0	17	93.8294	75.8827	6.0000	243.0000	4.2650	0.2727	11.0455	0.6945	1.5818	2.8909	6.6818	10.7545	0	15
Longfellow Creek	L370	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	11	1.5355	0.1050	1.3300	1.7100	0.0021	0.0018	0.0024	0.0019	0.0020	0.0022	0.0022	0.0023	0	0
Longfellow Creek	L370	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	11	1.5355	0.1050	1.3300	1.7100	0.0038	0.0033	0.0043	0.0035	0.0037	0.0039	0.0040	0.0042	0	0
Longfellow Creek	ULCB	Diazinon	µg/L	0.0963	Acute	None	50.0	2	0.0235	0.0318	0.0010	0.0460	0.2440	0.0104	0.4777	0.0337	0.1272	0.2440	0.3609	0.4543	0	0
Longfellow Creek	ULCB	Simazine	µg/L	125	Acute	None	0.0	1	0.0025	-	0.0025	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Longfellow Creek	ULCB	Simazine	µg/L	0.307	Chronic	None	0.0	1	0.0025	-	0.0025	0.0025	0.0081	0.0081	0.0081	0.0081	0.0081	0.0081	0.0081	0.0081	0	0
Lower Green River - East	A330	Aluminum, Total	µg/L	750	Acute	None	100.0	24	752.2875	1037.1959	96.9000	3630.0000	1.0031	0.1292	4.8400	0.1351	0.1903	0.2647	1.2637	4.2007	0	7
Lower Green River - East	A330	Aluminum, Total	µg/L	87	Chronic	None	100.0	24	752.2875	1037.1959	96.9000	3630.0000	8.6470	1.1138	41.7241	1.1649	1.6408	2.2816	10.8937	36.2126	0	24
Lower Green River - East	A330	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	41.7	24	0.0081	0.0040	0.0050	0.0160	0.0009	0.0003	0.0048	0.0003	0.0005	0.0006	0.0011	0.0015	0	0
Lower Green River - East	A330	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	41.7	24	0.0081	0.0040	0.0050	0.0160	0.0046	0.0022	0.0183	0.0023	0.0023	0.0036	0.0060	0.0073	0	0
Lower Green River - East	A330	Antimony, Dissolved	µg/L	88	Acute	None	100.0	19	0.0582	0.0375	0.0230	0.1240	0.0007	0.0003	0.0014	0.0003	0.0003	0.0006	0.0009	0.0014	0	0
Lower Green River - East	A330	Antimony, Dissolved	µg/L	30	Chronic	None	100.0	19	0.0582	0.0375	0.0230	0.1240	0.0019	0.0008	0.0041	0.0008	0.0009	0.0017	0.0027	0.0041	0	0
Lower Green River - East	A330	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	24	0.8232	0.2034	0.5000	1.0600	0.0023	0.0014	0.0029	0.0014	0.0018	0.0024	0.0028	0.0029	0	0
Lower Green River - East	A330	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	24	0.8232	0.2034	0.5000	1.0600	0.0043	0.0026	0.0056	0.0026	0.0034	0.0045	0.0052	0.0056	0	0
Lower Green River - East	A330	Barium, Dissolved	µg/L	7250	Acute	None	100.0	20	5.2775	0.4925	4.2600	6.1600	0.0007	0.0006	0.0008	0.0006	0.0007	0.0007	0.0008	0.0008	0	0
Lower Green River - East	A330	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	20	5.2775	0.4925	4.2600	6.1600	0.0036	0.0029	0.0042	0.0030	0.0035	0.0036	0.0039	0.0042	0	0
Lower Green River - East	A330	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	4.2	24	0.0055	0.0022	0.0050	0.0160	0.0041	0.0031	0.0142	0.0031	0.0032	0.0035	0.0042	0.0052	0	0
Lower Green River - East	A330	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	4.2	24	0.0055	0.0022	0.0050	0.0160	0.0288	0.0228	0.0948	0.0229	0.0233	0.0248	0.0286	0.0334	0	0
Lower Green River - East	A330	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	100.0	24	0.2497	0.0550	0.1800	0.3590	0.0006	0.0004	0.0012	0.0004	0.0005	0.0006	0.0008	0.0011	0	0
Lower Green River - East	A330	Chromium, Dissolved	µg/L	14.7	Acute	None	100.0	24	0.2497	0.0550	0.1800	0.3590	0.0170	0.0122	0.0244	0.0122	0.0141	0.0160	0.0192	0.0239	0	0
Lower Green River - East	A330	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	100.0	24	0.2497	0.0550	0.1800	0.3590	0.0048	0.0029	0.0091	0.0029	0.0035	0.0046	0.0058	0.0086	0	0
Lower Green River - East	A330	Chromium, Dissolved	µg/L	9.62	Chronic	None	100.0	24	0.2497	0.0550	0.1800	0.3590	0.0260	0.0187	0.0373	0.0187	0.0216	0.0244	0.0293	0.0366	0	0
Lower Green River - East	A330	Cobalt, Dissolved	µg/L	660	Acute	None	100.0	24	0.0604	0.0240	0.0180	0.0986	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Lower Green River - East	A330	Cobalt, Dissolved	µg/L	132	Chronic	None	100.0	24	0.0604	0.0240	0.0180	0.0986	0.0005	0.0001	0.0007	0.0002	0.0003	0.0005	0.0006	0.0007	0	0
Lower Green River - East	A330	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	24	0.7052	0.4166	0.2400	1.5500	0.0850	0.0222	0.2368	0.0232	0.0306	0.0680	0.1148	0.2045	0	0
Lower Green River - East	A330	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	24	0.7052	0.4166	0.2400	1.5500	0.1218	0.0327	0.3323	0.0342	0.0449	0.0992	0.1640	0.2877	0	0
Lower Green River - East	A330	Iron, Total	µg/L		Acute	None	100.0	24	854.2500	992.1160	160.0000	3820.0000	-	-	-	-	-	-	-	-	0	0
Lower Green River - East	A330	Iron, Total	µg/L	1000	Chronic	None	100.0	24	854.2500	992.1160	160.0000	3820.0000	0.8543	0.1600	3.8200	0.1700	0.2250	0.3130	1.0885	2.6005	0	6
Lower Green River - East	A330	Lead, Dissolved	µg/L		Acute	hardness-dependent	37.5	24	0.0304	0.0256	0.0125	0.0770	0.0009	0.0002	0.0027	0.0002	0.0003	0.0003	0.0012	0.0026	0	0
Lower Green River - East	A330	Lead, Dissolved	µg/L		Chronic	hardness-dependent	37.5	24	0.0304	0.0256	0.0125	0.0770	0.0222	0.0063	0.0701	0.0063	0.0065	0.0072	0.0313	0.0659	0	0
Lower Green River - East	A330	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	24	12.8025	5.7493	2.0200	25.1000	0.0054	0.0009	0.0107	0.0010	0.0039	0.0059	0.0071	0.0085	0	0
Lower Green River - East	A330	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	24	12.8025	5.7493	2.0200	25.1000	0.0272	0.0043	0.0534	0.0052	0.0193	0.0296	0.0357	0.0424	0	0
Lower Green River - East	A330	Mercury, Total	µg/L	2.1	Acute	None	100.0	24	0.0036	0.0032	0.0009	0.0118	0.0017	0.0004	0.0056	0.0005	0.0006	0.0009	0.0031	0.0045	0	0
Lower Green River - East	A330	Mercury, Total	µg/L	1.302	Chronic	None	100.0	24	0.0036	0.0032	0.0009	0.0118	0.0027	0.0007	0.0091	0.0008	0.0010	0.0014	0.0049	0.0073	0	0
Lower Green River - East	A330	Molybdenum, Dissolved	µg/L	35000	Acute	None	100.0	24	0.1773	0.0440	0.1020	0.2320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - East	A330	Molybdenum, Dissolved	µg/L	2250	Chronic	None	100.0	24	0.1773	0.0440	0.1020	0.2320	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0	0
Lower Green River - East	A330	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	24	0.8604	0.1728	0.5690	1.1800	0.0027	0.0015	0.0040	0.0015	0.0019	0.0028	0.0032	0.0040	0	0
Lower Green River - East	A330	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	24	0.8604	0.1728	0.5690	1.1800	0.0239	0.0132	0.0360	0.0137	0.0170	0.0251	0.0288	0.0357	0	0
Lower Green River - East	A330	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	24	694.2083	134.1323	450.0000	906.0000	0.0008	0.0005	0.0011	0.0006	0.0007	0.0009	0.0010	0.0010	0	0
Lower Green River - East	A330	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	24	694.2083	134.1323	450.0000	906.0000	0.0844	0.0547	0.1102	0.0565	0.0733	0.0860	0.0974	0.1056	0	0
Lower Green River - East	A330	Selenium, Total	µg/L	20	Acute	None	0.0	24	0.2500	0.0000	0.2500	0.2500	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0	0
Lower Green River - East	A330	Selenium, Total	µg/L	5	Chronic	None	0.0	24	0.2500	0.0000	0.2500	0.2500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0	0
Lower Green River - East	A330	Strontium, Dissolved	µg/L	80	Acute	None	100.0	2	81.7000	2.4042	80.0000	83.4000	1.0213	1.0000	1.0425	1.0021	1.0106	1.0213	1.0319	1.0404	0	1
Lower Green River - East	A330	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	2	81.7000	2.4042	80.0000	83.4000	1.6673	1.6327	1.7020	1.6361	1.6500	1.6673	1.6847	1.6986	0	2
Lower Green River - East	A330	TSS	mg/L	244	Acute	None	100.0	24	18.6579	23.2592	2.5800	99.6000	0.0765	0.0106	0.4082	0.0115	0.0181	0.0307	0.1004	0.2028	0	0
Lower Green River - East	A330	TSS	mg/L	22	Chronic	None	100.0	24	18.6579	23.2592	2.5800	99.6000	0.8481	0.1173	4.5273	0.1279	0.2006	0.3400	1.1136	2.2498	0	6
Lower Green River - East	A330	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	23	0.8767	0.1802	0.5780	1.1500	0.0012	0.0008	0.0016	0.0008	0.0010	0.0013	0.0014	0.0016	0	0
Lower Green River - East	A330	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	23	0.8767	0.1802	0.5780	1.1500	0.0022	0.0014	0.0029	0.0015	0.0018	0.0023	0.0025	0.0028	0	0
Lower Green River - East	A330	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	24	24.0484	113.5193	0.2100	557.0000	0.3385	0.0022	7.8642	0.0031	0.0053	0.0101	0.0158	0.0315	0	1
Lower Green River - East	A330	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	24	24.0484	113.5193	0.2100	557.0000	0.3357	0.0022	7.8004	0.0031	0.0053	0.0101	0.0157	0.0312	0	1
Lower Green River - West	0311	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	94.3	53	0.0330	0.0272	0.0050	0.1710	0.0015	0.0002	0.0071	0.0004	0.0007	0.0012	0.0019	0.0035	0	0
Lower Green River - West	0311	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	94.3	53	0.0330	0.0272	0.0050	0.1710	0.0163	0.0023	0.0775	0.0039	0.0074	0.0118	0.0245	0.0371	0	0
Lower Green River - West	0311	Antimony, Dissolved	µg/L	88	Acute	None	0.0	4	0.2500	0.0000	0.2500	0.2500	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0	0
Lower Green River - West	0311	Antimony, Dissolved	µg/L	30	Chronic	None	0.0	4	0.2500	0.0000	0.2500	0.2500	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0	0
Lower Green River - West	0311	Arsenic, Dissolved	µg/L	360	Acute	None	25.0	4	0.3200	0.1400	0.2500	0.5300	0.0009	0.0007	0.0015	0.0007	0.0007	0.0007	0.0009	0.0014	0	0
Lower Green River - West	0311	Arsenic, Dissolved	µg/L	190	Chronic	None	25.0	4	0.3200	0.1400	0.2500	0.5300	0.0017	0.0013	0.0028	0.0013	0.0013	0.0013	0.0017	0.0026	0	0
Lower Green River - West	0311	Barium, Dissolved	µg/L	7250	Acute	None	100.0	4	1.8725	0.0403	1.8400	1.9300	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0	0
Lower Green River - West	0311	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	4	1.8725	0.0403	1.8400	1.9300	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0	0
Lower Green River - West	0311	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	4	0.0500	0.0000	0.0500	0.0500	0.0825	0.0809	0.0848	0.0811	0.0818	0.0822	0.0829	0.0845	0	0
Lower Green River - West	0311	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	4	0.0500	0.0000	0.0500	0.0500	0.4629	0.4566	0.4722	0.4572	0.4598	0.4615	0.4646	0.4707	0	0
Lower Green River - West	0311	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	0.0	4	0.2000	0.0000	0.2000	0.2000	0.0010	0.0009	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0	0
Lower Green River - West	0311	Chromium, Dissolved	µg/L	14.7	Acute	None	0.0	4	0.2000	0.0000	0.2000	0.2000	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0	0
Lower Green River - West	0311	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	0.0	4	0.2000	0.0000	0.2000	0.2000	0.0074	0.0073	0.0076	0.0073	0.0074	0.0074	0.0074	0.0076	0	0
Lower Green River - West	0311	Chromium, Dissolved	µg/L	9.62	Chronic	None	0.0	4	0.2000	0.0000	0.2000	0.2000	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0	0
Lower Green River - West	0311	Cobalt, Dissolved	µg/L	660	Acute	None	0.0	4	0.1000	0.0000	0.1000	0.1000	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Lower Green River - West	0311	Cobalt, Dissolved	µg/L	132	Chronic	None	0.0	4	0.1000	0.0000	0.1000	0.1000	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0	0
Lower Green River - West	0311	Copper, Dissolved	µg/L		Acute	hardness-dependent	75.0	4	0.9800	0.9358	0.2000	2.2900	0.2321	0.0475	0.5349	0.0556	0.0882	0.1731	0.3170	0.4913	0	0
Lower Green River - West	0311	Copper, Dissolved	µg/L		Chronic	hardness-dependent	75.0	4	0.9800	0.9358	0.2000	2.2900	0.3127	0.0639	0.7215	0.0749	0.1188	0.2327	0.4267	0.6626	0	0
Lower Green River - West	0311	Lead, Dissolved	µg/L		Acute	hardness-dependent	25.0	4	0.1250	0.0500	0.1000	0.2000	0.0076	0.0060	0.0119	0.0060	0.0060	0.0062	0.0077	0.0110	0	0
Lower Green River - West	0311	Lead, Dissolved	µg/L		Chronic	hardness-dependent	25.0	4	0.1250	0.0500	0.1000	0.2000	0.1938	0.1546	0.3046	0.1547	0.1551	0.1580	0.1967	0.2830	0	0
Lower Green River - West	0311	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	1	28.0000	-	28.0000	28.0000	0.0119	0.0119	0.0119	0.0119	0.0119	0.0119	0.0119	0.0119	0	0
Lower Green River - West	0311	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	1	28.0000	-	28.0000	28.0000	0.0596	0.0596	0.0596	0.0596	0.0596	0.0596	0.0596	0.0596	0	0
Lower Green River - West	0311	Mercury, Total	µg/L	2.1	Acute	None	0.0	6	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Lower Green River - West	0311	Mercury, Total	µg/L	1.302	Chronic	None	0.0	6	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Lower Green River - West	0311	Molybdenum, Dissolved	µg/L	35000	Acute	None	0.0	4	0.2500	0.0000	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	0311	Molybdenum, Dissolved	µg/L	2250	Chronic	None	0.0	4	0.2500	0.0000	0.2500	0.2500	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Lower Green River - West	0311	Nickel, Dissolved	µg/L		Acute	hardness-dependent	50.0	4	0.2325	0.0954	0.1500	0.3200	0.0014	0.0009	0.0019	0.0009	0.0009	0.0014	0.0019	0.0019	0	0
Lower Green River - West	0311	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	50.0	4	0.2325	0.0954	0.1500	0.3200	0.0127	0.0081	0.0173	0.0082	0.0082	0.0127	0.0172	0.0173	0	0
Lower Green River - West	0311	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	53	389.1887	153.7285	111.0000	779.0000	0.0005	0.0001	0.0009	0.0002	0.0003	0.0004	0.0006	0.0008	0	0
Lower Green River - West	0311	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	53	389.1887	153.7285	111.0000	779.0000	0.0473	0.0135	0.0947	0.0229	0.0322	0.0439	0.0574	0.0817	0	0
Lower Green River - West	0311	Selenium, Total	µg/L	20	Acute	None	0.0	6	0.7500	0.0000	0.7500	0.7500	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Lower Green River - West	0311	Selenium, Total	µg/L	5	Chronic	None	0.0	6	0.7500	0.0000	0.7500	0.7500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Lower Green River - West	0311	TSS	mg/L	244	Acute	None	100.0	53	7.7366	6.5757	1.6000	38.5000	0.0317	0.0066	0.1578	0.0084	0.0168	0.0254	0.0352	0.0707	0	0
Lower Green River - West	0311	TSS	mg/L	22	Chronic	None	100.0	53	7.7366	6.5757	1.6000	38.5000	0.3517	0.0727	1.7500	0.0927	0.1864	0.2818	0.3909	0.7845	0	2
Lower Green River - West	0311	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	4	0.5300	0.0141	0.5200	0.5500	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007	0.0008	0	0
Lower Green River - West	0311	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	4	0.5300	0.0141	0.5200	0.5500	0.0013	0.0013	0.0014	0.0013	0.0013	0.0013	0.0013	0.0014	0	0
Lower Green River - West	0311	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	4	3.7675	3.0905	0.8900	6.4500	0.0917	0.0216	0.1604	0.0230	0.0289	0.0924	0.1552	0.1594	0	0
Lower Green River - West	0311	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	4	3.7675	3.0905	0.8900	6.4500	0.0910	0.0214	0.1591	0.0228	0.0287	0.0917	0.1540	0.1581	0	0
Lower Green River - West	A310_3106	2,4-D	µg/L	700	Acute	None	0.0	14	0.0143	0.0051	0.0080	0.0205	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	2,4-D	µg/L	50	Chronic	None	0.0	14	0.0143	0.0051	0.0080	0.0205	0.0003	0.0002	0.0004	0.0002	0.0002	0.0003	0.0004	0.0004	0	0
Lower Green River - West	A310_3106	4-Methylphenol	µg/L	700	Acute	None	0.0	12	0.1300	0.0052	0.1250	0.1400	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Lower Green River - West	A310_3106	4-Methylphenol	µg/L	140	Chronic	None	0.0	12	0.1300	0.0052	0.1250	0.1400	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010	0	0
Lower Green River - West	A310_3106	Acenaphthene	µg/L	30	Acute	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Lower Green River - West	A310_3106	Acenaphthene	µg/L	6	Chronic	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0009	0.0008	0.0009	0.0008	0.0008	0.0008	0.0009	0.0009	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Lower Green River - West	A310_3106	Aluminum, Total	µg/L	750	Acute	None	100.0	100	367.5320	350.7715	11.8000	2030.0000	0.4900	0.0157	2.7067	0.0796	0.1970	0.3867	0.6133	1.2256	0	8
Lower Green River - West	A310_3106	Aluminum, Total	µg/L	87	Chronic	None	100.0	100	367.5320	350.7715	11.8000	2030.0000	4.2245	0.1356	23.3333	0.6858	1.6983	3.3333	5.2874	10.5655	0	89
Lower Green River - West	A310_3106	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	94.4	160	0.0327	0.0240	0.0050	0.1410	0.0014	0.0002	0.0077	0.0003	0.0007	0.0010	0.0017	0.0036	0	0
Lower Green River - West	A310_3106	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	94.4	160	0.0327	0.0240	0.0050	0.1410	0.0156	0.0023	0.0637	0.0024	0.0079	0.0115	0.0212	0.0390	0	0
Lower Green River - West	A310_3106	Anthracene	µg/L	0.635	Acute	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0081	0.0075	0.0087	0.0075	0.0078	0.0079	0.0087	0.0087	0	0
Lower Green River - West	A310_3106	Anthracene	µg/L	0.127	Chronic	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0403	0.0374	0.0433	0.0377	0.0390	0.0394	0.0433	0.0433	0	0
Lower Green River - West	A310_3106	Antimony, Dissolved	µg/L	88	Acute	None	8.8	113	0.2318	0.0590	0.0240	0.2500	0.0026	0.0003	0.0028	0.0005	0.0028	0.0028	0.0028	0.0028	0	0
Lower Green River - West	A310_3106	Antimony, Dissolved	µg/L	30	Chronic	None	8.8	113	0.2318	0.0590	0.0240	0.2500	0.0077	0.0008	0.0083	0.0016	0.0083	0.0083	0.0083	0.0083	0	0
Lower Green River - West	A310_3106	Arsenic, Dissolved	µg/L	360	Acute	None	76.7	116	0.5114	0.1664	0.2500	0.8500	0.0014	0.0007	0.0024	0.0007	0.0012	0.0015	0.0017	0.0022	0	0
Lower Green River - West	A310_3106	Arsenic, Dissolved	µg/L	190	Chronic	None	76.7	116	0.5114	0.1664	0.2500	0.8500	0.0027	0.0013	0.0045	0.0013	0.0023	0.0028	0.0033	0.0042	0	0
Lower Green River - West	A310_3106	Barium, Dissolved	µg/L	7250	Acute	None	100.0	113	2.4829	0.7769	1.0700	5.0000	0.0003	0.0001	0.0007	0.0002	0.0003	0.0003	0.0004	0.0005	0	0
Lower Green River - West	A310_3106	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	113	2.4829	0.7769	1.0700	5.0000	0.0017	0.0007	0.0034	0.0010	0.0013	0.0017	0.0019	0.0027	0	0
Lower Green River - West	A310_3106	Benzo(a)pyrene	µg/L	0.75	Acute	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0068	0.0063	0.0073	0.0064	0.0066	0.0067	0.0073	0.0073	0	0
Lower Green River - West	A310_3106	Benzo(a)pyrene	µg/L	0.15	Chronic	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0342	0.0317	0.0367	0.0319	0.0330	0.0333	0.0367	0.0367	0	0
Lower Green River - West	A310_3106	Benzo(b)fluoranthene	µg/L	512	Acute	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Lower Green River - West	A310_3106	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0073	0.0068	0.0079	0.0068	0.0071	0.0071	0.0079	0.0079	0	0
Lower Green River - West	A310_3106	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	0.0	15	0.0051	0.0003	0.0048	0.0055	0.0366	0.0339	0.0393	0.0342	0.0354	0.0357	0.0393	0.0393	0	0
Lower Green River - West	A310_3106	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	15	0.7983	0.3518	0.3340	1.4100	0.0020	0.0008	0.0035	0.0008	0.0014	0.0020	0.0026	0.0033	0	0
Lower Green River - West	A310_3106	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	15	0.7983	0.3518	0.3340	1.4100	0.0022	0.0009	0.0039	0.0009	0.0016	0.0022	0.0029	0.0037	0	0
Lower Green River - West	A310_3106	Butylbenzylphthalate	µg/L	390	Acute	None	100.0	15	0.0637	0.0328	0.0240	0.1220	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0002	0.0003	0	0
Lower Green River - West	A310_3106	Butylbenzylphthalate	µg/L	60	Chronic	None	100.0	15	0.0637	0.0328	0.0240	0.1220	0.0011	0.0004	0.0020	0.0004	0.0006	0.0009	0.0015	0.0020	0	0
Lower Green River - West	A310_3106	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	117	0.0462	0.0126	0.0050	0.0500	0.0704	0.0047	0.1190	0.0084	0.0594	0.0772	0.0843	0.1014	0	0
Lower Green River - West	A310_3106	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	117	0.0462	0.0126	0.0050	0.0500	0.4021	0.0310	0.6020	0.0471	0.3657	0.4411	0.4699	0.5367	0	0
Lower Green River - West	A310_3106	Caffeine	µg/L	95000	Acute	None	40.0	15	0.0444	0.0686	0.0048	0.1980	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Caffeine	µg/L	19000	Chronic	None	40.0	15	0.0444	0.0686	0.0048	0.1980	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Carbazole	µg/L	465	Acute	None	0.0	15	0.0128	0.0006	0.0120	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Carbazole	µg/L	93	Chronic	None	0.0	15	0.0128	0.0006	0.0120	0.0140	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Lower Green River - West	A310_3106	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	16.2	117	0.2146	0.0863	0.0250	0.5600	0.0009	0.0002	0.0027	0.0005	0.0008	0.0009	0.0010	0.0016	0	0
Lower Green River - West	A310_3106	Chromium, Dissolved	µg/L	14.7	Acute	None	16.2	117	0.2146	0.0863	0.0250	0.5600	0.0146	0.0017	0.0381	0.0075	0.0136	0.0136	0.0136	0.0307	0	0
Lower Green River - West	A310_3106	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	16.2	117	0.2146	0.0863	0.0250	0.5600	0.0073	0.0012	0.0205	0.0040	0.0062	0.0071	0.0078	0.0124	0	0
Lower Green River - West	A310_3106	Chromium, Dissolved	µg/L	9.62	Chronic	None	16.2	117	0.2146	0.0863	0.0250	0.5600	0.0223	0.0026	0.0582	0.0114	0.0208	0.0208	0.0208	0.0470	0	0
Lower Green River - West	A310_3106	Chrysene	µg/L	0.35	Acute	None	0.0	15	0.0128	0.0006	0.0120	0.0140	0.0367	0.0343	0.0400	0.0343	0.0357	0.0371	0.0371	0.0400	0	0
Lower Green River - West	A310_3106	Chrysene	µg/L	0.07	Chronic	None	0.0	15	0.0128	0.0006	0.0120	0.0140	0.1833	0.1714	0.2000	0.1714	0.1786	0.1857	0.1857	0.2000	0	0
Lower Green River - West	A310_3106	Cobalt, Dissolved	µg/L	660	Acute	None	10.3	116	0.1074	0.1006	0.0260	1.1200	0.0002	0.0000	0.0017	0.0001	0.0002	0.0002	0.0002	0.0002	0	0
Lower Green River - West	A310_3106	Cobalt, Dissolved	µg/L	132	Chronic	None	10.3	116	0.1074	0.1006	0.0260	1.1200	0.0008	0.0002	0.0085	0.0004	0.0008	0.0008	0.0008	0.0008	0	0
Lower Green River - West	A310_3106	Copper, Dissolved	µg/L		Acute	hardness-dependent	91.5	117	0.7217	0.3756	0.2000	2.9400	0.1577	0.0313	0.7115	0.0522	0.0996	0.1387	0.1994	0.2872	0	0
Lower Green River - West	A310_3106	Copper, Dissolved	µg/L		Chronic	hardness-dependent	91.5	117	0.7217	0.3756	0.2000	2.9400	0.2137	0.0439	0.9567	0.0700	0.1380	0.1889	0.2691	0.3860	0	0
Lower Green River - West	A310_3106	Diazinon	µg/L	0.0963	Acute	None	0.0	15	0.0234	0.0053	0.0205	0.0420	0.2426	0.2129	0.4361	0.2129	0.2233	0.2285	0.2336	0.3053	0	0
Lower Green River - West	A310_3106	Dichloroprop	µg/L	250	Acute	None	0.0	14	0.0102	0.0035	0.0055	0.0165	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Lower Green River - West	A310_3106	Dichloroprop	µg/L	50	Chronic	None	0.0	14	0.0102	0.0035	0.0055	0.0165	0.0002	0.0001	0.0003	0.0001	0.0002	0.0002	0.0002	0.0003	0	0
Lower Green River - West	A310_3106	Diethyl Phthalate	µg/L	6000	Acute	None	93.3	15	0.0303	0.0170	0.0050	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Diethyl Phthalate	µg/L	1200	Chronic	None	93.3	15	0.0303	0.0170	0.0050	0.0665	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Dimethyl Phthalate	µg/L	14500	Acute	None	16.7	12	0.0113	0.0143	0.0050	0.0432	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Dimethyl Phthalate	µg/L	2900	Chronic	None	16.7	12	0.0113	0.0143	0.0050	0.0432	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Di-N-Butyl Phthalate	µg/L	240	Acute	None	100.0	15	0.0811	0.0318	0.0400	0.1600	0.0003	0.0002	0.0007	0.0002	0.0003	0.0003	0.0004	0.0005	0	0
Lower Green River - West	A310_3106	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	100.0	15	0.0811	0.0318	0.0400	0.1600	0.0017	0.0008	0.0033	0.0008	0.0013	0.0015	0.0020	0.0027	0	0
Lower Green River - West	A310_3106	Di-N-Octyl Phthalate	µg/L	60	Acute	None	8.3	12	0.0075	0.0078	0.0050	0.0323	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Lower Green River - West	A310_3106	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	8.3	12	0.0075	0.0078	0.0050	0.0323	0.0006	0.0004	0.0027	0.0004	0.0004	0.0004	0.0005	0.0015	0	0
Lower Green River - West	A310_3106	Endosulfan	µg/L	0.22	Acute	None	0.0	15	0.0025	0.0001	0.0024	0.0028	0.0115	0.0107	0.0127	0.0110	0.0114	0.0114	0.0117	0.0123	0	0
Lower Green River - West	A310_3106	Endosulfan	µg/L	0.056	Chronic	None	0.0	15	0.0025	0.0001	0.0024	0.0028	0.0454	0.0420	0.0500	0.0432	0.0446	0.0446	0.0460	0.0481	0	0
Lower Green River - West	A310_3106	Fluoranthene	µg/L	18	Acute	None	26.7	15	0.0075	0.0042	0.0048	0.0180	0.0004	0.0003	0.0010	0.0003	0.0003	0.0003	0.0005	0.0008	0	0
Lower Green River - West	A310_3106	Fluoranthene	µg/L	3.55	Chronic	None	26.7	15	0.0075	0.0042	0.0048	0.0180	0.0021	0.0013	0.0051	0.0013	0.0014	0.0015	0.0025	0.0041	0	0
Lower Green River - West	A310_3106	Iron, Total	µg/L		Acute	None	100.0	114	793.1053	426.4110	309.0000	3240.0000	-	-	-	-	-	-	-	-	0	0
Lower Green River - West	A310_3106	Iron, Total	µg/L	1000	Chronic	None	100.0	114	793.1053	426.4110	309.0000	3240.0000	0.7931	0.3090	3.2400	0.3906	0.5210	0.6890	0.9108	1.5005	0	21
Lower Green River - West	A310_3106	Isophorone	µg/L	60000	Acute	None	8.3	12	0.0070	0.0060	0.0050	0.0260	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Isophorone	µg/L	12000	Chronic	None	8.3	12	0.0070	0.0060	0.0050	0.0260	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Lead, Dissolved	µg/L		Acute	hardness-dependent	7.7	117	0.1037	0.0563	0.0125	0.4700	0.0058	0.0004	0.0250	0.0021	0.0043	0.0056	0.0063	0.0091	0	0
Lower Green River - West	A310_3106	Lead, Dissolved	µg/L		Chronic	hardness-dependent	7.7	117	0.1037	0.0563	0.0125	0.4700	0.1487	0.0102	0.6422	0.0533	0.1094	0.1441	0.1621	0.2326	0	0
Lower Green River - West	A310_3106	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	99	29.3012	23.0756	6.8300	111.0000	0.0125	0.0029	0.0472	0.0038	0.0060	0.0082	0.0146	0.0318	0	0
Lower Green River - West	A310_3106	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	99	29.3012	23.0756	6.8300	111.0000	0.0623	0.0145	0.2362	0.0189	0.0302	0.0409	0.0729	0.1591	0	0
Lower Green River - West	A310_3106	Mercury, Total	µg/L	2.1	Acute	None	11.5	122	0.0203	0.0376	0.0007	0.1000	0.0097	0.0003	0.0476	0.0011	0.0012	0.0012	0.0012	0.0476	0	0
Lower Green River - West	A310_3106	Mercury, Total	µg/L	1.302	Chronic	None	11.5	122	0.0203	0.0376	0.0007	0.1000	0.0156	0.0005	0.0768	0.0018	0.0019	0.0019	0.0019	0.0768	0	0
Lower Green River - West	A310_3106	Molybdenum, Dissolved	µg/L	35000	Acute	None	10.3	116	0.2489	0.0608	0.1070	0.7200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Lower Green River - West	A310_3106	Molybdenum, Dissolved	µg/L	2250	Chronic	None	10.3	116	0.2489	0.0608	0.1070	0.7200	0.0001	0.0000	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Lower Green River - West	A310_3106	Naphthalene	µg/L	500	Acute	None	13.3	15	0.0151	0.0060	0.0120	0.0330	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Lower Green River - West	A310_3106	Naphthalene	µg/L	100	Chronic	None	13.3	15	0.0151	0.0060	0.0120	0.0330	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Lower Green River - West	A310_3106	Nickel, Dissolved	µg/L		Acute	hardness-dependent	85.5	117	0.3979	0.1747	0.1400	1.5000	0.0022	0.0009	0.0084	0.0010	0.0016	0.0020	0.0025	0.0037	0	0
Lower Green River - West	A310_3106	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	85.5	117	0.3979	0.1747	0.1400	1.5000	0.0196	0.0078	0.0758	0.0087	0.0147	0.0184	0.0229	0.0333	0	0
Lower Green River - West	A310_3106	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	160	441.5875	187.7637	105.0000	918.0000	0.0005	0.0001	0.0011	0.0002	0.0003	0.0005	0.0007	0.0010	0	0
Lower Green River - West	A310_3106	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	160	441.5875	187.7637	105.0000	918.0000	0.0537	0.0128	0.1116	0.0242	0.0344	0.0523	0.0690	0.1042	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Lower Green River - West	A310_3106	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	0.0	15	0.1483	0.1726	0.0600	0.4900	0.0141	0.0038	0.0508	0.0046	0.0056	0.0075	0.0082	0.0501	0	0
Lower Green River - West	A310_3106	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	0.0	15	0.1483	0.1726	0.0600	0.4900	0.0184	0.0049	0.0662	0.0060	0.0073	0.0098	0.0107	0.0653	0	0
Lower Green River - West	A310_3106	Phenanthrene	µg/L	29.82	Acute	None	26.7	15	0.0072	0.0037	0.0048	0.0170	0.0002	0.0002	0.0006	0.0002	0.0002	0.0002	0.0003	0.0005	0	0
Lower Green River - West	A310_3106	Phenanthrene	µg/L	6.325	Chronic	None	26.7	15	0.0072	0.0037	0.0048	0.0170	0.0011	0.0008	0.0027	0.0008	0.0008	0.0009	0.0013	0.0021	0	0
Lower Green River - West	A310_3106	Phenol	µg/L	22.5	Acute	None	0.0	15	0.0899	0.0786	0.0495	0.2450	0.0040	0.0022	0.0109	0.0022	0.0022	0.0024	0.0024	0.0107	0	0
Lower Green River - West	A310_3106	Phenol	µg/L	4.5	Chronic	None	0.0	15	0.0899	0.0786	0.0495	0.2450	0.0200	0.0110	0.0544	0.0110	0.0111	0.0122	0.0122	0.0537	0	0
Lower Green River - West	A310_3106	Pyrene	µg/L	45.45	Acute	None	20.0	15	0.0067	0.0033	0.0048	0.0160	0.0001	0.0001	0.0004	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Lower Green River - West	A310_3106	Pyrene	µg/L	9.09	Chronic	None	20.0	15	0.0067	0.0033	0.0048	0.0160	0.0007	0.0005	0.0018	0.0005	0.0005	0.0006	0.0006	0.0015	0	0
Lower Green River - West	A310_3106	Selenium, Total	µg/L	20	Acute	None	0.0	122	0.7090	0.1377	0.2500	0.7500	0.0355	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Lower Green River - West	A310_3106	Selenium, Total	µg/L	5	Chronic	None	0.0	122	0.7090	0.1377	0.2500	0.7500	0.1418	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Lower Green River - West	A310_3106	Strontium, Dissolved	µg/L	80	Acute	None	100.0	4	19.1500	0.6403	18.7000	20.1000	0.2394	0.2338	0.2513	0.2341	0.2356	0.2363	0.2400	0.2490	0	0
Lower Green River - West	A310_3106	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	4	19.1500	0.6403	18.7000	20.1000	0.3908	0.3816	0.4102	0.3822	0.3847	0.3857	0.3918	0.4065	0	0
Lower Green River - West	A310_3106	TSS	mg/L	244	Acute	None	100.0	160	10.9031	12.0457	1.2000	96.3000	0.0447	0.0049	0.3947	0.0098	0.0207	0.0307	0.0486	0.1160	0	0
Lower Green River - West	A310_3106	TSS	mg/L	22	Chronic	None	100.0	160	10.9031	12.0457	1.2000	96.3000	0.4956	0.0545	4.3773	0.1089	0.2299	0.3409	0.5386	1.2868	0	12
Lower Green River - West	A310_3106	Vanadium, Dissolved	µg/L	725	Acute	None	98.2	113	0.5366	0.1224	0.1500	0.8800	0.0007	0.0002	0.0012	0.0004	0.0007	0.0007	0.0009	0.0010	0	0
Lower Green River - West	A310_3106	Vanadium, Dissolved	µg/L	400	Chronic	None	98.2	113	0.5366	0.1224	0.1500	0.8800	0.0013	0.0004	0.0022	0.0008	0.0012	0.0014	0.0016	0.0017	0	0
Lower Green River - West	A310_3106	Zinc, Dissolved	µg/L		Acute	hardness-dependent	82.1	117	1.6990	2.1156	0.2500	16.9000	0.0373	0.0040	0.3841	0.0053	0.0131	0.0252	0.0445	0.1052	0	0
Lower Green River - West	A310_3106	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	82.1	117	1.6990	2.1156	0.2500	16.9000	0.0370	0.0040	0.3810	0.0052	0.0130	0.0250	0.0441	0.1044	0	0
Lower Green River - West	EC09A080	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	71.4	56	0.0249	0.0203	0.0050	0.1000	0.0015	0.0002	0.0057	0.0003	0.0005	0.0012	0.0023	0.0036	0	0
Lower Green River - West	EC09A080	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	71.4	56	0.0249	0.0203	0.0050	0.1000	0.0128	0.0022	0.0453	0.0022	0.0024	0.0087	0.0190	0.0335	0	0
Lower Green River - West	EC09A080	Arsenic, Dissolved	ug/L	360	Acute	None	100.0	6	0.6917	0.1729	0.3900	0.8900	0.0019	0.0011	0.0025	0.0013	0.0018	0.0019	0.0022	0.0024	0	0
Lower Green River - West	EC09A080	Arsenic, Dissolved	ug/L	190	Chronic	None	100.0	6	0.6917	0.1729	0.3900	0.8900	0.0036	0.0021	0.0047	0.0024	0.0035	0.0037	0.0042	0.0046	0	0
Lower Green River - West	EC09A080	Cadmium, Dissolved	ug/L		Acute	hardness-dependent	0.0	6	0.0233	0.0207	0.0100	0.0500	0.0379	0.0099	0.1284	0.0099	0.0105	0.0138	0.0423	0.1091	0	0
Lower Green River - West	EC09A080	Cadmium, Dissolved	ug/L		Chronic	hardness-dependent	0.0	6	0.0233	0.0207	0.0100	0.0500	0.2093	0.0641	0.6357	0.0643	0.0670	0.0814	0.2687	0.5589	0	0
Lower Green River - West	EC09A080	Chromium, Dissolved	ug/L	14.7	Acute	hardness-dependent	66.7	6	0.3833	0.2322	0.1250	0.7100	0.0014	0.0006	0.0023	0.0007	0.0010	0.0013	0.0017	0.0021	0	0
Lower Green River - West	EC09A080	Chromium, Dissolved	ug/L	14.7	Acute	None	66.7	6	0.3833	0.2322	0.1250	0.7100	0.0261	0.0085	0.0483	0.0085	0.0127	0.0269	0.0352	0.0456	0	0
Lower Green River - West	EC09A080	Chromium, Dissolved	ug/L	9.62	Chronic	hardness-dependent	66.7	6	0.3833	0.2322	0.1250	0.7100	0.0105	0.0044	0.0174	0.0050	0.0076	0.0103	0.0128	0.0164	0	0
Lower Green River - West	EC09A080	Chromium, Dissolved	ug/L	9.62	Chronic	None	66.7	6	0.3833	0.2322	0.1250	0.7100	0.0398	0.0130	0.0738	0.0130	0.0194	0.0411	0.0538	0.0696	0	0
Lower Green River - West	EC09A080	Copper, Dissolved	ug/L		Acute	hardness-dependent	100.0	6	0.5850	0.2960	0.3600	1.1100	0.1156	0.0522	0.1751	0.0530	0.0603	0.1192	0.1703	0.1745	0	0
Lower Green River - West	EC09A080	Copper, Dissolved	ug/L		Chronic	hardness-dependent	100.0	6	0.5850	0.2960	0.3600	1.1100	0.1576	0.0736	0.2334	0.0746	0.0844	0.1652	0.2295	0.2327	0	0
Lower Green River - West	EC09A080	Lead, Dissolved	ug/L		Acute	hardness-dependent	83.3	6	0.1515	0.2136	0.0100	0.5500	0.0078	0.0003	0.0316	0.0005	0.0011	0.0028	0.0073	0.0258	0	0
Lower Green River - West	EC09A080	Lead, Dissolved	ug/L		Chronic	hardness-dependent	83.3	6	0.1515	0.2136	0.0100	0.5500	0.2005	0.0086	0.8101	0.0130	0.0292	0.0713	0.1875	0.6614	0	0
Lower Green River - West	EC09A080	Mercury, Total	ug/L	2.1	Acute	None	66.7	6	0.0032	0.0018	0.0010	0.0058	0.0015	0.0005	0.0028	0.0006	0.0010	0.0014	0.0021	0.0026	0	0
Lower Green River - West	EC09A080	Mercury, Total	ug/L	1.302	Chronic	None	66.7	6	0.0032	0.0018	0.0010	0.0058	0.0025	0.0008	0.0045	0.0010	0.0016	0.0022	0.0034	0.0043	0	0
Lower Green River - West	EC09A080	Nickel, Dissolved	ug/L		Acute	hardness-dependent	100.0	6	0.3817	0.0962	0.2500	0.5400	0.0019	0.0013	0.0024	0.0013	0.0015	0.0020	0.0022	0.0023	0	0
Lower Green River - West	EC09A080	Nickel, Dissolved	ug/L		Chronic	hardness-dependent	100.0	6	0.3817	0.0962	0.2500	0.5400	0.0169	0.0119	0.0215	0.0121	0.0136	0.0178	0.0198	0.0211	0	0
Lower Green River - West	EC09A080	Nitrite+Nitrate-Nitrogen	ug/L	827900	Acute	None	100.0	56	359.2500	142.2182	135.0000	778.0000	0.0004	0.0002	0.0009	0.0002	0.0003	0.0004	0.0005	0.0008	0	0
Lower Green River - West	EC09A080	Nitrite+Nitrate-Nitrogen	ug/L	8225	Chronic	None	100.0	56	359.2500	142.2182	135.0000	778.0000	0.0437	0.0164	0.0946	0.0228	0.0323	0.0389	0.0528	0.0776	0	0
Lower Green River - West	EC09A080	TSS	mg/L	244	Acute	None	100.0	55	13.3636	11.8655	2.0000	71.0000	0.0548	0.0082	0.2910	0.0111	0.0266	0.0369	0.0656	0.1443	0	0
Lower Green River - West	EC09A080	TSS	mg/L	22	Chronic	None	100.0	55	13.3636	11.8655	2.0000	71.0000	0.6074	0.0909	3.2273	0.1227	0.2955	0.4091	0.7273	1.6000	0	7
Lower Green River - West	EC09A080	Zinc, Dissolved	ug/L		Acute	hardness-dependent	50.0	6	2.2167	2.8435	0.5000	7.8000	0.0403	0.0078	0.1231	0.0078	0.0105	0.0236	0.0492	0.1063	0	0
Lower Green River - West	EC09A080	Zinc, Dissolved	ug/L		Chronic	hardness-dependent	50.0	6	2.2167	2.8435	0.5000	7.8000	0.0400	0.0077	0.1221	0.0078	0.0104	0.0234	0.0488	0.1054	0	0
Lower Green River - West	G319	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	96.2	26	0.0265	0.0213	0.0050	0.0882	0.0010	0.0002	0.0028	0.0003	0.0005	0.0007	0.0013	0.0026	0	0
Lower Green River - West	G319	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	96.2	26	0.0265	0.0213	0.0050	0.0882	0.0130	0.0023	0.0424	0.0047	0.0065	0.0093	0.0148	0.0389	0	0
Lower Green River - West	G319	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	26	352.0000	149.8212	109.0000	699.0000	0.0004	0.0001	0.0008	0.0002	0.0003	0.0004	0.0006	0.0008	0	0
Lower Green River - West	G319	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	26	352.0000	149.8212	109.0000	699.0000	0.0428	0.0133	0.0850	0.0195	0.0304	0.0384	0.0558	0.0767	0	0
Lower Green River - West	G319	TSS	mg/L	244	Acute	None	100.0	26	4.7892	2.7865	1.8000	11.9000	0.0196	0.0074	0.0488	0.0083	0.0101	0.0166	0.0241	0.0443	0	0
Lower Green River - West	G319	TSS	mg/L	22	Chronic	None	100.0	26	4.7892	2.7865	1.8000	11.9000	0.2177	0.0818	0.5409	0.0916	0.1119	0.1841	0.2670	0.4909	0	0
Lower Green River - West	MULLEN1	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.0200	0.0085	0.0140	0.0260	0.0010	0.0007	0.0013	0.0008	0.0009	0.0010	0.0012	0.0013	0	0
Lower Green River - West	MULLEN1	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.0200	0.0085	0.0140	0.0260	0.0089	0.0061	0.0117	0.0064	0.0075	0.0089	0.0103	0.0114	0	0
Lower Green River - West	MULLEN1	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	792.0000	322.4407	564.0000	1020.0000	0.0010	0.0007	0.0012	0.0007	0.0008	0.0010	0.0011	0.0012	0	0
Lower Green River - West	MULLEN1	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	792.0000	322.4407	564.0000	1020.0000	0.0963	0.0686	0.1240	0.0713	0.0824	0.0963	0.1102	0.1212	0	0
Lower Green River - West	MULLEN2	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	50.0	2	0.0085	0.0049	0.0050	0.0120	0.0004	0.0003	0.0006	0.0003	0.0003	0.0004	0.0005	0.0006	0	0
Lower Green River - West	MULLEN2	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	50.0	2	0.0085	0.0049	0.0050	0.0120	0.0038	0.0022	0.0054	0.0023	0.0030	0.0038	0.0046	0.0052	0	0
Lower Green River - West	MULLEN2	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	611.0000	159.8061	498.0000	724.0000	0.0007	0.0006	0.0009	0.0006	0.0007	0.0007	0.0008	0.0009	0	0
Lower Green River - West	MULLEN2	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	611.0000	159.8061	498.0000	724.0000	0.0743	0.0605	0.0880	0.0619	0.0674	0.0743	0.0812	0.0867	0	0
Lower Green River - West	MULLEN3	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.1315	0.1450	0.0289	0.2340	0.0052	0.0015	0.0089	0.0019	0.0033	0.0052	0.0070	0.0085	0	0
Lower Green River - West	MULLEN3	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.1315	0.1450	0.0289	0.2340	0.0591	0.0126	0.1055	0.0173	0.0358	0.0591	0.0823	0.1009	0	0
Lower Green River - West	MULLEN3	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	455.0000	210.7178	306.0000	604.0000	0.0005	0.0004	0.0007	0.0004	0.0005	0.0005	0.0006	0.0007	0	0
Lower Green River - West	MULLEN3	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	455.0000	210.7178	306.0000	604.0000	0.0553	0.0372	0.0734	0.0390	0.0463	0.0553	0.0644	0.0716	0	0
Lower Green River - West	MULLEN4	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.0217	0.0038	0.0190	0.0244	0.0011	0.0010	0.0013	0.0010	0.0010	0.0011	0.0012	0.0012	0	0
Lower Green River - West	MULLEN4	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.0217	0.0038	0.0190	0.0244	0.0096	0.0083	0.0110	0.0084	0.0090	0.0096	0.0103	0.0109	0	0
Lower Green River - West	MULLEN4	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	2220.0000	84.8528	2160.0000	2280.0000	0.0027	0.0026	0.0028	0.0026	0.0026	0.0027	0.0027	0.0027	0	0
Lower Green River - West	MULLEN4	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	2220.0000	84.8528	2160.0000	2280.0000	0.2699	0.2626	0.2772	0.2633	0.2663	0.2699	0.2736	0.2765	0	0
Lower Green River - West	MULLEN5	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.1475	0.0318	0.1250	0.1700	0.0068	0.0049	0.0087	0.0051	0.0059	0.0068	0.0078	0.0086	0	0
Lower Green River - West	MULLEN5	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.1475	0.0318	0.1250	0.1700	0.0656	0.0546	0.0766	0.0557	0.0601	0.0656	0.0711	0.0755	0	0
Lower Green River - West	MULLEN5	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	50.0	2	72.0000	87.6812	10.0000	134.0000	0.0001	0.0000	0.0002	0.0000	0.0000	0.0001	0.0001	0.0002	0	0
Lower Green River - West	MULLEN5	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	50.0	2	72.0000	87.6812	10.0000	134.0000	0.0088	0.0012	0.0163	0.0020	0.0050	0.0088	0.0125	0.0155	0	0
Lower Green River - West	MULLEN6	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.0440	0.0269	0.0250	0.0630	0.0023	0.0013	0.0032	0.0014	0.0018	0.0023	0.0028	0.0031	0	0
Lower Green River - West	MULLEN6	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.0440	0.0269	0.0250	0.0630	0.0194	0.0113	0.0275	0.0121	0.0153	0.0194	0.0234	0.0267	0	0
Lower Green River - West	MULLEN6	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	417.0000	60.8112	374.0000	460.0000	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0005	0.0006	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Lower Green River - West	MULLEN6	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	417.0000	60.8112	374.0000	460.0000	0.0507	0.0455	0.0559	0.0460	0.0481	0.0507	0.0533	0.0554	0	0
Lower Green River - West	MULLEN7	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.0282	0.0130	0.0190	0.0374	0.0015	0.0010	0.0019	0.0010	0.0012	0.0015	0.0017	0.0019	0	0
Lower Green River - West	MULLEN7	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.0282	0.0130	0.0190	0.0374	0.0126	0.0083	0.0168	0.0087	0.0104	0.0126	0.0147	0.0164	0	0
Lower Green River - West	MULLEN7	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	313.0000	97.5807	244.0000	382.0000	0.0004	0.0003	0.0005	0.0003	0.0003	0.0004	0.0004	0.0005	0	0
Lower Green River - West	MULLEN7	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	313.0000	97.5807	244.0000	382.0000	0.0381	0.0297	0.0464	0.0305	0.0339	0.0381	0.0422	0.0456	0	0
Lower Green River - West	MULLEN8	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	2	0.0130	0.0028	0.0110	0.0150	0.0007	0.0006	0.0008	0.0006	0.0006	0.0007	0.0007	0.0008	0	0
Lower Green River - West	MULLEN8	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	2	0.0130	0.0028	0.0110	0.0150	0.0058	0.0048	0.0068	0.0049	0.0053	0.0058	0.0063	0.0067	0	0
Lower Green River - West	MULLEN8	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	2	1254.5000	446.1844	939.0000	1570.0000	0.0015	0.0011	0.0019	0.0012	0.0013	0.0015	0.0017	0.0019	0	0
Lower Green River - West	MULLEN8	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	2	1254.5000	446.1844	939.0000	1570.0000	0.1525	0.1142	0.1909	0.1180	0.1333	0.1525	0.1717	0.1870	0	0
Middle Green River	0321	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	72	0.0906	0.0527	0.0160	0.2700	0.0054	0.0011	0.0237	0.0016	0.0033	0.0045	0.0073	0.0104	0	0
Middle Green River	0321	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	72	0.0906	0.0527	0.0160	0.2700	0.0423	0.0075	0.1242	0.0132	0.0239	0.0356	0.0582	0.0801	0	0
Middle Green River	0321	Antimony, Dissolved	µg/L	88	Acute	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0	0
Middle Green River	0321	Antimony, Dissolved	µg/L	30	Chronic	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0	0
Middle Green River	0321	Arsenic, Dissolved	µg/L	360	Acute	None	78.6	14	0.5350	0.1621	0.2500	0.7100	0.0015	0.0007	0.0020	0.0007	0.0015	0.0016	0.0018	0.0019	0	0
Middle Green River	0321	Arsenic, Dissolved	µg/L	190	Chronic	None	78.6	14	0.5350	0.1621	0.2500	0.7100	0.0028	0.0013	0.0037	0.0013	0.0028	0.0031	0.0033	0.0036	0	0
Middle Green River	0321	Barium, Dissolved	µg/L	7250	Acute	None	100.0	14	2.6164	0.6046	1.9400	4.1700	0.0004	0.0003	0.0006	0.0003	0.0003	0.0003	0.0004	0.0005	0	0
Middle Green River	0321	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	14	2.6164	0.6046	1.9400	4.1700	0.0018	0.0013	0.0029	0.0014	0.0016	0.0017	0.0019	0.0025	0	0
Middle Green River	0321	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	6.3	16	0.0613	0.0450	0.0500	0.2300	0.0697	0.0463	0.2758	0.0484	0.0515	0.0580	0.0598	0.1194	0	0
Middle Green River	0321	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	6.3	16	0.0613	0.0450	0.0500	0.2300	0.4338	0.3059	1.6934	0.3156	0.3299	0.3594	0.3675	0.7234	0	1
Middle Green River	0321	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	6.3	16	0.2150	0.0600	0.2000	0.4400	0.0008	0.0006	0.0016	0.0006	0.0006	0.0007	0.0007	0.0010	0	0
Middle Green River	0321	Chromium, Dissolved	µg/L	14.7	Acute	None	6.3	16	0.2150	0.0600	0.2000	0.4400	0.0146	0.0136	0.0299	0.0136	0.0136	0.0136	0.0136	0.0177	0	0
Middle Green River	0321	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	6.3	16	0.2150	0.0600	0.2000	0.4400	0.0058	0.0046	0.0125	0.0047	0.0050	0.0055	0.0057	0.0078	0	0
Middle Green River	0321	Chromium, Dissolved	µg/L	9.62	Chronic	None	6.3	16	0.2150	0.0600	0.2000	0.4400	0.0223	0.0208	0.0457	0.0208	0.0208	0.0208	0.0208	0.0270	0	0
Middle Green River	0321	Cobalt, Dissolved	µg/L	660	Acute	None	0.0	14	0.1000	0.0000	0.1000	0.1000	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Middle Green River	0321	Cobalt, Dissolved	µg/L	132	Chronic	None	0.0	14	0.1000	0.0000	0.1000	0.1000	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0	0
Middle Green River	0321	Copper, Dissolved	µg/L		Acute	hardness-dependent	81.3	16	0.7700	0.4423	0.2000	1.7000	0.1276	0.0272	0.2956	0.0284	0.0876	0.1170	0.1568	0.2660	0	0
Middle Green River	0321	Copper, Dissolved	µg/L		Chronic	hardness-dependent	81.3	16	0.7700	0.4423	0.2000	1.7000	0.1777	0.0386	0.4099	0.0401	0.1224	0.1636	0.2192	0.3693	0	0
Middle Green River	0321	Iron, Total	µg/L		Acute	None	100.0	16	701.0000	463.8228	190.0000	1860.0000	-	-	-	-	-	-	-	-	0	0
Middle Green River	0321	Iron, Total	µg/L	1000	Chronic	None	100.0	16	701.0000	463.8228	190.0000	1860.0000	0.7010	0.1900	1.8600	0.2740	0.4120	0.6195	0.6805	1.7625	0	2
Middle Green River	0321	Lead, Dissolved	µg/L		Acute	hardness-dependent	0.0	16	0.1000	0.0000	0.1000	0.1000	0.0039	0.0031	0.0048	0.0033	0.0035	0.0040	0.0042	0.0045	0	0
Middle Green River	0321	Lead, Dissolved	µg/L		Chronic	hardness-dependent	0.0	16	0.1000	0.0000	0.1000	0.1000	0.1002	0.0803	0.1232	0.0844	0.0906	0.1038	0.1075	0.1144	0	0
Middle Green River	0321	Mercury, Total	µg/L	2.1	Acute	None	0.0	16	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Middle Green River	0321	Mercury, Total	µg/L	1.302	Chronic	None	0.0	16	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Middle Green River	0321	Molybdenum, Dissolved	µg/L	35000	Acute	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Middle Green River	0321	Molybdenum, Dissolved	µg/L	2250	Chronic	None	0.0	14	0.2500	0.0000	0.2500	0.2500	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Middle Green River	0321	Nickel, Dissolved	µg/L		Acute	hardness-dependent	87.5	16	0.4606	0.1940	0.1500	0.9900	0.0020	0.0006	0.0045	0.0007	0.0017	0.0019	0.0022	0.0032	0	0
Middle Green River	0321	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	87.5	16	0.4606	0.1940	0.1500	0.9900	0.0180	0.0052	0.0408	0.0060	0.0153	0.0173	0.0201	0.0292	0	0
Middle Green River	0321	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	72	758.0000	134.7799	517.0000	1430.0000	0.0009	0.0006	0.0017	0.0007	0.0008	0.0009	0.0010	0.0012	0	0
Middle Green River	0321	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	72	758.0000	134.7799	517.0000	1430.0000	0.0922	0.0629	0.1739	0.0706	0.0841	0.0920	0.0974	0.1176	0	0
Middle Green River	0321	Selenium, Total	µg/L	20	Acute	None	0.0	15	0.7500	0.0000	0.7500	0.7500	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Middle Green River	0321	Selenium, Total	µg/L	5	Chronic	None	0.0	15	0.7500	0.0000	0.7500	0.7500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Middle Green River	0321	TSS	mg/L	244	Acute	None	100.0	72	8.1656	9.7760	0.7000	72.5000	0.0335	0.0029	0.2971	0.0058	0.0131	0.0256	0.0389	0.0906	0	0
Middle Green River	0321	TSS	mg/L	22	Chronic	None	100.0	72	8.1656	9.7760	0.7000	72.5000	0.3712	0.0318	3.2955	0.0641	0.1455	0.2841	0.4318	1.0043	0	4
Middle Green River	0321	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	14	0.8229	0.1214	0.6600	1.1000	0.0011	0.0009	0.0015	0.0009	0.0010	0.0011	0.0012	0.0014	0	0
Middle Green River	0321	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	14	0.8229	0.1214	0.6600	1.1000	0.0021	0.0017	0.0028	0.0017	0.0019	0.0021	0.0022	0.0026	0	0
Middle Green River	0321	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	16	1.4838	0.6842	0.7200	3.2700	0.0259	0.0106	0.0599	0.0129	0.0157	0.0261	0.0294	0.0468	0	0
Middle Green River	0321	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	16	1.4838	0.6842	0.7200	3.2700	0.0257	0.0105	0.0594	0.0128	0.0156	0.0259	0.0292	0.0465	0	0
Middle Green River	A319	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	53.7	54	0.0115	0.0109	0.0050	0.0626	0.0006	0.0002	0.0026	0.0002	0.0003	0.0004	0.0007	0.0012	0	0
Middle Green River	A319	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	53.7	54	0.0115	0.0109	0.0050	0.0626	0.0054	0.0021	0.0300	0.0022	0.0023	0.0048	0.0065	0.0107	0	0
Middle Green River	A319	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	54	316.9537	130.2398	66.5000	602.0000	0.0004	0.0001	0.0007	0.0002	0.0003	0.0004	0.0005	0.0007	0	0
Middle Green River	A319	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	54	316.9537	130.2398	66.5000	602.0000	0.0385	0.0081	0.0732	0.0166	0.0261	0.0364	0.0477	0.0669	0	0
Middle Green River	A319	TSS	mg/L	244	Acute	None	100.0	54	5.7698	10.2525	0.7000	64.2000	0.0236	0.0029	0.2631	0.0044	0.0063	0.0092	0.0168	0.1031	0	0
Middle Green River	A319	TSS	mg/L	22	Chronic	None	100.0	54	5.7698	10.2525	0.7000	64.2000	0.2623	0.0318	2.9182	0.0484	0.0693	0.1023	0.1868	1.1432	0	4
Middle Green River	A341	Aluminum, Total	µg/L	750	Acute	None	100.0	20	244.9200	245.9089	86.4000	848.0000	0.3266	0.1152	1.1307	0.1324	0.1593	0.1980	0.2513	1.0572	0	3
Middle Green River	A341	Aluminum, Total	µg/L	87	Chronic	None	100.0	20	244.9200	245.9089	86.4000	848.0000	2.8152	0.9931	9.7471	1.1416	1.3736	1.7069	2.1667	9.1138	0	19
Middle Green River	A341	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	12.5	16	0.0058	0.0023	0.0050	0.0130	0.0004	0.0003	0.0007	0.0003	0.0003	0.0003	0.0003	0.0006	0	0
Middle Green River	A341	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	12.5	16	0.0058	0.0023	0.0050	0.0130	0.0027	0.0023	0.0059	0.0023	0.0023	0.0023	0.0024	0.0050	0	0
Middle Green River	A341	Antimony, Dissolved	µg/L	88	Acute	None	40.0	20	0.1571	0.1169	0.0110	0.2500	0.0018	0.0001	0.0028	0.0001	0.0002	0.0028	0.0028	0.0028	0	0
Middle Green River	A341	Antimony, Dissolved	µg/L	30	Chronic	None	40.0	20	0.1571	0.1169	0.0110	0.2500	0.0052	0.0004	0.0083	0.0004	0.0006	0.0083	0.0083	0.0083	0	0
Middle Green River	A341	Arsenic, Dissolved	µg/L	360	Acute	None	0.0	20	0.1700	0.1005	0.0500	0.2500	0.0005	0.0001	0.0007	0.0001	0.0001	0.0007	0.0007	0.0007	0	0
Middle Green River	A341	Arsenic, Dissolved	µg/L	190	Chronic	None	0.0	20	0.1700	0.1005	0.0500	0.2500	0.0009	0.0003	0.0013	0.0003	0.0003	0.0013	0.0013	0.0013	0	0
Middle Green River	A341	Barium, Dissolved	µg/L	7250	Acute	None	100.0	17	6.5659	0.3903	6.1100	7.2200	0.0009	0.0008	0.0010	0.0008	0.0009	0.0009	0.0010	0.0010	0	0
Middle Green River	A341	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	17	6.5659	0.3903	6.1100	7.2200	0.0045	0.0042	0.0050	0.0042	0.0043	0.0046	0.0048	0.0049	0	0
Middle Green River	A341	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	20	0.0320	0.0226	0.0050	0.0500	0.0334	0.0038	0.0553	0.0046	0.0060	0.0468	0.0539	0.0552	0	0
Middle Green River	A341	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	20	0.0320	0.0226	0.0050	0.0500	0.2133	0.0263	0.3475	0.0306	0.0369	0.3084	0.3410	0.3470	0	0
Middle Green River	A341	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	40.0	20	0.1685	0.0417	0.0900	0.2000	0.0006	0.0003	0.0007	0.0003	0.0004	0.0006	0.0007	0.0007	0	0
Middle Green River	A341	Chromium, Dissolved	µg/L	14.7	Acute	None	40.0	20	0.1685	0.0417	0.0900	0.2000	0.0115	0.0061	0.0136	0.0061	0.0088	0.0136	0.0136	0.0136	0	0
Middle Green River	A341	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	40.0	20	0.1685	0.0417	0.0900	0.2000	0.0043	0.0021	0.0053	0.0026	0.0034	0.0046	0.0052	0.0053	0	0
Middle Green River	A341	Chromium, Dissolved	µg/L	9.62	Chronic	None	40.0	20	0.1685	0.0417	0.0900	0.2000	0.0175	0.0094	0.0208	0.0094	0.0135	0.0208	0.0208	0.0208	0	0
Middle Green River	A341	Cobalt, Dissolved	µg/L	660	Acute	None	40.0	20	0.0707	0.0372	0.0200	0.1000	0.0001	0.0000	0.0002	0.0000	0.0000	0.0002	0.0002	0.0002	0	0
Middle Green River	A341	Cobalt, Dissolved	µg/L	132	Chronic	None	40.0	20	0.0707	0.0372	0.0200	0.1000	0.0005	0.0002	0.0008	0.0002	0.0002	0.0008	0.0008	0.0008	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Middle Green River	A341	Copper, Dissolved	µg/L		Acute	hardness-dependent	40.0	20	0.2295	0.0875	0.1400	0.5000	0.0356	0.0220	0.0762	0.0236	0.0275	0.0316	0.0323	0.0681	0	0
Middle Green River	A341	Copper, Dissolved	µg/L		Chronic	hardness-dependent	40.0	20	0.2295	0.0875	0.1400	0.5000	0.0499	0.0308	0.1045	0.0330	0.0390	0.0442	0.0451	0.0940	0	0
Middle Green River	A341	Iron, Total	µg/L		Acute	None	100.0	20	232.7500	219.0188	94.0000	781.0000	-	-	-	-	-	-	-	-	0	0
Middle Green River	A341	Iron, Total	µg/L	1000	Chronic	None	100.0	20	232.7500	219.0188	94.0000	781.0000	0.2328	0.0940	0.7810	0.0969	0.1175	0.1550	0.1975	0.7744	0	0
Middle Green River	A341	Lead, Dissolved	µg/L		Acute	hardness-dependent	0.0	20	0.0650	0.0440	0.0125	0.1000	0.0023	0.0003	0.0038	0.0004	0.0005	0.0032	0.0037	0.0038	0	0
Middle Green River	A341	Lead, Dissolved	µg/L		Chronic	hardness-dependent	0.0	20	0.0650	0.0440	0.0125	0.1000	0.0600	0.0079	0.0984	0.0100	0.0135	0.0814	0.0955	0.0982	0	0
Middle Green River	A341	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	20	0.4575	0.2903	0.2400	1.2500	0.0002	0.0001	0.0005	0.0001	0.0001	0.0001	0.0002	0.0005	0	0
Middle Green River	A341	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	20	0.4575	0.2903	0.2400	1.2500	0.0010	0.0005	0.0027	0.0006	0.0006	0.0007	0.0009	0.0024	0	0
Middle Green River	A341	Mercury, Total	µg/L	2.1	Acute	None	40.0	20	0.0034	0.0026	0.0011	0.0106	0.0016	0.0005	0.0050	0.0006	0.0012	0.0012	0.0012	0.0044	0	0
Middle Green River	A341	Mercury, Total	µg/L	1.302	Chronic	None	40.0	20	0.0034	0.0026	0.0011	0.0106	0.0026	0.0009	0.0081	0.0009	0.0019	0.0019	0.0019	0.0070	0	0
Middle Green River	A341	Molybdenum, Dissolved	µg/L	35000	Acute	None	40.0	20	0.2187	0.0511	0.1120	0.2720	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Middle Green River	A341	Molybdenum, Dissolved	µg/L	2250	Chronic	None	40.0	20	0.2187	0.0511	0.1120	0.2720	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Middle Green River	A341	Nickel, Dissolved	µg/L		Acute	hardness-dependent	65.0	20	0.2280	0.0820	0.1500	0.3800	0.0009	0.0006	0.0016	0.0006	0.0006	0.0009	0.0013	0.0015	0	0
Middle Green River	A341	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	65.0	20	0.2280	0.0820	0.1500	0.3800	0.0085	0.0050	0.0140	0.0050	0.0057	0.0082	0.0117	0.0137	0	0
Middle Green River	A341	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	16	1037.9375	220.0407	708.0000	1460.0000	0.0013	0.0009	0.0018	0.0009	0.0011	0.0012	0.0014	0.0017	0	0
Middle Green River	A341	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	16	1037.9375	220.0407	708.0000	1460.0000	0.1262	0.0861	0.1775	0.0870	0.1134	0.1246	0.1389	0.1739	0	0
Middle Green River	A341	Selenium, Total	µg/L	20	Acute	None	0.0	20	0.5500	0.2513	0.2500	0.7500	0.0275	0.0125	0.0375	0.0125	0.0125	0.0375	0.0375	0.0375	0	0
Middle Green River	A341	Selenium, Total	µg/L	5	Chronic	None	0.0	20	0.5500	0.2513	0.2500	0.7500	0.1100	0.0500	0.1500	0.0500	0.0500	0.1500	0.1500	0.1500	0	0
Middle Green River	A341	Strontium, Dissolved	µg/L	80	Acute	None	100.0	4	62.1250	1.8209	60.8000	64.8000	0.7766	0.7600	0.8100	0.7608	0.7638	0.7681	0.7809	0.8042	0	0
Middle Green River	A341	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	4	62.1250	1.8209	60.8000	64.8000	1.2679	1.2408	1.3224	1.2420	1.2469	1.2541	1.2750	1.3130	0	4
Middle Green River	A341	TSS	mg/L	244	Acute	None	100.0	16	8.0194	6.5883	3.0100	24.6000	0.0329	0.0123	0.1008	0.0130	0.0161	0.0176	0.0455	0.0756	0	0
Middle Green River	A341	TSS	mg/L	22	Chronic	None	100.0	16	8.0194	6.5883	3.0100	24.6000	0.3645	0.1368	1.1182	0.1443	0.1788	0.1957	0.5043	0.8386	0	1
Middle Green River	A341	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	17	0.3955	0.0344	0.3430	0.4600	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0006	0.0006	0	0
Middle Green River	A341	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	17	0.3955	0.0344	0.3430	0.4600	0.0010	0.0009	0.0012	0.0009	0.0009	0.0010	0.0011	0.0011	0	0
Middle Green River	A341	Zinc, Dissolved	µg/L		Acute	hardness-dependent	40.0	20	0.3424	0.1765	0.2100	0.9180	0.0057	0.0035	0.0150	0.0037	0.0041	0.0042	0.0058	0.0118	0	0
Middle Green River	A341	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	40.0	20	0.3424	0.1765	0.2100	0.9180	0.0056	0.0035	0.0149	0.0036	0.0041	0.0042	0.0058	0.0117	0	0
Middle Green River	B319	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	20.5	83	0.0065	0.0031	0.0050	0.0150	0.0005	0.0001	0.0019	0.0002	0.0003	0.0004	0.0005	0.0010	0	0
Middle Green River	B319	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	20.5	83	0.0065	0.0031	0.0050	0.0150	0.0033	0.0022	0.0107	0.0022	0.0023	0.0024	0.0031	0.0072	0	0
Middle Green River	B319	Antimony, Dissolved	µg/L	88	Acute	None	0.0	18	0.2500	0.0000	0.2500	0.2500	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0	0
Middle Green River	B319	Antimony, Dissolved	µg/L	30	Chronic	None	0.0	18	0.2500	0.0000	0.2500	0.2500	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0	0
Middle Green River	B319	Arsenic, Dissolved	µg/L	360	Acute	None	66.7	18	0.5189	0.2077	0.2500	0.8100	0.0014	0.0007	0.0023	0.0007	0.0007	0.0016	0.0019	0.0021	0	0
Middle Green River	B319	Arsenic, Dissolved	µg/L	190	Chronic	None	66.7	18	0.5189	0.2077	0.2500	0.8100	0.0027	0.0013	0.0043	0.0013	0.0013	0.0031	0.0035	0.0040	0	0
Middle Green River	B319	Barium, Dissolved	µg/L	7250	Acute	None	100.0	18	1.4889	0.6544	0.7800	2.9800	0.0002	0.0001	0.0004	0.0001	0.0001	0.0002	0.0002	0.0004	0	0
Middle Green River	B319	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	18	1.4889	0.6544	0.7800	2.9800	0.0010	0.0005	0.0021	0.0005	0.0006	0.0011	0.0012	0.0020	0	0
Middle Green River	B319	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	5.3	19	0.0595	0.0413	0.0500	0.2300	0.1411	0.0862	0.5674	0.0863	0.1076	0.1142	0.1353	0.1880	0	0
Middle Green River	B319	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	5.3	19	0.0595	0.0413	0.0500	0.2300	0.7131	0.4777	2.8410	0.4782	0.5598	0.5842	0.6598	0.9110	0	1
Middle Green River	B319	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	0.0	19	0.2000	0.0000	0.2000	0.2000	0.0013	0.0010	0.0016	0.0010	0.0012	0.0013	0.0014	0.0015	0	0
Middle Green River	B319	Chromium, Dissolved	µg/L	14.7	Acute	None	0.0	19	0.2000	0.0000	0.2000	0.2000	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0	0
Middle Green River	B319	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	0.0	19	0.2000	0.0000	0.2000	0.2000	0.0100	0.0077	0.0120	0.0077	0.0093	0.0097	0.0109	0.0117	0	0
Middle Green River	B319	Chromium, Dissolved	µg/L	9.62	Chronic	None	0.0	19	0.2000	0.0000	0.2000	0.2000	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0	0
Middle Green River	B319	Cobalt, Dissolved	µg/L	660	Acute	None	0.0	18	0.1000	0.0000	0.1000	0.1000	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Middle Green River	B319	Cobalt, Dissolved	µg/L	132	Chronic	None	0.0	18	0.1000	0.0000	0.1000	0.1000	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0	0
Middle Green River	B319	Copper, Dissolved	µg/L		Acute	hardness-dependent	36.8	19	0.2958	0.1327	0.2000	0.5700	0.0991	0.0497	0.1874	0.0497	0.0620	0.0794	0.1424	0.1819	0	0
Middle Green River	B319	Copper, Dissolved	µg/L		Chronic	hardness-dependent	36.8	19	0.2958	0.1327	0.2000	0.5700	0.1292	0.0666	0.2410	0.0667	0.0814	0.1019	0.1866	0.2380	0	0
Middle Green River	B319	Iron, Total	µg/L		Acute	None	100.0	19	889.5789	1139.9267	63.0000	3350.0000	-	-	-	-	-	-	-	-	0	0
Middle Green River	B319	Iron, Total	µg/L	1000	Chronic	None	100.0	19	889.5789	1139.9267	63.0000	3350.0000	0.8896	0.0630	3.3500	0.0648	0.1300	0.4340	1.2450	3.3500	0	5
Middle Green River	B319	Lead, Dissolved	µg/L		Acute	hardness-dependent	0.0	19	0.1000	0.0000	0.1000	0.1000	0.0092	0.0064	0.0117	0.0064	0.0082	0.0088	0.0103	0.0114	0	0
Middle Green River	B319	Lead, Dissolved	µg/L		Chronic	hardness-dependent	0.0	19	0.1000	0.0000	0.1000	0.1000	0.2353	0.1638	0.3012	0.1641	0.2115	0.2266	0.2652	0.2918	0	0
Middle Green River	B319	Mercury, Total	µg/L	2.1	Acute	None	0.0	19	0.1000	0.0000	0.1000	0.1000	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0	0
Middle Green River	B319	Mercury, Total	µg/L	1.302	Chronic	None	0.0	19	0.1000	0.0000	0.1000	0.1000	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0.0768	0	0
Middle Green River	B319	Molybdenum, Dissolved	µg/L	35000	Acute	None	0.0	18	0.2500	0.0000	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Middle Green River	B319	Molybdenum, Dissolved	µg/L	2250	Chronic	None	0.0	18	0.2500	0.0000	0.2500	0.2500	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Middle Green River	B319	Nickel, Dissolved	µg/L		Acute	hardness-dependent	0.0	19	0.1500	0.0000	0.1500	0.1500	0.0012	0.0009	0.0015	0.0009	0.0011	0.0012	0.0014	0.0015	0	0
Middle Green River	B319	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	0.0	19	0.1500	0.0000	0.1500	0.1500	0.0111	0.0085	0.0134	0.0085	0.0103	0.0109	0.0122	0.0131	0	0
Middle Green River	B319	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	83	220.4398	79.4941	33.0000	386.0000	0.0003	0.0000	0.0005	0.0001	0.0002	0.0003	0.0003	0.0004	0	0
Middle Green River	B319	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	83	220.4398	79.4941	33.0000	386.0000	0.0268	0.0040	0.0469	0.0130	0.0202	0.0261	0.0345	0.0432	0	0
Middle Green River	B319	Selenium, Total	µg/L	20	Acute	None	0.0	19	0.7500	0.0000	0.7500	0.7500	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0	0
Middle Green River	B319	Selenium, Total	µg/L	5	Chronic	None	0.0	19	0.7500	0.0000	0.7500	0.7500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0	0
Middle Green River	B319	TSS	mg/L	244	Acute	None	98.8	83	8.3781	18.3360	0.2500	98.8000	0.0343	0.0010	0.4049	0.0029	0.0045	0.0066	0.0176	0.1559	0	0
Middle Green River	B319	TSS	mg/L	22	Chronic	None	98.8	83	8.3781	18.3360	0.2500	98.8000	0.3808	0.0114	4.4909	0.0318	0.0500	0.0727	0.1955	1.7291	0	8
Middle Green River	B319	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	18	0.5950	0.0933	0.4400	0.7800	0.0008	0.0006	0.0011	0.0006	0.0007	0.0008	0.0009	0.0010	0	0
Middle Green River	B319	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	18	0.5950	0.0933	0.4400	0.7800	0.0015	0.0011	0.0020	0.0011	0.0013	0.0015	0.0016	0.0018	0	0
Middle Green River	B319	Zinc, Dissolved	µg/L		Acute	hardness-dependent	15.8	19	0.5637	1.0827	0.2500	4.9600	0.0181	0.0063	0.1563	0.0063	0.0077	0.0088	0.0097	0.0417	0	0
Middle Green River	B319	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	15.8	19	0.5637	1.0827	0.2500	4.9600	0.0179	0.0063	0.1551	0.0063	0.0076	0.0088	0.0096	0.0414	0	0
Middle Green River	EC09A190	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	33.3	12	0.0094	0.0079	0.0050	0.0300	0.0008	0.0003	0.0018	0.0003	0.0004	0.0005	0.0012	0.0016	0	0
Middle Green River	EC09A190	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	33.3	12	0.0094	0.0079	0.0050	0.0300	0.0045	0.0022	0.0136	0.0022	0.0023	0.0024	0.0056	0.0109	0	0
Middle Green River	EC09A190	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	12	105.8333	63.0481	19.0000	236.0000	0.0001	0.0000	0.0003	0.0000	0.0001	0.0001	0.0002	0.0002	0	0
Middle Green River	EC09A190	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	12	105.8333	63.0481	19.0000	236.0000	0.0129	0.0023	0.0287	0.0027	0.0077	0.0113	0.0172	0.0245	0	0
Middle Green River	EC09A190	TSS	mg/L	244	Acute	None	91.7	12	5.3750	9.2420	0.5000	32.0000	0.0220	0.0020	0.1311	0.0032	0.0041	0.0082	0.0123	0.0928	0	0
Middle Green River	EC09A190	TSS	mg/L	22	Chronic	None	91.7	12	5.3750	9.2420	0.5000	32.0000	0.2443	0.0227	1.4545	0.0352	0.0455	0.0909	0.1364	1.0295	0	1
Middle Green River	F321	Aluminum, Total	µg/L	750	Acute	None	100.0	20	153.4400	309.7985	9.9000	1420.0000	0.2046	0.0132	1.8933	0.0138	0.0485	0.0836	0.1967	0.5380	0	1

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Middle Green River	F321	Aluminum, Total	µg/L	87	Chronic	None	100.0	20	153.4400	309.7985	9.9000	1420.0000	1.7637	0.1138	16.3218	0.1193	0.4184	0.7207	1.6954	4.6379	0	7
Middle Green River	F321	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	7.3	82	0.0056	0.0024	0.0050	0.0209	0.0005	0.0002	0.0014	0.0003	0.0003	0.0004	0.0006	0.0011	0	0
Middle Green River	F321	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	7.3	82	0.0056	0.0024	0.0050	0.0209	0.0028	0.0023	0.0098	0.0023	0.0023	0.0023	0.0027	0.0051	0	0
Middle Green River	F321	Antimony, Dissolved	µg/L	88	Acute	None	100.0	16	0.0354	0.0102	0.0260	0.0622	0.0004	0.0003	0.0007	0.0003	0.0003	0.0003	0.0004	0.0006	0	0
Middle Green River	F321	Antimony, Dissolved	µg/L	30	Chronic	None	100.0	16	0.0354	0.0102	0.0260	0.0622	0.0012	0.0009	0.0021	0.0009	0.0010	0.0010	0.0012	0.0018	0	0
Middle Green River	F321	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	20	0.5548	0.0392	0.4500	0.6090	0.0015	0.0013	0.0017	0.0013	0.0015	0.0016	0.0016	0.0017	0	0
Middle Green River	F321	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	20	0.5548	0.0392	0.4500	0.6090	0.0029	0.0024	0.0032	0.0025	0.0029	0.0030	0.0030	0.0032	0	0
Middle Green River	F321	Barium, Dissolved	µg/L	7250	Acute	None	100.0	18	1.8839	0.4164	1.4800	2.9500	0.0003	0.0002	0.0004	0.0002	0.0002	0.0002	0.0003	0.0004	0	0
Middle Green River	F321	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	18	1.8839	0.4164	1.4800	2.9500	0.0013	0.0010	0.0020	0.0010	0.0011	0.0012	0.0014	0.0019	0	0
Middle Green River	F321	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	20	0.0050	0.0000	0.0050	0.0050	0.0056	0.0047	0.0080	0.0048	0.0050	0.0055	0.0060	0.0069	0	0
Middle Green River	F321	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	20	0.0050	0.0000	0.0050	0.0050	0.0350	0.0309	0.0452	0.0314	0.0321	0.0345	0.0369	0.0408	0	0
Middle Green River	F321	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	100.0	20	0.2139	0.0381	0.1600	0.2810	0.0007	0.0005	0.0012	0.0005	0.0006	0.0007	0.0008	0.0010	0	0
Middle Green River	F321	Chromium, Dissolved	µg/L	14.7	Acute	None	100.0	20	0.2139	0.0381	0.1600	0.2810	0.0145	0.0109	0.0191	0.0115	0.0126	0.0146	0.0160	0.0191	0	0
Middle Green River	F321	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	100.0	20	0.2139	0.0381	0.1600	0.2810	0.0057	0.0039	0.0089	0.0042	0.0048	0.0057	0.0063	0.0080	0	0
Middle Green River	F321	Chromium, Dissolved	µg/L	9.62	Chronic	None	100.0	20	0.2139	0.0381	0.1600	0.2810	0.0222	0.0166	0.0292	0.0176	0.0192	0.0223	0.0244	0.0291	0	0
Middle Green River	F321	Cobalt, Dissolved	µg/L	660	Acute	None	100.0	20	0.0213	0.0087	0.0120	0.0509	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Middle Green River	F321	Cobalt, Dissolved	µg/L	132	Chronic	None	100.0	20	0.0213	0.0087	0.0120	0.0509	0.0002	0.0001	0.0004	0.0001	0.0001	0.0001	0.0002	0.0002	0	0
Middle Green River	F321	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	20	0.3329	0.2190	0.1100	0.8480	0.0547	0.0165	0.1632	0.0169	0.0300	0.0461	0.0589	0.1192	0	0
Middle Green River	F321	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	20	0.3329	0.2190	0.1100	0.8480	0.0761	0.0232	0.2235	0.0239	0.0423	0.0644	0.0819	0.1685	0	0
Middle Green River	F321	Iron, Total	µg/L		Acute	None	65.0	20	143.0500	279.6794	25.0000	1280.0000	-	-	-	-	-	-	-	-	0	0
Middle Green River	F321	Iron, Total	µg/L	1000	Chronic	None	65.0	20	143.0500	279.6794	25.0000	1280.0000	0.1431	0.0250	1.2800	0.0250	0.0250	0.0540	0.1275	0.4089	0	1
Middle Green River	F321	Lead, Dissolved	µg/L		Acute	hardness-dependent	25.0	20	0.0209	0.0185	0.0125	0.0830	0.0009	0.0004	0.0041	0.0004	0.0004	0.0005	0.0006	0.0031	0	0
Middle Green River	F321	Lead, Dissolved	µg/L		Chronic	hardness-dependent	25.0	20	0.0209	0.0185	0.0125	0.0830	0.0231	0.0102	0.1045	0.0105	0.0109	0.0123	0.0164	0.0808	0	0
Middle Green River	F321	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	20	0.8920	0.6760	0.2800	3.4000	0.0004	0.0001	0.0014	0.0001	0.0002	0.0003	0.0005	0.0007	0	0
Middle Green River	F321	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	20	0.8920	0.6760	0.2800	3.4000	0.0019	0.0006	0.0072	0.0006	0.0012	0.0014	0.0025	0.0034	0	0
Middle Green River	F321	Mercury, Total	µg/L	2.1	Acute	None	100.0	20	0.0019	0.0019	0.0002	0.0085	0.0009	0.0001	0.0040	0.0001	0.0005	0.0007	0.0012	0.0021	0	0
Middle Green River	F321	Mercury, Total	µg/L	1.302	Chronic	None	100.0	20	0.0019	0.0019	0.0002	0.0085	0.0015	0.0001	0.0065	0.0002	0.0008	0.0011	0.0020	0.0033	0	0
Middle Green River	F321	Molybdenum, Dissolved	µg/L	35000	Acute	None	100.0	20	0.1265	0.0231	0.0794	0.1580	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Middle Green River	F321	Molybdenum, Dissolved	µg/L	2250	Chronic	None	100.0	20	0.1265	0.0231	0.0794	0.1580	0.0001	0.0000	0.0001	0.0000	0.0000	0.0001	0.0001	0.0001	0	0
Middle Green River	F321	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	20	0.2728	0.0611	0.1700	0.4460	0.0012	0.0007	0.0023	0.0009	0.0010	0.0010	0.0014	0.0018	0	0
Middle Green River	F321	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	20	0.2728	0.0611	0.1700	0.4460	0.0107	0.0061	0.0207	0.0079	0.0087	0.0093	0.0127	0.0159	0	0
Middle Green River	F321	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	82	644.1829	101.1448	443.0000	1000.0000	0.0008	0.0005	0.0012	0.0006	0.0007	0.0008	0.0008	0.0010	0	0
Middle Green River	F321	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	82	644.1829	101.1448	443.0000	1000.0000	0.0783	0.0539	0.1216	0.0630	0.0698	0.0759	0.0845	0.1049	0	0
Middle Green River	F321	Selenium, Total	µg/L	20	Acute	None	0.0	20	0.2500	0.0000	0.2500	0.2500	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0	0
Middle Green River	F321	Selenium, Total	µg/L	5	Chronic	None	0.0	20	0.2500	0.0000	0.2500	0.2500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0	0
Middle Green River	F321	Strontium, Dissolved	µg/L	80	Acute	None	100.0	1	49.3000	-	49.3000	49.3000	0.6163	0.6163	0.6163	0.6163	0.6163	0.6163	0.6163	0.6163	0	0
Middle Green River	F321	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	1	49.3000	-	49.3000	49.3000	1.0061	1.0061	1.0061	1.0061	1.0061	1.0061	1.0061	1.0061	0	1
Middle Green River	F321	TSS	mg/L	244	Acute	None	92.7	82	1.6979	4.2649	0.2500	38.4000	0.0070	0.0010	0.1574	0.0011	0.0029	0.0037	0.0059	0.0153	0	0
Middle Green River	F321	TSS	mg/L	22	Chronic	None	92.7	82	1.6979	4.2649	0.2500	38.4000	0.0772	0.0114	1.7455	0.0119	0.0318	0.0409	0.0657	0.1698	0	1
Middle Green River	F321	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	20	0.6846	0.0838	0.5400	0.8010	0.0009	0.0007	0.0011	0.0008	0.0009	0.0010	0.0010	0.0011	0	0
Middle Green River	F321	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	20	0.6846	0.0838	0.5400	0.8010	0.0017	0.0014	0.0020	0.0014	0.0015	0.0017	0.0019	0.0020	0	0
Middle Green River	F321	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	20	0.5527	0.3498	0.2800	1.9000	0.0100	0.0042	0.0393	0.0045	0.0067	0.0084	0.0098	0.0215	0	0
Middle Green River	F321	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	20	0.5527	0.3498	0.2800	1.9000	0.0099	0.0042	0.0390	0.0044	0.0067	0.0083	0.0098	0.0214	0	0
Middle Green River	UDUWAM	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	69.231	65	0.0394	0.0296	0.0100	0.1500	0.0028	0.0007	0.0135	0.0008	0.0015	0.0020	0.0030	0.0084	0	0
Middle Green River	UDUWAM	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	69.231	65	0.0394	0.0296	0.0100	0.1500	0.0188	0.0045	0.0697	0.0047	0.0095	0.0141	0.0240	0.0447	0	0
Middle Green River	UDUWAM	Diazinon	µg/L	0.0963	Acute	None	6.9767	43	0.0023	0.0021	0.0010	0.0110	0.0234	0.0104	0.1142	0.0104	0.0104	0.0260	0.0260	0.0587	0	0
Middle Green River	UDUWAM	Fluoride, Dissolved	µg/L	3845	Acute	None	9.0909	33	90.9091	114.1918	50.0000	700.0000	0.0236	0.0130	0.1821	0.0130	0.0130	0.0130	0.0260	0.0364	0	0
Middle Green River	UDUWAM	Fluoride, Dissolved	µg/L	769	Chronic	None	9.0909	33	90.9091	114.1918	50.0000	700.0000	0.1182	0.0650	0.9103	0.0650	0.0650	0.0650	0.1300	0.1821	0	0
Middle Green River	UDUWAM	Manganese, Dissolved	µg/L	2350	Acute	None	100	33	39.5152	25.9335	10.5000	111.0000	0.0168	0.0045	0.0472	0.0054	0.0075	0.0138	0.0213	0.0380	0	0
Middle Green River	UDUWAM	Manganese, Dissolved	µg/L	470	Chronic	None	100	33	39.5152	25.9335	10.5000	111.0000	0.0841	0.0223	0.2362	0.0272	0.0377	0.0691	0.1066	0.1901	0	0
Middle Green River	UDUWAM	Nitrate-nitrogen	µg/L	827900	Acute	None	100	6	1161.3333	1083.4476	160.0000	2930.0000	0.0014	0.0002	0.0035	0.0003	0.0006	0.0008	0.0021	0.0033	0	0
Middle Green River	UDUWAM	Nitrate-nitrogen	µg/L	8225	Chronic	None	100	6	1161.3333	1083.4476	160.0000	2930.0000	0.1412	0.0195	0.3562	0.0286	0.0620	0.0832	0.2084	0.3295	0	0
Middle Green River	UDUWAM	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100	47	369.3617	157.0572	130.0000	870.0000	0.0004	0.0002	0.0011	0.0002	0.0003	0.0004	0.0005	0.0008	0	0
Middle Green River	UDUWAM	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100	47	369.3617	157.0572	130.0000	870.0000	0.0449	0.0158	0.1058	0.0207	0.0304	0.0426	0.0553	0.0796	0	0
Middle Green River	UDUWAM	Nitrite-nitrogen	µg/L	3410	Acute	None	40	50	6.6000	7.3983	3.0000	43.0000	0.0019	0.0009	0.0126	0.0009	0.0012	0.0015	0.0015	0.0059	0	0
Middle Green River	UDUWAM	Nitrite-nitrogen	µg/L	682	Chronic	None	40	50	6.6000	7.3983	3.0000	43.0000	0.0097	0.0044	0.0630	0.0044	0.0059	0.0073	0.0073	0.0295	0	0
Middle Green River	UDUWAM	Simazine	µg/L	125	Acute	None	23.256	43	0.0059	0.0076	0.0025	0.0500	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Middle Green River	UDUWAM	Simazine	µg/L	0.307	Chronic	None	23.256	43	0.0059	0.0076	0.0025	0.0500	0.0194	0.0081	0.1629	0.0081	0.0081	0.0179	0.0179	0.0391	0	0
Mill Creek	A315	2,4-D	µg/L	700	Acute	None	5.9	17	0.0157	0.0200	0.0080	0.0917	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	2,4-D	µg/L	50	Chronic	None	5.9	17	0.0157	0.0200	0.0080	0.0917	0.0003	0.0002	0.0018	0.0002	0.0002	0.0002	0.0003	0.0007	0	0
Mill Creek	A315	4-Methylphenol	µg/L	700	Acute	None	20.0	10	0.3035	0.3790	0.1200	1.2000	0.0004	0.0002	0.0017	0.0002	0.0002	0.0002	0.0002	0.0015	0	0
Mill Creek	A315	4-Methylphenol	µg/L	140	Chronic	None	20.0	10	0.3035	0.3790	0.1200	1.2000	0.0022	0.0009	0.0086	0.0009	0.0009	0.0009	0.0010	0.0073	0	0
Mill Creek	A315	Acenaphthene	µg/L	30	Acute	None	0.0	17	0.0050	0.0002	0.0047	0.0055	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Mill Creek	A315	Acenaphthene	µg/L	6	Chronic	None	0.0	17	0.0050	0.0002	0.0047	0.0055	0.0008	0.0008	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009	0	0
Mill Creek	A315	Aluminum, Total	µg/L	750	Acute	None	100.0	18	546.8167	387.2621	40.7000	1400.0000	0.7291	0.0543	1.8667	0.0668	0.2104	0.7207	1.1107	1.3703	0	6
Mill Creek	A315	Aluminum, Total	µg/L	87	Chronic	None	100.0	18	546.8167	387.2621	40.7000	1400.0000	6.2852	0.4678	16.0920	0.5763	1.8135	6.2126	9.5747	11.8126	0	13
Mill Creek	A315	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	96.6	88	0.1089	0.2400	0.0050	1.7000	0.0042	0.0002	0.0504	0.0006	0.0013	0.0023	0.0036	0.0084	0	0
Mill Creek	A315	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	96.6	88	0.1089	0.2400	0.0050	1.7000	0.0423	0.0023	0.4623	0.0059	0.0160	0.0250	0.0415	0.0655	0	0
Mill Creek	A315	Anthracene	µg/L	0.635	Acute	None	11.8	17	0.0061	0.0034	0.0047	0.0160	0.0097	0.0074	0.0252	0.0075	0.0076	0.0078	0.0079	0.0227	0	0
Mill Creek	A315	Anthracene	µg/L	0.127	Chronic	None	11.8	17	0.0061	0.0034	0.0047	0.0160	0.0484	0.0370	0.1260	0.0373	0.0378	0.0390	0.0394	0.1134	0	0
Mill Creek	A315	Antimony, Dissolved	µg/L	88	Acute	None	51.9	27	0.2025	0.0712	0.0642	0.2860	0.0023	0.0007	0.0033	0.0008	0.0017	0.0028	0.0028	0.0028	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Mill Creek	A315	Antimony, Dissolved	µg/L	30	Chronic	None	51.9	27	0.2025	0.0712	0.0642	0.2860	0.0067	0.0021	0.0095	0.0025	0.0050	0.0083	0.0083	0.0083	0	0
Mill Creek	A315	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	31	0.6013	0.0839	0.4300	0.8050	0.0017	0.0012	0.0022	0.0014	0.0015	0.0017	0.0018	0.0021	0	0
Mill Creek	A315	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	31	0.6013	0.0839	0.4300	0.8050	0.0032	0.0023	0.0042	0.0026	0.0028	0.0032	0.0034	0.0039	0	0
Mill Creek	A315	Barium, Dissolved	µg/L	7250	Acute	None	100.0	29	6.2031	1.2991	3.5300	8.9500	0.0009	0.0005	0.0012	0.0006	0.0007	0.0009	0.0009	0.0012	0	0
Mill Creek	A315	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	29	6.2031	1.2991	3.5300	8.9500	0.0043	0.0024	0.0062	0.0028	0.0036	0.0045	0.0047	0.0058	0	0
Mill Creek	A315	Benzo(a)pyrene	µg/L	0.75	Acute	None	5.9	17	0.0057	0.0032	0.0047	0.0180	0.0076	0.0063	0.0240	0.0063	0.0064	0.0066	0.0067	0.0107	0	0
Mill Creek	A315	Benzo(a)pyrene	µg/L	0.15	Chronic	None	5.9	17	0.0057	0.0032	0.0047	0.0180	0.0382	0.0313	0.1200	0.0316	0.0320	0.0330	0.0333	0.0533	0	0
Mill Creek	A315	Benzo(b)fluoranthene	µg/L	512	Acute	None	17.6	17	0.0065	0.0036	0.0047	0.0180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	17.6	17	0.0065	0.0036	0.0047	0.0180	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Mill Creek	A315	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	11.8	17	0.0059	0.0027	0.0047	0.0130	0.0085	0.0067	0.0186	0.0068	0.0069	0.0071	0.0071	0.0186	0	0
Mill Creek	A315	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	11.8	17	0.0059	0.0027	0.0047	0.0130	0.0423	0.0336	0.0929	0.0339	0.0346	0.0357	0.0357	0.0929	0	0
Mill Creek	A315	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	17	1.7966	1.2804	0.3340	4.1100	0.0045	0.0008	0.0103	0.0013	0.0018	0.0032	0.0061	0.0101	0	0
Mill Creek	A315	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	17	1.7966	1.2804	0.3340	4.1100	0.0050	0.0009	0.0114	0.0015	0.0020	0.0035	0.0068	0.0113	0	0
Mill Creek	A315	Butylbenzylphthalate	µg/L	390	Acute	None	100.0	17	0.0744	0.0427	0.0170	0.2090	0.0002	0.0000	0.0005	0.0001	0.0001	0.0002	0.0002	0.0003	0	0
Mill Creek	A315	Butylbenzylphthalate	µg/L	60	Chronic	None	100.0	17	0.0744	0.0427	0.0170	0.2090	0.0012	0.0003	0.0035	0.0004	0.0009	0.0012	0.0015	0.0021	0	0
Mill Creek	A315	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	25.0	32	0.0266	0.0212	0.0050	0.0500	0.0276	0.0021	0.0855	0.0024	0.0056	0.0143	0.0418	0.0731	0	0
Mill Creek	A315	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	25.0	32	0.0266	0.0212	0.0050	0.0500	0.1749	0.0171	0.4747	0.0191	0.0351	0.0899	0.2842	0.4246	0	0
Mill Creek	A315	Caffeine	µg/L	95000	Acute	None	82.4	17	0.1320	0.1440	0.0049	0.4850	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Caffeine	µg/L	19000	Chronic	None	82.4	17	0.1320	0.1440	0.0049	0.4850	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Carbazole	µg/L	465	Acute	None	11.8	17	0.0167	0.0119	0.0120	0.0526	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Mill Creek	A315	Carbazole	µg/L	93	Chronic	None	11.8	17	0.0167	0.0119	0.0120	0.0526	0.0002	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0005	0	0
Mill Creek	A315	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	65.6	32	0.2573	0.1184	0.0580	0.6000	0.0008	0.0001	0.0021	0.0002	0.0005	0.0007	0.0010	0.0015	0	0
Mill Creek	A315	Chromium, Dissolved	µg/L	14.7	Acute	None	65.6	32	0.2573	0.1184	0.0580	0.6000	0.0175	0.0039	0.0408	0.0076	0.0136	0.0139	0.0212	0.0345	0	0
Mill Creek	A315	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	65.6	32	0.2573	0.1184	0.0580	0.6000	0.0061	0.0008	0.0160	0.0015	0.0039	0.0057	0.0078	0.0113	0	0
Mill Creek	A315	Chromium, Dissolved	µg/L	9.62	Chronic	None	65.6	32	0.2573	0.1184	0.0580	0.6000	0.0268	0.0060	0.0624	0.0115	0.0208	0.0213	0.0325	0.0527	0	0
Mill Creek	A315	Chrysene	µg/L	0.35	Acute	None	0.0	17	0.0126	0.0006	0.0120	0.0140	0.0359	0.0343	0.0400	0.0343	0.0343	0.0357	0.0371	0.0389	0	0
Mill Creek	A315	Chrysene	µg/L	0.07	Chronic	None	0.0	17	0.0126	0.0006	0.0120	0.0140	0.1794	0.1714	0.2000	0.1714	0.1714	0.1786	0.1857	0.1943	0	0
Mill Creek	A315	Cobalt, Dissolved	µg/L	660	Acute	None	83.9	31	0.2089	0.1220	0.0750	0.5370	0.0003	0.0001	0.0008	0.0001	0.0002	0.0003	0.0004	0.0007	0	0
Mill Creek	A315	Cobalt, Dissolved	µg/L	132	Chronic	None	83.9	31	0.2089	0.1220	0.0750	0.5370	0.0016	0.0006	0.0041	0.0007	0.0008	0.0013	0.0019	0.0034	0	0
Mill Creek	A315	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	32	2.4089	1.3166	0.7030	7.2400	0.3572	0.0451	0.9415	0.0593	0.1783	0.2971	0.5216	0.8050	0	0
Mill Creek	A315	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	32	2.4089	1.3166	0.7030	7.2400	0.5009	0.0689	1.3413	0.0887	0.2593	0.4217	0.7258	1.0958	0	2
Mill Creek	A315	Diazinon	µg/L	0.0963	Acute	None	0.0	17	0.0214	0.0011	0.0205	0.0240	0.2226	0.2129	0.2492	0.2129	0.2129	0.2181	0.2285	0.2409	0	0
Mill Creek	A315	Dichloroprop	µg/L	250	Acute	None	0.0	17	0.0108	0.0030	0.0060	0.0160	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0	0
Mill Creek	A315	Dichloroprop	µg/L	50	Chronic	None	0.0	17	0.0108	0.0030	0.0060	0.0160	0.0002	0.0001	0.0003	0.0001	0.0002	0.0002	0.0003	0.0003	0	0
Mill Creek	A315	Diethyl Phthalate	µg/L	6000	Acute	None	100.0	17	0.0500	0.0302	0.0210	0.1120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Diethyl Phthalate	µg/L	1200	Chronic	None	100.0	17	0.0500	0.0302	0.0210	0.1120	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Mill Creek	A315	Dimethyl Phthalate	µg/L	14500	Acute	None	40.0	10	0.0205	0.0252	0.0048	0.0714	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Dimethyl Phthalate	µg/L	2900	Chronic	None	40.0	10	0.0205	0.0252	0.0048	0.0714	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Di-N-Butyl Phthalate	µg/L	240	Acute	None	100.0	17	0.1083	0.0583	0.0356	0.2230	0.0005	0.0001	0.0009	0.0002	0.0003	0.0004	0.0006	0.0008	0	0
Mill Creek	A315	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	100.0	17	0.1083	0.0583	0.0356	0.2230	0.0023	0.0007	0.0046	0.0010	0.0015	0.0019	0.0031	0.0042	0	0
Mill Creek	A315	Di-N-Octyl Phthalate	µg/L	60	Acute	None	40.0	10	0.0336	0.0535	0.0050	0.1550	0.0006	0.0001	0.0026	0.0001	0.0001	0.0001	0.0003	0.0022	0	0
Mill Creek	A315	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	40.0	10	0.0336	0.0535	0.0050	0.1550	0.0028	0.0004	0.0129	0.0004	0.0004	0.0005	0.0017	0.0112	0	0
Mill Creek	A315	Endosulfan	µg/L	0.22	Acute	None	5.9	17	0.0034	0.0036	0.0024	0.0174	0.0155	0.0107	0.0791	0.0109	0.0111	0.0116	0.0120	0.0260	0	0
Mill Creek	A315	Endosulfan	µg/L	0.056	Chronic	None	5.9	17	0.0034	0.0036	0.0024	0.0174	0.0611	0.0420	0.3107	0.0427	0.0438	0.0455	0.0473	0.1021	0	0
Mill Creek	A315	Fluoranthene	µg/L	18	Acute	None	47.1	17	0.0099	0.0060	0.0047	0.0210	0.0006	0.0003	0.0012	0.0003	0.0003	0.0003	0.0008	0.0011	0	0
Mill Creek	A315	Fluoranthene	µg/L	3.55	Chronic	None	47.1	17	0.0099	0.0060	0.0047	0.0210	0.0028	0.0013	0.0059	0.0013	0.0014	0.0015	0.0042	0.0055	0	0
Mill Creek	A315	Iron, Total	µg/L		Acute	None	100.0	32	2310.1563	1192.3943	513.0000	5190.0000	-	-	-	-	-	-	-	-	0	0
Mill Creek	A315	Iron, Total	µg/L	1000	Chronic	None	100.0	32	2310.1563	1192.3943	513.0000	5190.0000	2.3102	0.5130	5.1900	0.6763	1.4650	2.1650	3.1450	4.2045	0	25
Mill Creek	A315	Isophorone	µg/L	60000	Acute	None	0.0	10	0.0050	0.0003	0.0048	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Isophorone	µg/L	12000	Chronic	None	0.0	10	0.0050	0.0003	0.0048	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Lead, Dissolved	µg/L		Acute	hardness-dependent	65.6	32	0.1214	0.0976	0.0125	0.4800	0.0046	0.0002	0.0215	0.0003	0.0017	0.0032	0.0047	0.0166	0	0
Mill Creek	A315	Lead, Dissolved	µg/L		Chronic	hardness-dependent	65.6	32	0.1214	0.0976	0.0125	0.4800	0.1187	0.0040	0.5528	0.0085	0.0429	0.0834	0.1214	0.4247	0	0
Mill Creek	A315	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	18	153.8700	151.9679	7.8100	475.0000	0.0655	0.0033	0.2021	0.0037	0.0165	0.0332	0.1083	0.1801	0	0
Mill Creek	A315	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	18	153.8700	151.9679	7.8100	475.0000	0.3274	0.0166	1.0106	0.0187	0.0827	0.1662	0.5415	0.9003	0	1
Mill Creek	A315	Mercury, Total	µg/L	2.1	Acute	None	56.3	32	0.0463	0.0481	0.0007	0.1000	0.0221	0.0003	0.0476	0.0004	0.0022	0.0038	0.0476	0.0476	0	0
Mill Creek	A315	Mercury, Total	µg/L	1.302	Chronic	None	56.3	32	0.0463	0.0481	0.0007	0.1000	0.0356	0.0006	0.0768	0.0006	0.0036	0.0061	0.0768	0.0768	0	0
Mill Creek	A315	Molybdenum, Dissolved	µg/L	35000	Acute	None	77.4	31	0.5128	0.1782	0.2500	0.9860	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Molybdenum, Dissolved	µg/L	2250	Chronic	None	77.4	31	0.5128	0.1782	0.2500	0.9860	0.0002	0.0001	0.0004	0.0001	0.0002	0.0002	0.0003	0.0003	0	0
Mill Creek	A315	Naphthalene	µg/L	500	Acute	None	0.0	17	0.0126	0.0006	0.0120	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Mill Creek	A315	Naphthalene	µg/L	100	Chronic	None	0.0	17	0.0126	0.0006	0.0120	0.0140	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Mill Creek	A315	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	32	1.0143	0.2592	0.6550	1.6600	0.0036	0.0014	0.0059	0.0017	0.0031	0.0037	0.0042	0.0056	0	0
Mill Creek	A315	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	32	1.0143	0.2592	0.6550	1.6600	0.0328	0.0127	0.0529	0.0156	0.0278	0.0330	0.0374	0.0505	0	0
Mill Creek	A315	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	88	564.5682	219.2920	147.0000	1400.0000	0.0007	0.0002	0.0017	0.0003	0.0005	0.0006	0.0008	0.0012	0	0
Mill Creek	A315	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	88	564.5682	219.2920	147.0000	1400.0000	0.0686	0.0179	0.1702	0.0344	0.0507	0.0652	0.0807	0.1188	0	0
Mill Creek	A315	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	0.0	17	0.2091	0.1923	0.0600	0.4950	0.0244	0.0061	0.0767	0.0061	0.0075	0.0084	0.0368	0.0761	0	0
Mill Creek	A315	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	0.0	17	0.2091	0.1923	0.0600	0.4950	0.0319	0.0079	0.1000	0.0079	0.0097	0.0110	0.0480	0.0992	0	0
Mill Creek	A315	Phenanthrene	µg/L	29.82	Acute	None	41.2	17	0.0099	0.0072	0.0047	0.0265	0.0003	0.0002	0.0009	0.0002	0.0002	0.0002	0.0004	0.0008	0	0
Mill Creek	A315	Phenanthrene	µg/L	6.325	Chronic	None	41.2	17	0.0099	0.0072	0.0047	0.0265	0.0016	0.0007	0.0042	0.0007	0.0008	0.0009	0.0019	0.0039	0	0
Mill Creek	A315	Phenol	µg/L	22.5	Acute	None	29.4	17	0.1729	0.1220	0.0475	0.5000	0.0077	0.0021	0.0222	0.0021	0.0022	0.0067	0.0109	0.0136	0	0
Mill Creek	A315	Phenol	µg/L	4.5	Chronic	None	29.4	17	0.1729	0.1220	0.0475	0.5000	0.0384	0.0106	0.1111	0.0106	0.0111	0.0333	0.0544	0.0681	0	0
Mill Creek	A315	Pyrene	µg/L	45.45	Acute	None	35.3	17	0.0103	0.0079	0.0047	0.0264	0.0002	0.0001	0.0006	0.0001	0.0001	0.0001	0.0004	0.0006	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Mill Creek	A315	Pyrene	µg/L	9.09	Chronic	None	35.3	17	0.0103	0.0079	0.0047	0.0264	0.0011	0.0005	0.0029	0.0005	0.0005	0.0006	0.0019	0.0029	0	0
Mill Creek	A315	Selenium, Total	µg/L	20	Acute	None	0.0	32	0.4688	0.2520	0.2500	0.7500	0.0234	0.0125	0.0375	0.0125	0.0125	0.0125	0.0375	0.0375	0	0
Mill Creek	A315	Selenium, Total	µg/L	5	Chronic	None	0.0	32	0.4688	0.2520	0.2500	0.7500	0.0938	0.0500	0.1500	0.0500	0.0500	0.0500	0.1500	0.1500	0	0
Mill Creek	A315	TSS	mg/L	244	Acute	None	100.0	88	11.2842	10.8238	1.2000	50.2000	0.0462	0.0049	0.2057	0.0071	0.0139	0.0342	0.0603	0.1501	0	0
Mill Creek	A315	TSS	mg/L	22	Chronic	None	100.0	88	11.2842	10.8238	1.2000	50.2000	0.5129	0.0545	2.2818	0.0792	0.1544	0.3795	0.6693	1.6645	0	12
Mill Creek	A315	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	30	0.4131	0.1083	0.2750	0.7000	0.0006	0.0004	0.0010	0.0004	0.0005	0.0005	0.0007	0.0008	0	0
Mill Creek	A315	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	30	0.4131	0.1083	0.2750	0.7000	0.0010	0.0007	0.0018	0.0007	0.0008	0.0009	0.0012	0.0015	0	0
Mill Creek	A315	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	32	5.1534	2.4909	0.7710	9.3800	0.0812	0.0063	0.1792	0.0075	0.0455	0.0785	0.1165	0.1569	0	0
Mill Creek	A315	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	32	5.1534	2.4909	0.7710	9.3800	0.0806	0.0063	0.1778	0.0075	0.0452	0.0779	0.1155	0.1557	0	0
Newaukum Creek	0322	2,4-D	µg/L	700	Acute	None	11.8	17	0.0263	0.0474	0.0075	0.1940	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0002	0	0
Newaukum Creek	0322	2,4-D	µg/L	50	Chronic	None	11.8	17	0.0263	0.0474	0.0075	0.1940	0.0005	0.0002	0.0039	0.0002	0.0002	0.0002	0.0003	0.0022	0	0
Newaukum Creek	0322	4-Methylphenol	µg/L	700	Acute	None	0.0	11	0.1277	0.0065	0.1200	0.1400	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	0322	4-Methylphenol	µg/L	140	Chronic	None	0.0	11	0.1277	0.0065	0.1200	0.1400	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010	0	0
Newaukum Creek	0322	Acenaphthene	µg/L	30	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	0322	Acenaphthene	µg/L	6	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0008	0.0008	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009	0	0
Newaukum Creek	0322	Aluminum, Total	µg/L	750	Acute	None	100.0	88	951.4398	1213.7596	19.4000	6710.0000	1.2686	0.0259	8.9467	0.0441	0.3067	0.7027	1.5100	4.1820	0	34
Newaukum Creek	0322	Aluminum, Total	µg/L	87	Chronic	None	100.0	88	951.4398	1213.7596	19.4000	6710.0000	10.9361	0.2230	77.1264	0.3798	2.6437	6.0575	13.0172	36.0517	0	77
Newaukum Creek	0322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	79.3	135	0.0457	0.0484	0.0050	0.2740	0.0033	0.0002	0.0245	0.0003	0.0008	0.0019	0.0048	0.0095	0	0
Newaukum Creek	0322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	79.3	135	0.0457	0.0484	0.0050	0.2740	0.0212	0.0021	0.1302	0.0023	0.0057	0.0114	0.0355	0.0541	0	0
Newaukum Creek	0322	Anthracene	µg/L	0.635	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0078	0.0074	0.0087	0.0075	0.0076	0.0077	0.0079	0.0087	0	0
Newaukum Creek	0322	Anthracene	µg/L	0.127	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0389	0.0370	0.0433	0.0373	0.0378	0.0386	0.0394	0.0433	0	0
Newaukum Creek	0322	Antimony, Dissolved	µg/L	88	Acute	None	14.1	92	0.2226	0.0687	0.0300	0.2500	0.0025	0.0003	0.0028	0.0005	0.0028	0.0028	0.0028	0.0028	0	0
Newaukum Creek	0322	Antimony, Dissolved	µg/L	30	Chronic	None	14.1	92	0.2226	0.0687	0.0300	0.2500	0.0074	0.0010	0.0083	0.0013	0.0083	0.0083	0.0083	0.0083	0	0
Newaukum Creek	0322	Arsenic, Dissolved	µg/L	360	Acute	None	90.1	101	0.5831	0.1532	0.2500	0.9400	0.0016	0.0007	0.0026	0.0007	0.0014	0.0017	0.0019	0.0024	0	0
Newaukum Creek	0322	Arsenic, Dissolved	µg/L	190	Chronic	None	90.1	101	0.5831	0.1532	0.2500	0.9400	0.0031	0.0013	0.0049	0.0013	0.0027	0.0032	0.0035	0.0045	0	0
Newaukum Creek	0322	Barium, Dissolved	µg/L	7250	Acute	None	100.0	92	5.8088	1.7658	2.8600	9.4000	0.0008	0.0004	0.0013	0.0004	0.0006	0.0008	0.0010	0.0012	0	0
Newaukum Creek	0322	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	92	5.8088	1.7658	2.8600	9.4000	0.0040	0.0020	0.0065	0.0022	0.0028	0.0040	0.0050	0.0060	0	0
Newaukum Creek	0322	Benzo(a)pyrene	µg/L	0.75	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0066	0.0063	0.0073	0.0063	0.0064	0.0065	0.0067	0.0073	0	0
Newaukum Creek	0322	Benzo(a)pyrene	µg/L	0.15	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0330	0.0313	0.0367	0.0316	0.0320	0.0327	0.0333	0.0367	0	0
Newaukum Creek	0322	Benzo(b)fluoranthene	µg/L	512	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Newaukum Creek	0322	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0071	0.0067	0.0079	0.0068	0.0069	0.0070	0.0071	0.0079	0	0
Newaukum Creek	0322	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0353	0.0336	0.0393	0.0339	0.0343	0.0350	0.0357	0.0393	0	0
Newaukum Creek	0322	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	17	2.0266	3.6617	0.2110	15.8000	0.0051	0.0005	0.0395	0.0006	0.0013	0.0026	0.0048	0.0143	0	0
Newaukum Creek	0322	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	17	2.0266	3.6617	0.2110	15.8000	0.0056	0.0006	0.0439	0.0006	0.0015	0.0028	0.0053	0.0159	0	0
Newaukum Creek	0322	Butylbenzylphthalate	µg/L	390	Acute	None	94.1	17	0.0469	0.0267	0.0049	0.0946	0.0001	0.0000	0.0002	0.0000	0.0001	0.0001	0.0002	0.0002	0	0
Newaukum Creek	0322	Butylbenzylphthalate	µg/L	60	Chronic	None	94.1	17	0.0469	0.0267	0.0049	0.0946	0.0008	0.0001	0.0016	0.0003	0.0004	0.0007	0.0011	0.0015	0	0
Newaukum Creek	0322	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	2.0	102	0.0426	0.0242	0.0050	0.1900	0.0436	0.0039	0.2049	0.0044	0.0392	0.0486	0.0534	0.0647	0	0
Newaukum Creek	0322	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	2.0	102	0.0426	0.0242	0.0050	0.1900	0.2792	0.0269	1.2967	0.0295	0.2717	0.3167	0.3389	0.3887	0	1
Newaukum Creek	0322	Caffeine	µg/L	95000	Acute	None	35.3	17	0.0192	0.0197	0.0048	0.0598	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Caffeine	µg/L	19000	Chronic	None	35.3	17	0.0192	0.0197	0.0048	0.0598	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Carbazole	µg/L	465	Acute	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Carbazole	µg/L	93	Chronic	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	0322	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	52.0	102	0.2884	0.1394	0.0900	0.6300	0.0009	0.0002	0.0022	0.0004	0.0006	0.0007	0.0014	0.0020	0	0
Newaukum Creek	0322	Chromium, Dissolved	µg/L	14.7	Acute	None	52.0	102	0.2884	0.1394	0.0900	0.6300	0.0196	0.0061	0.0429	0.0096	0.0136	0.0136	0.0293	0.0360	0	0
Newaukum Creek	0322	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	52.0	102	0.2884	0.1394	0.0900	0.6300	0.0073	0.0018	0.0170	0.0031	0.0043	0.0051	0.0105	0.0155	0	0
Newaukum Creek	0322	Chromium, Dissolved	µg/L	9.62	Chronic	None	52.0	102	0.2884	0.1394	0.0900	0.6300	0.0300	0.0094	0.0655	0.0146	0.0208	0.0208	0.0447	0.0550	0	0
Newaukum Creek	0322	Chrysene	µg/L	0.35	Acute	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.0358	0.0343	0.0400	0.0343	0.0343	0.0357	0.0371	0.0389	0	0
Newaukum Creek	0322	Chrysene	µg/L	0.07	Chronic	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.1790	0.1714	0.2000	0.1714	0.1714	0.1786	0.1857	0.1943	0	0
Newaukum Creek	0322	Cobalt, Dissolved	µg/L	660	Acute	None	17.2	93	0.1506	0.3996	0.0350	3.7700	0.0002	0.0001	0.0057	0.0001	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	0322	Cobalt, Dissolved	µg/L	132	Chronic	None	17.2	93	0.1506	0.3996	0.0350	3.7700	0.0011	0.0003	0.0286	0.0004	0.0008	0.0008	0.0008	0.0010	0	0
Newaukum Creek	0322	Copper, Dissolved	µg/L		Acute	hardness-dependent	99.0	102	2.3194	1.1489	0.2000	4.2300	0.3580	0.0231	0.7946	0.0670	0.1934	0.3338	0.5641	0.6605	0	0
Newaukum Creek	0322	Copper, Dissolved	µg/L		Chronic	hardness-dependent	99.0	102	2.3194	1.1489	0.2000	4.2300	0.5016	0.0333	1.0909	0.0963	0.2753	0.4748	0.7821	0.9243	0	3
Newaukum Creek	0322	Diazinon	µg/L	0.0963	Acute	None	0.0	17	0.0238	0.0066	0.0205	0.0410	0.2471	0.2129	0.4258	0.2129	0.2129	0.2233	0.2285	0.4258	0	0
Newaukum Creek	0322	Dichloroprop	µg/L	250	Acute	None	5.9	17	0.0146	0.0193	0.0055	0.0887	0.0001	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Newaukum Creek	0322	Dichloroprop	µg/L	50	Chronic	None	5.9	17	0.0146	0.0193	0.0055	0.0887	0.0003	0.0001	0.0018	0.0001	0.0002	0.0002	0.0002	0.0006	0	0
Newaukum Creek	0322	Diethyl Phthalate	µg/L	6000	Acute	None	94.1	17	0.0409	0.0320	0.0050	0.1240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Diethyl Phthalate	µg/L	1200	Chronic	None	94.1	17	0.0409	0.0320	0.0050	0.1240	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Newaukum Creek	0322	Dimethyl Phthalate	µg/L	14500	Acute	None	9.1	11	0.0058	0.0027	0.0047	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Dimethyl Phthalate	µg/L	2900	Chronic	None	9.1	11	0.0058	0.0027	0.0047	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Di-N-Butyl Phthalate	µg/L	240	Acute	None	100.0	17	0.0896	0.0498	0.0286	0.1960	0.0004	0.0001	0.0008	0.0002	0.0002	0.0003	0.0005	0.0008	0	0
Newaukum Creek	0322	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	100.0	17	0.0896	0.0498	0.0286	0.1960	0.0019	0.0006	0.0041	0.0009	0.0012	0.0015	0.0027	0.0040	0	0
Newaukum Creek	0322	Di-N-Octyl Phthalate	µg/L	60	Acute	None	18.2	11	0.0086	0.0080	0.0047	0.0286	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0004	0	0
Newaukum Creek	0322	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	18.2	11	0.0086	0.0080	0.0047	0.0286	0.0007	0.0004	0.0024	0.0004	0.0004	0.0004	0.0005	0.0020	0	0
Newaukum Creek	0322	Endosulfan	µg/L	0.22	Acute	None	0.0	17	0.0025	0.0001	0.0024	0.0028	0.0113	0.0109	0.0127	0.0109	0.0109	0.0111	0.0116	0.0120	0	0
Newaukum Creek	0322	Endosulfan	µg/L	0.056	Chronic	None	0.0	17	0.0025	0.0001	0.0024	0.0028	0.0445	0.0429	0.0500	0.0429	0.0429	0.0438	0.0455	0.0471	0	0
Newaukum Creek	0322	Fluoranthene	µg/L	18	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0	0
Newaukum Creek	0322	Fluoranthene	µg/L	3.55	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0014	0.0013	0.0015	0.0013	0.0014	0.0014	0.0014	0.0015	0	0
Newaukum Creek	0322	Iron, Total	µg/L		Acute	None	100.0	102	1091.6569	1282.3793	57.0000	7100.0000	-	-	-	-	-	-	-	-	0	0
Newaukum Creek	0322	Iron, Total	µg/L	1000	Chronic	None	100.0	102	1091.6569	1282.3793	57.0000	7100.0000	1.0917	0.0570	7.1000	0.0768	0.3103	0.6370	1.3025	3.5570	0	35
Newaukum Creek	0322	Isophorone	µg/L	60000	Acute	None	0.0	11	0.0050	0.0003	0.0047	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Newaukum Creek	0322	Isophorone	µg/L	12000	Chronic	None	0.0	11	0.0050	0.0003	0.0047	0.0055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Lead, Dissolved	µg/L		Acute	hardness-dependent	16.7	102	0.1134	0.1142	0.0125	0.7900	0.0039	0.0003	0.0300	0.0004	0.0028	0.0033	0.0039	0.0082	0	0
Newaukum Creek	0322	Lead, Dissolved	µg/L		Chronic	hardness-dependent	16.7	102	0.1134	0.1142	0.0125	0.7900	0.1011	0.0082	0.7696	0.0097	0.0717	0.0852	0.1000	0.2094	0	0
Newaukum Creek	0322	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	88	4.0531	2.4073	1.2900	14.5000	0.0017	0.0005	0.0062	0.0007	0.0012	0.0016	0.0019	0.0036	0	0
Newaukum Creek	0322	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	88	4.0531	2.4073	1.2900	14.5000	0.0086	0.0027	0.0309	0.0035	0.0059	0.0081	0.0093	0.0181	0	0
Newaukum Creek	0322	Mercury, Total	µg/L	2.1	Acute	None	61.8	102	0.0198	0.0326	0.0009	0.1000	0.0095	0.0004	0.0476	0.0007	0.0012	0.0037	0.0060	0.0476	0	0
Newaukum Creek	0322	Mercury, Total	µg/L	1.302	Chronic	None	61.8	102	0.0198	0.0326	0.0009	0.1000	0.0152	0.0007	0.0768	0.0012	0.0019	0.0059	0.0097	0.0768	0	0
Newaukum Creek	0322	Molybdenum, Dissolved	µg/L	35000	Acute	None	14.0	93	0.2462	0.0334	0.1560	0.3890	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Molybdenum, Dissolved	µg/L	2250	Chronic	None	14.0	93	0.2462	0.0334	0.1560	0.3890	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	0322	Naphthalene	µg/L	500	Acute	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	0322	Naphthalene	µg/L	100	Chronic	None	0.0	17	0.0125	0.0006	0.0120	0.0140	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	0322	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	102	0.7632	0.2466	0.3090	1.7800	0.0031	0.0010	0.0060	0.0013	0.0021	0.0031	0.0039	0.0049	0	0
Newaukum Creek	0322	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	102	0.7632	0.2466	0.3090	1.7800	0.0275	0.0093	0.0543	0.0117	0.0187	0.0279	0.0350	0.0440	0	0
Newaukum Creek	0322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	135	1994.0741	620.1039	1020.0000	4550.0000	0.0024	0.0012	0.0055	0.0016	0.0019	0.0022	0.0028	0.0036	0	0
Newaukum Creek	0322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	135	1994.0741	620.1039	1020.0000	4550.0000	0.2424	0.1240	0.5532	0.1598	0.1915	0.2201	0.2821	0.3660	0	0
Newaukum Creek	0322	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	0.0	17	0.2109	0.2049	0.0600	0.4900	0.0120	0.0030	0.0340	0.0033	0.0037	0.0046	0.0180	0.0334	0	0
Newaukum Creek	0322	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	0.0	17	0.2109	0.2049	0.0600	0.4900	0.0157	0.0039	0.0443	0.0043	0.0048	0.0060	0.0235	0.0436	0	0
Newaukum Creek	0322	Phenanthrene	µg/L	29.82	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	0322	Phenanthrene	µg/L	6.325	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0008	0.0007	0.0009	0.0007	0.0008	0.0008	0.0008	0.0009	0	0
Newaukum Creek	0322	Phenol	µg/L	22.5	Acute	None	17.6	17	0.1667	0.1616	0.0470	0.5410	0.0074	0.0021	0.0240	0.0021	0.0022	0.0024	0.0107	0.0233	0	0
Newaukum Creek	0322	Phenol	µg/L	4.5	Chronic	None	17.6	17	0.1667	0.1616	0.0470	0.5410	0.0370	0.0104	0.1202	0.0106	0.0111	0.0122	0.0533	0.1165	0	0
Newaukum Creek	0322	Pyrene	µg/L	45.45	Acute	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	0322	Pyrene	µg/L	9.09	Chronic	None	0.0	17	0.0049	0.0002	0.0047	0.0055	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0006	0.0006	0	0
Newaukum Creek	0322	Selenium, Total	µg/L	20	Acute	None	0.0	101	0.6460	0.2039	0.2500	0.7500	0.0323	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Newaukum Creek	0322	Selenium, Total	µg/L	5	Chronic	None	0.0	101	0.6460	0.2039	0.2500	0.7500	0.1292	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Newaukum Creek	0322	Strontium, Dissolved	µg/L	80	Acute	None	100.0	2	61.9500	1.6263	60.8000	63.1000	0.7744	0.7600	0.7888	0.7614	0.7672	0.7744	0.7816	0.7873	0	0
Newaukum Creek	0322	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	2	61.9500	1.6263	60.8000	63.1000	1.2643	1.2408	1.2878	1.2432	1.2526	1.2643	1.2760	1.2854	0	2
Newaukum Creek	0322	TSS	mg/L	244	Acute	None	97.9	146	18.5032	36.5210	0.5000	296.0000	0.0758	0.0020	1.2131	0.0045	0.0111	0.0226	0.0724	0.3390	0	1
Newaukum Creek	0322	TSS	mg/L	22	Chronic	None	97.9	146	18.5032	36.5210	0.5000	296.0000	0.8411	0.0227	13.4545	0.0500	0.1227	0.2507	0.8034	3.7602	0	30
Newaukum Creek	0322	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	92	1.1836	0.4055	0.4100	2.0000	0.0016	0.0006	0.0028	0.0008	0.0011	0.0017	0.0021	0.0025	0	0
Newaukum Creek	0322	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	92	1.1836	0.4055	0.4100	2.0000	0.0030	0.0010	0.0050	0.0014	0.0021	0.0030	0.0038	0.0045	0	0
Newaukum Creek	0322	Zinc, Dissolved	µg/L		Acute	hardness-dependent	97.1	102	2.2660	1.2211	0.2500	4.9800	0.0376	0.0031	0.0886	0.0071	0.0180	0.0341	0.0593	0.0802	0	0
Newaukum Creek	0322	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	97.1	102	2.2660	1.2211	0.2500	4.9800	0.0373	0.0031	0.0879	0.0070	0.0179	0.0338	0.0588	0.0796	0	0
Newaukum Creek	AA322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	69.7	33	0.0618	0.0875	0.0050	0.3850	0.0111	0.0003	0.0932	0.0003	0.0009	0.0020	0.0067	0.0539	0	0
Newaukum Creek	AA322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	69.7	33	0.0618	0.0875	0.0050	0.3850	0.0521	0.0022	0.3756	0.0023	0.0032	0.0107	0.0577	0.2121	0	0
Newaukum Creek	AA322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	33	2016.9394	757.4082	989.0000	3920.0000	0.0024	0.0012	0.0047	0.0014	0.0018	0.0021	0.0028	0.0043	0	0
Newaukum Creek	AA322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	33	2016.9394	757.4082	989.0000	3920.0000	0.2452	0.1202	0.4766	0.1432	0.1860	0.2067	0.2833	0.4284	0	0
Newaukum Creek	AA322	TSS	mg/L	244	Acute	None	93.9	33	5.2182	5.3607	0.2500	23.4000	0.0214	0.0010	0.0959	0.0029	0.0078	0.0123	0.0221	0.0591	0	0
Newaukum Creek	AA322	TSS	mg/L	22	Chronic	None	93.9	33	5.2182	5.3607	0.2500	23.4000	0.2372	0.0114	1.0636	0.0318	0.0864	0.1364	0.2455	0.6555	0	1
Newaukum Creek	AB322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	62.9	35	0.0628	0.0976	0.0050	0.4520	0.0055	0.0002	0.0299	0.0002	0.0004	0.0010	0.0052	0.0250	0	0
Newaukum Creek	AB322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	62.9	35	0.0628	0.0976	0.0050	0.4520	0.0309	0.0022	0.2073	0.0023	0.0024	0.0056	0.0435	0.1210	0	0
Newaukum Creek	AB322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	35	1706.9714	439.8592	933.0000	3150.0000	0.0021	0.0011	0.0038	0.0012	0.0018	0.0020	0.0022	0.0028	0	0
Newaukum Creek	AB322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	35	1706.9714	439.8592	933.0000	3150.0000	0.2075	0.1134	0.3830	0.1198	0.1848	0.2055	0.2243	0.2866	0	0
Newaukum Creek	AB322	TSS	mg/L	244	Acute	None	97.1	35	4.2689	4.1415	0.5000	18.7000	0.0175	0.0020	0.0766	0.0035	0.0066	0.0107	0.0219	0.0471	0	0
Newaukum Creek	AB322	TSS	mg/L	22	Chronic	None	97.1	35	4.2689	4.1415	0.5000	18.7000	0.1940	0.0227	0.8500	0.0383	0.0727	0.1182	0.2432	0.5223	0	0
Newaukum Creek	AC322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	73.5	34	0.0126	0.0109	0.0050	0.0695	0.0007	0.0002	0.0022	0.0002	0.0004	0.0006	0.0008	0.0014	0	0
Newaukum Creek	AC322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	73.5	34	0.0126	0.0109	0.0050	0.0695	0.0059	0.0023	0.0328	0.0023	0.0029	0.0055	0.0061	0.0090	0	0
Newaukum Creek	AC322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	34	1760.5588	560.2646	339.0000	3380.0000	0.0021	0.0004	0.0041	0.0009	0.0019	0.0022	0.0025	0.0030	0	0
Newaukum Creek	AC322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	34	1760.5588	560.2646	339.0000	3380.0000	0.2140	0.0412	0.4109	0.0900	0.1900	0.2195	0.2520	0.2991	0	0
Newaukum Creek	AC322	TSS	mg/L	244	Acute	None	100.0	34	1.1879	0.4527	0.5800	3.1200	0.0049	0.0024	0.0128	0.0027	0.0038	0.0045	0.0053	0.0071	0	0
Newaukum Creek	AC322	TSS	mg/L	22	Chronic	None	100.0	34	1.1879	0.4527	0.5800	3.1200	0.0540	0.0264	0.1418	0.0302	0.0424	0.0500	0.0591	0.0791	0	0
Newaukum Creek	AD322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	70.6	34	0.0322	0.0390	0.0050	0.1890	0.0030	0.0002	0.0349	0.0003	0.0004	0.0011	0.0034	0.0090	0	0
Newaukum Creek	AD322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	70.6	34	0.0322	0.0390	0.0050	0.1890	0.0153	0.0022	0.0857	0.0023	0.0024	0.0062	0.0201	0.0462	0	0
Newaukum Creek	AD322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	34	1635.5882	336.7689	1030.0000	2770.0000	0.0020	0.0012	0.0033	0.0013	0.0017	0.0020	0.0022	0.0025	0	0
Newaukum Creek	AD322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	34	1635.5882	336.7689	1030.0000	2770.0000	0.1989	0.1252	0.3368	0.1336	0.1705	0.1994	0.2170	0.2529	0	0
Newaukum Creek	AD322	TSS	mg/L	244	Acute	None	100.0	34	4.2235	3.0423	1.2000	12.6000	0.0173	0.0049	0.0516	0.0049	0.0068	0.0137	0.0249	0.0401	0	0
Newaukum Creek	AD322	TSS	mg/L	22	Chronic	None	100.0	34	4.2235	3.0423	1.2000	12.6000	0.1920	0.0545	0.5727	0.0545	0.0750	0.1523	0.2761	0.4450	0	0
Newaukum Creek	AE322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	71.4	35	0.0328	0.0406	0.0050	0.2000	0.0019	0.0003	0.0101	0.0003	0.0004	0.0010	0.0027	0.0063	0	0
Newaukum Creek	AE322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	71.4	35	0.0328	0.0406	0.0050	0.2000	0.0151	0.0022	0.0910	0.0023	0.0024	0.0079	0.0206	0.0461	0	0
Newaukum Creek	AE322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	35	1624.8571	342.2621	1040.0000	2750.0000	0.0020	0.0013	0.0033	0.0013	0.0017	0.0020	0.0022	0.0025	0	0
Newaukum Creek	AE322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	35	1624.8571	342.2621	1040.0000	2750.0000	0.1976	0.1264	0.3343	0.1346	0.1714	0.2006	0.2182	0.2496	0	0
Newaukum Creek	AE322	TSS	mg/L	244	Acute	None	100.0	35	4.8743	2.9208	1.1000	12.8000	0.0200	0.0045	0.0525	0.0048	0.0096	0.0184	0.0266	0.0396	0	0
Newaukum Creek	AE322	TSS	mg/L	22	Chronic	None	100.0	35	4.8743	2.9208	1.1000	12.8000	0.2216	0.0500	0.5818	0.0532	0.1068	0.2045	0.2955	0.4391	0	0
Newaukum Creek	AF322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	78.1	32	0.0342	0.0379	0.0050	0.1670	0.0019	0.0003	0.0095	0.0003	0.0005	0.0010	0.0024	0.0053	0	0
Newaukum Creek	AF322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	78.1	32	0.0342	0.0379	0.0050	0.1670	0.0157	0.0022	0.0760	0.0023	0.0052	0.0083	0.0233	0.0466	0	0
Newaukum Creek	AF322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	32	1480.1250	363.4554	994.0000	2730.0000	0.0018	0.0012	0.0033	0.0012	0.0015	0.0018	0.0019	0.0025	0	0
Newaukum Creek	AF322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	32	1480.1250	363.4554	994.0000	2730.0000	0.1800	0.1209	0.3319	0.1241	0.1529	0.1781	0.1945	0.2517	0	0
Newaukum Creek	AF322	TSS	mg/L	244	Acute	None	100.0	32	5.5778	5.5492	0.9900	24.7000	0.0229	0.0041	0.1012	0.0048	0.0094	0.0148	0.0284	0.0765	0	0
Newaukum Creek	AF322	TSS	mg/L	22	Chronic	None	100.0	32	5.5778	5.5492	0.9900	24.7000	0.2535	0.0450	1.1227	0.0530	0.1045	0.1636	0.3148	0.8482	0	2
Newaukum Creek	AG322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	75.7	37	0.0143	0.0080	0.0050	0.0375	0.0011	0.0003	0.0029	0.0003	0.0006	0.0008	0.0013	0.0028	0	0
Newaukum Creek	AG322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	75.7	37	0.0143	0.0080	0.0050	0.0375	0.0068	0.0022	0.0181	0.0023	0.0045	0.0060	0.0089	0.0134	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Newaukum Creek	AG322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	37	774.2432	221.4921	189.0000	1070.0000	0.0009	0.0002	0.0013	0.0004	0.0007	0.0010	0.0011	0.0013	0	0
Newaukum Creek	AG322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	37	774.2432	221.4921	189.0000	1070.0000	0.0941	0.0230	0.1301	0.0438	0.0738	0.0992	0.1114	0.1267	0	0
Newaukum Creek	AG322	TSS	mg/L	244	Acute	None	100.0	37	12.9122	13.7925	0.8500	53.5000	0.0529	0.0035	0.2193	0.0069	0.0172	0.0303	0.0635	0.1920	0	0
Newaukum Creek	AG322	TSS	mg/L	22	Chronic	None	100.0	37	12.9122	13.7925	0.8500	53.5000	0.5869	0.0386	2.4318	0.0764	0.1909	0.3364	0.7045	2.1300	0	7
Newaukum Creek	AH322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	93.3	15	0.0626	0.0627	0.0050	0.2040	0.0036	0.0003	0.0135	0.0005	0.0010	0.0021	0.0042	0.0106	0	0
Newaukum Creek	AH322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	93.3	15	0.0626	0.0627	0.0050	0.2040	0.0288	0.0024	0.0921	0.0047	0.0074	0.0148	0.0454	0.0802	0	0
Newaukum Creek	AH322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	15	1810.2667	376.0523	814.0000	2340.0000	0.0022	0.0010	0.0028	0.0014	0.0021	0.0023	0.0024	0.0027	0	0
Newaukum Creek	AH322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	15	1810.2667	376.0523	814.0000	2340.0000	0.2201	0.0990	0.2845	0.1386	0.2073	0.2347	0.2462	0.2683	0	0
Newaukum Creek	AH322	TSS	mg/L	244	Acute	None	100.0	15	4.0200	3.0869	1.1000	10.6000	0.0165	0.0045	0.0434	0.0048	0.0061	0.0127	0.0215	0.0414	0	0
Newaukum Creek	AH322	TSS	mg/L	22	Chronic	None	100.0	15	4.0200	3.0869	1.1000	10.6000	0.1827	0.0500	0.4818	0.0532	0.0682	0.1409	0.2386	0.4595	0	0
Newaukum Creek	AI322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	42.4	33	0.0103	0.0098	0.0050	0.0500	0.0008	0.0002	0.0023	0.0002	0.0003	0.0006	0.0010	0.0021	0	0
Newaukum Creek	AI322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	42.4	33	0.0103	0.0098	0.0050	0.0500	0.0049	0.0022	0.0233	0.0023	0.0023	0.0027	0.0052	0.0145	0	0
Newaukum Creek	AI322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	33	1112.8485	131.9472	840.0000	1410.0000	0.0013	0.0010	0.0017	0.0011	0.0013	0.0013	0.0014	0.0016	0	0
Newaukum Creek	AI322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	33	1112.8485	131.9472	840.0000	1410.0000	0.1353	0.1021	0.1714	0.1113	0.1277	0.1325	0.1435	0.1646	0	0
Newaukum Creek	AI322	TSS	mg/L	244	Acute	None	100.0	33	6.9030	11.4758	1.2000	66.6000	0.0283	0.0049	0.2730	0.0072	0.0098	0.0143	0.0275	0.0682	0	0
Newaukum Creek	AI322	TSS	mg/L	22	Chronic	None	100.0	33	6.9030	11.4758	1.2000	66.6000	0.3138	0.0545	3.0273	0.0800	0.1091	0.1591	0.3045	0.7564	0	1
Newaukum Creek	AJ322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	25.4	67	0.0082	0.0129	0.0050	0.1090	0.0007	0.0002	0.0082	0.0002	0.0003	0.0004	0.0007	0.0020	0	0
Newaukum Creek	AJ322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	25.4	67	0.0082	0.0129	0.0050	0.1090	0.0040	0.0022	0.0499	0.0022	0.0023	0.0024	0.0043	0.0072	0	0
Newaukum Creek	AJ322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	67	996.0448	246.5743	493.0000	1610.0000	0.0012	0.0006	0.0019	0.0009	0.0010	0.0011	0.0014	0.0019	0	0
Newaukum Creek	AJ322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	67	996.0448	246.5743	493.0000	1610.0000	0.1211	0.0599	0.1957	0.0892	0.1006	0.1093	0.1386	0.1881	0	0
Newaukum Creek	AJ322	TSS	mg/L	244	Acute	None	97.0	67	5.9084	12.1612	0.2500	71.1000	0.0242	0.0010	0.2914	0.0034	0.0057	0.0107	0.0162	0.0709	0	0
Newaukum Creek	AJ322	TSS	mg/L	22	Chronic	None	97.0	67	5.9084	12.1612	0.2500	71.1000	0.2686	0.0114	3.2318	0.0377	0.0636	0.1182	0.1795	0.7864	0	3
Newaukum Creek	AK322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	76.2	21	0.0254	0.0197	0.0050	0.0747	0.0016	0.0002	0.0049	0.0003	0.0006	0.0011	0.0025	0.0033	0	0
Newaukum Creek	AK322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	76.2	21	0.0254	0.0197	0.0050	0.0747	0.0117	0.0022	0.0342	0.0023	0.0047	0.0085	0.0174	0.0244	0	0
Newaukum Creek	AK322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	21	1541.8095	541.0848	904.0000	2750.0000	0.0019	0.0011	0.0033	0.0011	0.0014	0.0018	0.0021	0.0033	0	0
Newaukum Creek	AK322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	21	1541.8095	541.0848	904.0000	2750.0000	0.1875	0.1099	0.3343	0.1133	0.1410	0.1763	0.2091	0.3343	0	0
Newaukum Creek	AK322	TSS	mg/L	244	Acute	None	100.0	21	4.7462	3.9091	1.1000	12.3000	0.0195	0.0045	0.0504	0.0061	0.0074	0.0107	0.0361	0.0451	0	0
Newaukum Creek	AK322	TSS	mg/L	22	Chronic	None	100.0	21	4.7462	3.9091	1.1000	12.3000	0.2157	0.0500	0.5591	0.0682	0.0818	0.1182	0.4000	0.5000	0	0
Newaukum Creek	B322	Aluminum, Total	µg/L	750	Acute	None	100.0	63	446.8000	409.6564	25.5000	1830.0000	0.5957	0.0340	2.4400	0.0805	0.2287	0.4267	0.7160	1.6947	0	11
Newaukum Creek	B322	Aluminum, Total	µg/L	87	Chronic	None	100.0	63	446.8000	409.6564	25.5000	1830.0000	5.1356	0.2931	21.0345	0.6939	1.9713	3.6782	6.1724	14.6092	0	57
Newaukum Creek	B322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	100.0	56	0.6613	1.0274	0.0226	6.8200	0.0393	0.0017	0.2829	0.0046	0.0105	0.0231	0.0402	0.1390	0	0
Newaukum Creek	B322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	100.0	56	0.6613	1.0274	0.0226	6.8200	0.3046	0.0103	3.1054	0.0322	0.0765	0.1721	0.2752	1.0338	0	4
Newaukum Creek	B322	Antimony, Dissolved	µg/L	88	Acute	None	19.3	57	0.2248	0.0599	0.0320	0.2500	0.0026	0.0004	0.0028	0.0008	0.0028	0.0028	0.0028	0.0028	0	0
Newaukum Creek	B322	Antimony, Dissolved	µg/L	30	Chronic	None	19.3	57	0.2248	0.0599	0.0320	0.2500	0.0075	0.0011	0.0083	0.0024	0.0083	0.0083	0.0083	0.0083	0	0
Newaukum Creek	B322	Arsenic, Dissolved	µg/L	360	Acute	None	95.2	63	0.9757	0.3821	0.2000	1.9000	0.0027	0.0006	0.0053	0.0007	0.0020	0.0028	0.0033	0.0044	0	0
Newaukum Creek	B322	Arsenic, Dissolved	µg/L	190	Chronic	None	95.2	63	0.9757	0.3821	0.2000	1.9000	0.0051	0.0011	0.0100	0.0014	0.0038	0.0053	0.0063	0.0084	0	0
Newaukum Creek	B322	Barium, Dissolved	µg/L	7250	Acute	None	100.0	62	16.3576	7.2976	1.6700	32.2000	0.0023	0.0002	0.0044	0.0008	0.0015	0.0020	0.0031	0.0038	0	0
Newaukum Creek	B322	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	62	16.3576	7.2976	1.6700	32.2000	0.0113	0.0012	0.0222	0.0042	0.0073	0.0102	0.0156	0.0189	0	0
Newaukum Creek	B322	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	14.3	63	0.0432	0.0181	0.0050	0.1100	0.0298	0.0038	0.0986	0.0045	0.0213	0.0260	0.0406	0.0552	0	0
Newaukum Creek	B322	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	14.3	63	0.0432	0.0181	0.0050	0.1100	0.2118	0.0265	0.6574	0.0298	0.1755	0.2025	0.2783	0.3468	0	0
Newaukum Creek	B322	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	81.0	63	0.4855	0.2139	0.0640	0.8400	0.0011	0.0002	0.0023	0.0004	0.0007	0.0011	0.0013	0.0021	0	0
Newaukum Creek	B322	Chromium, Dissolved	µg/L	14.7	Acute	None	81.0	63	0.4855	0.2139	0.0640	0.8400	0.0330	0.0044	0.0571	0.0112	0.0150	0.0361	0.0449	0.0515	0	0
Newaukum Creek	B322	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	81.0	63	0.4855	0.2139	0.0640	0.8400	0.0084	0.0016	0.0177	0.0028	0.0051	0.0086	0.0103	0.0162	0	0
Newaukum Creek	B322	Chromium, Dissolved	µg/L	9.62	Chronic	None	81.0	63	0.4855	0.2139	0.0640	0.8400	0.0505	0.0067	0.0873	0.0170	0.0229	0.0551	0.0686	0.0787	0	0
Newaukum Creek	B322	Cobalt, Dissolved	µg/L	660	Acute	None	96.8	63	0.3331	0.1511	0.0410	0.8900	0.0005	0.0001	0.0013	0.0002	0.0004	0.0005	0.0006	0.0008	0	0
Newaukum Creek	B322	Cobalt, Dissolved	µg/L	132	Chronic	None	96.8	63	0.3331	0.1511	0.0410	0.8900	0.0025	0.0003	0.0067	0.0008	0.0019	0.0023	0.0030	0.0041	0	0
Newaukum Creek	B322	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	63	5.9975	1.8975	0.6740	10.6000	0.5908	0.0868	1.0248	0.3518	0.4981	0.5660	0.6629	0.8987	0	3
Newaukum Creek	B322	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	63	5.9975	1.8975	0.6740	10.6000	0.8601	0.1237	1.4545	0.5304	0.7371	0.8515	0.9726	1.2629	0	14
Newaukum Creek	B322	Iron, Total	µg/L		Acute	None	100.0	63	491.9365	278.6974	130.0000	1570.0000	-	-	-	-	-	-	-	-	0	0
Newaukum Creek	B322	Iron, Total	µg/L	1000	Chronic	None	100.0	63	491.9365	278.6974	130.0000	1570.0000	0.4919	0.1300	1.5700	0.1510	0.3135	0.4250	0.5950	0.9973	0	4
Newaukum Creek	B322	Lead, Dissolved	µg/L		Acute	hardness-dependent	25.4	63	0.1099	0.0587	0.0290	0.4600	0.0024	0.0009	0.0058	0.0013	0.0015	0.0021	0.0031	0.0041	0	0
Newaukum Creek	B322	Lead, Dissolved	µg/L		Chronic	hardness-dependent	25.4	63	0.1099	0.0587	0.0290	0.4600	0.0622	0.0218	0.1501	0.0324	0.0386	0.0533	0.0800	0.1064	0	0
Newaukum Creek	B322	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	63	31.8411	58.8875	2.4800	388.0000	0.0135	0.0011	0.1651	0.0032	0.0041	0.0062	0.0101	0.0380	0	0
Newaukum Creek	B322	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	63	31.8411	58.8875	2.4800	388.0000	0.0677	0.0053	0.8255	0.0162	0.0207	0.0309	0.0506	0.1900	0	0
Newaukum Creek	B322	Mercury, Total	µg/L	2.1	Acute	None	87.3	63	0.0079	0.0035	0.0013	0.0155	0.0038	0.0006	0.0074	0.0012	0.0029	0.0038	0.0048	0.0066	0	0
Newaukum Creek	B322	Mercury, Total	µg/L	1.302	Chronic	None	87.3	63	0.0079	0.0035	0.0013	0.0155	0.0061	0.0010	0.0119	0.0019	0.0047	0.0061	0.0077	0.0107	0	0
Newaukum Creek	B322	Molybdenum, Dissolved	µg/L	35000	Acute	None	95.2	63	1.0816	0.6226	0.0710	3.2400	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Newaukum Creek	B322	Molybdenum, Dissolved	µg/L	2250	Chronic	None	95.2	63	1.0816	0.6226	0.0710	3.2400	0.0005	0.0000	0.0014	0.0001	0.0003	0.0004	0.0007	0.0009	0	0
Newaukum Creek	B322	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	63	1.2087	0.4411	0.1600	2.0300	0.0032	0.0006	0.0072	0.0015	0.0029	0.0032	0.0037	0.0041	0	0
Newaukum Creek	B322	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	63	1.2087	0.4411	0.1600	2.0300	0.0290	0.0050	0.0652	0.0138	0.0264	0.0287	0.0337	0.0372	0	0
Newaukum Creek	B322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	56	7213.9286	5542.4473	1350.0000	17900.0000	0.0087	0.0016	0.0216	0.0020	0.0032	0.0055	0.0148	0.0202	0	0
Newaukum Creek	B322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	56	7213.9286	5542.4473	1350.0000	17900.0000	0.8771	0.1641	2.1763	0.2036	0.3252	0.5568	1.4863	2.0334	0	21
Newaukum Creek	B322	Selenium, Total	µg/L	20	Acute	None	0.0	63	0.6389	0.2095	0.2500	0.7500	0.0319	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Newaukum Creek	B322	Selenium, Total	µg/L	5	Chronic	None	0.0	63	0.6389	0.2095	0.2500	0.7500	0.1278	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Newaukum Creek	B322	Strontium, Dissolved	µg/L	80	Acute	None	100.0	1	103.0000	-	103.0000	103.0000	1.2875	1.2875	1.2875	1.2875	1.2875	1.2875	1.2875	1.2875	0	1
Newaukum Creek	B322	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	1	103.0000	-	103.0000	103.0000	2.1020	2.1020	2.1020	2.1020	2.1020	2.1020	2.1020	2.1020	0	1
Newaukum Creek	B322	TSS	mg/L	244	Acute	None	100.0	56	8.9395	9.9213	0.8800	53.5000	0.0366	0.0036	0.2193	0.0065	0.0102	0.0190	0.0464	0.1148	0	0
Newaukum Creek	B322	TSS	mg/L	22	Chronic	None	100.0	56	8.9395	9.9213	0.8800	53.5000	0.4063	0.0400	2.4318	0.0725	0.1131	0.2107	0.5148	1.2727	0	6
Newaukum Creek	B322	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	63	2.0092	0.5767	0.6230	3.2700	0.0028	0.0009	0.0045	0.0012	0.0024	0.0027	0.0033	0.0038	0	0
Newaukum Creek	B322	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	63	2.0092	0.5767	0.6230	3.2700	0.0050	0.0016	0.0082	0.0021	0.0044	0.0050	0.0060	0.0069	0	0
Newaukum Creek	B322	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	63	16.5513	10.9547	0.6700	58.9000	0.1701	0.0094	0.5506	0.0683	0.1187	0.1619	0.1952	0.3163	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Newaukum Creek	B322	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	63	16.5513	10.9547	0.6700	58.9000	0.1688	0.0093	0.5461	0.0677	0.1178	0.1606	0.1937	0.3138	0	0
Newaukum Creek	D322	Aluminum, Total	µg/L	750	Acute	None	100.0	118	418.2381	512.8312	36.7000	2630.0000	0.5577	0.0489	3.5067	0.0658	0.1460	0.3260	0.5467	2.3240	0	18
Newaukum Creek	D322	Aluminum, Total	µg/L	87	Chronic	None	100.0	118	418.2381	512.8312	36.7000	2630.0000	4.8073	0.4218	30.2299	0.5670	1.2586	2.8103	4.7126	20.0345	0	97
Newaukum Creek	D322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	92.4	92	0.0417	0.0431	0.0050	0.2550	0.0027	0.0003	0.0169	0.0003	0.0012	0.0018	0.0033	0.0079	0	0
Newaukum Creek	D322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	92.4	92	0.0417	0.0431	0.0050	0.2550	0.0190	0.0023	0.1144	0.0023	0.0083	0.0124	0.0230	0.0554	0	0
Newaukum Creek	D322	Antimony, Dissolved	µg/L	88	Acute	None	14.7	109	0.2272	0.0594	0.0450	0.2800	0.0026	0.0005	0.0032	0.0008	0.0028	0.0028	0.0028	0.0028	0	0
Newaukum Creek	D322	Antimony, Dissolved	µg/L	30	Chronic	None	14.7	109	0.2272	0.0594	0.0450	0.2800	0.0076	0.0015	0.0093	0.0023	0.0083	0.0083	0.0083	0.0083	0	0
Newaukum Creek	D322	Arsenic, Dissolved	µg/L	360	Acute	None	74.6	118	0.7485	0.8664	0.2500	6.8800	0.0021	0.0007	0.0191	0.0007	0.0007	0.0016	0.0022	0.0059	0	0
Newaukum Creek	D322	Arsenic, Dissolved	µg/L	190	Chronic	None	74.6	118	0.7485	0.8664	0.2500	6.8800	0.0039	0.0013	0.0362	0.0013	0.0014	0.0029	0.0042	0.0111	0	0
Newaukum Creek	D322	Barium, Dissolved	µg/L	7250	Acute	None	100.0	110	12.1672	2.5503	8.5300	23.2000	0.0017	0.0012	0.0032	0.0013	0.0014	0.0016	0.0019	0.0022	0	0
Newaukum Creek	D322	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	110	12.1672	2.5503	8.5300	23.2000	0.0084	0.0059	0.0160	0.0063	0.0069	0.0081	0.0097	0.0112	0	0
Newaukum Creek	D322	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	6.8	118	0.0427	0.0255	0.0050	0.2300	0.0354	0.0020	0.2447	0.0035	0.0203	0.0332	0.0513	0.0652	0	0
Newaukum Creek	D322	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	6.8	118	0.0427	0.0255	0.0050	0.2300	0.2380	0.0168	1.5543	0.0248	0.1694	0.2412	0.3290	0.3911	0	1
Newaukum Creek	D322	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	54.2	118	0.3268	0.1934	0.0580	1.4600	0.0009	0.0001	0.0040	0.0003	0.0003	0.0007	0.0015	0.0020	0	0
Newaukum Creek	D322	Chromium, Dissolved	µg/L	14.7	Acute	None	54.2	118	0.3268	0.1934	0.0580	1.4600	0.0222	0.0039	0.0993	0.0115	0.0136	0.0136	0.0318	0.0433	0	0
Newaukum Creek	D322	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	54.2	118	0.3268	0.1934	0.0580	1.4600	0.0071	0.0007	0.0308	0.0022	0.0026	0.0050	0.0114	0.0150	0	0
Newaukum Creek	D322	Chromium, Dissolved	µg/L	9.62	Chronic	None	54.2	118	0.3268	0.1934	0.0580	1.4600	0.0340	0.0060	0.1518	0.0175	0.0208	0.0208	0.0486	0.0661	0	0
Newaukum Creek	D322	Cobalt, Dissolved	µg/L	660	Acute	None	32.4	111	0.1251	0.0450	0.0885	0.2500	0.0002	0.0001	0.0004	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Newaukum Creek	D322	Cobalt, Dissolved	µg/L	132	Chronic	None	32.4	111	0.1251	0.0450	0.0885	0.2500	0.0009	0.0007	0.0019	0.0008	0.0008	0.0008	0.0010	0.0017	0	0
Newaukum Creek	D322	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	118	2.9383	2.0886	0.4100	11.0000	0.4073	0.0253	1.7940	0.0265	0.1103	0.3172	0.6484	0.9160	0	5
Newaukum Creek	D322	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	118	2.9383	2.0886	0.4100	11.0000	0.5751	0.0388	2.4632	0.0406	0.1615	0.4583	0.9129	1.2847	0	24
Newaukum Creek	D322	Iron, Total	µg/L		Acute	None	100.0	118	923.7034	836.6136	294.0000	4440.0000	-	-	-	-	-	-	-	-	0	0
Newaukum Creek	D322	Iron, Total	µg/L	1000	Chronic	None	100.0	118	923.7034	836.6136	294.0000	4440.0000	0.9237	0.2940	4.4400	0.3738	0.4738	0.6170	0.8825	2.8335	0	27
Newaukum Creek	D322	Lead, Dissolved	µg/L		Acute	hardness-dependent	21.2	118	0.1326	0.1879	0.0125	1.1000	0.0041	0.0002	0.0425	0.0004	0.0013	0.0025	0.0035	0.0120	0	0
Newaukum Creek	D322	Lead, Dissolved	µg/L		Chronic	hardness-dependent	21.2	118	0.1326	0.1879	0.0125	1.1000	0.1060	0.0039	1.0907	0.0096	0.0337	0.0638	0.0908	0.3081	0	2
Newaukum Creek	D322	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	118	41.1753	33.4331	5.1000	138.0000	0.0175	0.0022	0.0587	0.0033	0.0066	0.0119	0.0281	0.0443	0	0
Newaukum Creek	D322	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	118	41.1753	33.4331	5.1000	138.0000	0.0876	0.0109	0.2936	0.0164	0.0329	0.0596	0.1403	0.2216	0	0
Newaukum Creek	D322	Mercury, Total	µg/L	2.1	Acute	None	62.7	118	0.0059	0.0043	0.0006	0.0219	0.0028	0.0003	0.0104	0.0010	0.0012	0.0025	0.0039	0.0067	0	0
Newaukum Creek	D322	Mercury, Total	µg/L	1.302	Chronic	None	62.7	118	0.0059	0.0043	0.0006	0.0219	0.0046	0.0004	0.0168	0.0016	0.0019	0.0040	0.0064	0.0108	0	0
Newaukum Creek	D322	Molybdenum, Dissolved	µg/L	35000	Acute	None	18.9	111	0.2516	0.0684	0.1040	0.5500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	D322	Molybdenum, Dissolved	µg/L	2250	Chronic	None	18.9	111	0.2516	0.0684	0.1040	0.5500	0.0001	0.0000	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Newaukum Creek	D322	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	118	1.0112	0.3106	0.5630	3.5100	0.0033	0.0017	0.0173	0.0018	0.0023	0.0031	0.0040	0.0049	0	0
Newaukum Creek	D322	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	118	1.0112	0.3106	0.5630	3.5100	0.0296	0.0151	0.1558	0.0161	0.0207	0.0282	0.0357	0.0437	0	0
Newaukum Creek	D322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	92	3381.3043	1179.8149	1510.0000	9980.0000	0.0041	0.0018	0.0121	0.0022	0.0032	0.0040	0.0050	0.0058	0	0
Newaukum Creek	D322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	92	3381.3043	1179.8149	1510.0000	9980.0000	0.4111	0.1836	1.2134	0.2176	0.3179	0.4055	0.5015	0.5849	0	1
Newaukum Creek	D322	Selenium, Total	µg/L	20	Acute	None	0.0	118	0.6441	0.2052	0.2500	0.7500	0.0322	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Newaukum Creek	D322	Selenium, Total	µg/L	5	Chronic	None	0.0	118	0.6441	0.2052	0.2500	0.7500	0.1288	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Newaukum Creek	D322	Strontium, Dissolved	µg/L	80	Acute	None	100.0	4	127.7500	2.3629	126.0000	131.0000	1.5969	1.5750	1.6375	1.5750	1.5750	1.5875	1.6094	1.6319	0	4
Newaukum Creek	D322	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	4	127.7500	2.3629	126.0000	131.0000	2.6071	2.5714	2.6735	2.5714	2.5714	2.5918	2.6276	2.6643	0	4
Newaukum Creek	D322	TSS	mg/L	244	Acute	None	100.0	108	15.8262	39.5750	0.9000	392.0000	0.0649	0.0037	1.6066	0.0110	0.0186	0.0287	0.0456	0.2149	0	1
Newaukum Creek	D322	TSS	mg/L	22	Chronic	None	100.0	108	15.8262	39.5750	0.9000	392.0000	0.7194	0.0409	17.8182	0.1215	0.2059	0.3180	0.5057	2.3832	0	15
Newaukum Creek	D322	Vanadium, Dissolved	µg/L	725	Acute	None	98.1	107	0.8019	0.4315	0.1500	1.7800	0.0011	0.0002	0.0025	0.0004	0.0006	0.0009	0.0016	0.0021	0	0
Newaukum Creek	D322	Vanadium, Dissolved	µg/L	400	Chronic	None	98.1	107	0.8019	0.4315	0.1500	1.7800	0.0020	0.0004	0.0045	0.0008	0.0010	0.0017	0.0029	0.0038	0	0
Newaukum Creek	D322	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	118	3.4129	2.0379	0.8300	8.0000	0.0508	0.0059	0.1525	0.0069	0.0153	0.0375	0.0810	0.1245	0	0
Newaukum Creek	D322	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	118	3.4129	2.0379	0.8300	8.0000	0.0504	0.0059	0.1512	0.0069	0.0152	0.0372	0.0803	0.1235	0	0
Newaukum Creek	F322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	76.3	59	0.0522	0.0899	0.0050	0.4810	0.0040	0.0002	0.0528	0.0003	0.0005	0.0008	0.0021	0.0185	0	0
Newaukum Creek	F322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	76.3	59	0.0522	0.0899	0.0050	0.4810	0.0261	0.0022	0.2206	0.0023	0.0046	0.0058	0.0171	0.1141	0	0
Newaukum Creek	F322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	59	1667.9322	474.7324	928.0000	3310.0000	0.0020	0.0011	0.0040	0.0014	0.0016	0.0019	0.0022	0.0033	0	0
Newaukum Creek	F322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	59	1667.9322	474.7324	928.0000	3310.0000	0.2028	0.1128	0.4024	0.1424	0.1647	0.1921	0.2243	0.3334	0	0
Newaukum Creek	F322	TSS	mg/L	244	Acute	None	100.0	59	3.9695	2.6843	1.1000	11.2000	0.0163	0.0045	0.0459	0.0053	0.0074	0.0131	0.0221	0.0387	0	0
Newaukum Creek	F322	TSS	mg/L	22	Chronic	None	100.0	59	3.9695	2.6843	1.1000	11.2000	0.1804	0.0500	0.5091	0.0586	0.0818	0.1455	0.2455	0.4295	0	0
Newaukum Creek	H322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	97.3	37	0.0428	0.0404	0.0050	0.1660	0.0025	0.0005	0.0095	0.0006	0.0008	0.0015	0.0041	0.0066	0	0
Newaukum Creek	H322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	97.3	37	0.0428	0.0404	0.0050	0.1660	0.0197	0.0024	0.0756	0.0052	0.0061	0.0104	0.0293	0.0575	0	0
Newaukum Creek	H322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	37	1363.0811	379.3006	878.0000	2650.0000	0.0016	0.0011	0.0032	0.0011	0.0014	0.0016	0.0018	0.0027	0	0
Newaukum Creek	H322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	37	1363.0811	379.3006	878.0000	2650.0000	0.1657	0.1067	0.3222	0.1110	0.1362	0.1617	0.1799	0.2726	0	0
Newaukum Creek	H322	TSS	mg/L	244	Acute	None	100.0	37	7.3838	8.9758	1.0000	45.4000	0.0303	0.0041	0.1861	0.0053	0.0098	0.0184	0.0320	0.0927	0	0
Newaukum Creek	H322	TSS	mg/L	22	Chronic	None	100.0	37	7.3838	8.9758	1.0000	45.4000	0.3356	0.0455	2.0636	0.0591	0.1091	0.2045	0.3545	1.0282	0	2
Newaukum Creek	I322B	Aluminum, Total	µg/L	750	Acute	None	100.0	82	415.9037	415.7916	11.4000	2230.0000	0.5545	0.0152	2.9733	0.0354	0.1933	0.4000	0.6823	1.7180	0	12
Newaukum Creek	I322B	Aluminum, Total	µg/L	87	Chronic	None	100.0	82	415.9037	415.7916	11.4000	2230.0000	4.7805	0.1310	25.6322	0.3055	1.6667	3.4483	5.8822	14.8103	0	67
Newaukum Creek	I322B	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	91.8	61	0.0243	0.0181	0.0050	0.0962	0.0016	0.0003	0.0064	0.0003	0.0010	0.0013	0.0018	0.0043	0	0
Newaukum Creek	I322B	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	91.8	61	0.0243	0.0181	0.0050	0.0962	0.0113	0.0023	0.0445	0.0024	0.0069	0.0088	0.0124	0.0303	0	0
Newaukum Creek	I322B	Antimony, Dissolved	µg/L	88	Acute	None	31.5	73	0.3384	0.2135	0.2190	1.3000	0.0038	0.0025	0.0148	0.0028	0.0028	0.0028	0.0028	0.0081	0	0
Newaukum Creek	I322B	Antimony, Dissolved	µg/L	30	Chronic	None	31.5	73	0.3384	0.2135	0.2190	1.3000	0.0113	0.0073	0.0433	0.0082	0.0083	0.0083	0.0083	0.0239	0	0
Newaukum Creek	I322B	Arsenic, Dissolved	µg/L	360	Acute	None	40.2	82	0.3356	0.1332	0.2500	0.7500	0.0009	0.0007	0.0021	0.0007	0.0007	0.0007	0.0011	0.0017	0	0
Newaukum Creek	I322B	Arsenic, Dissolved	µg/L	190	Chronic	None	40.2	82	0.3356	0.1332	0.2500	0.7500	0.0018	0.0013	0.0039	0.0013	0.0013	0.0013	0.0020	0.0033	0	0
Newaukum Creek	I322B	Barium, Dissolved	µg/L	7250	Acute	None	100.0	72	7.1596	2.2633	2.7600	12.3000	0.0010	0.0004	0.0017	0.0005	0.0007	0.0010	0.0012	0.0014	0	0
Newaukum Creek	I322B	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	72	7.1596	2.2633	2.7600	12.3000	0.0049	0.0019	0.0085	0.0026	0.0035	0.0049	0.0061	0.0072	0	0
Newaukum Creek	I322B	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	26.8	82	0.0421	0.0133	0.0130	0.0500	0.0705	0.0126	0.2318	0.0131	0.0414	0.0532	0.0976	0.1631	0	0
Newaukum Creek	I322B	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	26.8	82	0.0421	0.0133	0.0130	0.0500	0.3855	0.0821	0.9712	0.0895	0.2534	0.3364	0.5220	0.7547	0	0
Newaukum Creek	I322B	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	50.0	82	0.2600	0.1348	0.0570	0.7700	0.0013	0.0002	0.0047	0.0004	0.0006	0.0009	0.0015	0.0037	0	0
Newaukum Creek	I322B	Chromium, Dissolved	µg/L	14.7	Acute	None	50.0	82	0.2600	0.1348	0.0570	0.7700	0.0177	0.0039	0.0524	0.0095	0.0136	0.0136	0.0210	0.0327	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Newaukum Creek	I322B	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	50.0	82	0.2600	0.1348	0.0570	0.7700	0.0099	0.0013	0.0362	0.0029	0.0048	0.0069	0.0118	0.0287	0	0
Newaukum Creek	I322B	Chromium, Dissolved	µg/L	9.62	Chronic	None	50.0	82	0.2600	0.1348	0.0570	0.7700	0.0270	0.0059	0.0800	0.0146	0.0208	0.0208	0.0321	0.0499	0	0
Newaukum Creek	I322B	Cobalt, Dissolved	µg/L	660	Acute	None	21.6	74	0.1363	0.3357	0.0572	2.9800	0.0002	0.0001	0.0045	0.0001	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	I322B	Cobalt, Dissolved	µg/L	132	Chronic	None	21.6	74	0.1363	0.3357	0.0572	2.9800	0.0010	0.0004	0.0226	0.0005	0.0008	0.0008	0.0008	0.0008	0	0
Newaukum Creek	I322B	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	82	2.2932	0.8392	0.8200	5.0900	0.4762	0.2114	1.0355	0.2346	0.3839	0.4669	0.5405	0.7687	0	1
Newaukum Creek	I322B	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	82	2.2932	0.8392	0.8200	5.0900	0.6445	0.2983	1.3239	0.3363	0.5243	0.6291	0.7370	1.0380	0	6
Newaukum Creek	I322B	Iron, Total	µg/L		Acute	None	96.3	82	365.5244	363.8017	25.0000	1800.0000	-	-	-	-	-	-	-	-	0	0
Newaukum Creek	I322B	Iron, Total	µg/L	1000	Chronic	None	96.3	82	365.5244	363.8017	25.0000	1800.0000	0.3655	0.0250	1.8000	0.0701	0.1325	0.2350	0.4423	1.1285	0	7
Newaukum Creek	I322B	Lead, Dissolved	µg/L		Acute	hardness-dependent	28.0	82	0.1012	0.0489	0.0125	0.4100	0.0067	0.0003	0.0620	0.0009	0.0033	0.0044	0.0084	0.0147	0	0
Newaukum Creek	I322B	Lead, Dissolved	µg/L		Chronic	hardness-dependent	28.0	82	0.1012	0.0489	0.0125	0.4100	0.1721	0.0085	1.5898	0.0229	0.0858	0.1138	0.2166	0.3762	0	1
Newaukum Creek	I322B	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	82	5.8021	2.5901	0.9100	10.4000	0.0025	0.0004	0.0044	0.0008	0.0016	0.0024	0.0034	0.0041	0	0
Newaukum Creek	I322B	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	82	5.8021	2.5901	0.9100	10.4000	0.0123	0.0019	0.0221	0.0042	0.0079	0.0119	0.0170	0.0206	0	0
Newaukum Creek	I322B	Mercury, Total	µg/L	2.1	Acute	None	69.5	82	0.0059	0.0084	0.0011	0.0758	0.0028	0.0005	0.0361	0.0007	0.0012	0.0024	0.0032	0.0052	0	0
Newaukum Creek	I322B	Mercury, Total	µg/L	1.302	Chronic	None	69.5	82	0.0059	0.0084	0.0011	0.0758	0.0045	0.0009	0.0582	0.0011	0.0019	0.0039	0.0051	0.0084	0	0
Newaukum Creek	I322B	Molybdenum, Dissolved	µg/L	35000	Acute	None	18.9	74	0.2457	0.0396	0.1610	0.4330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Newaukum Creek	I322B	Molybdenum, Dissolved	µg/L	2250	Chronic	None	18.9	74	0.2457	0.0396	0.1610	0.4330	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	I322B	Nickel, Dissolved	µg/L		Acute	hardness-dependent	97.6	82	0.5413	0.1961	0.1500	1.7300	0.0029	0.0016	0.0151	0.0018	0.0024	0.0028	0.0031	0.0041	0	0
Newaukum Creek	I322B	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	97.6	82	0.5413	0.1961	0.1500	1.7300	0.0265	0.0145	0.1362	0.0162	0.0213	0.0249	0.0283	0.0369	0	0
Newaukum Creek	I322B	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	61	2221.6557	1255.1822	259.0000	5460.0000	0.0027	0.0003	0.0066	0.0005	0.0013	0.0027	0.0037	0.0054	0	0
Newaukum Creek	I322B	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	61	2221.6557	1255.1822	259.0000	5460.0000	0.2701	0.0315	0.6638	0.0540	0.1313	0.2699	0.3733	0.5410	0	0
Newaukum Creek	I322B	Selenium, Total	µg/L	20	Acute	None	0.0	82	0.6159	0.2229	0.2500	0.7500	0.0308	0.0125	0.0375	0.0125	0.0125	0.0375	0.0375	0.0375	0	0
Newaukum Creek	I322B	Selenium, Total	µg/L	5	Chronic	None	0.0	82	0.6159	0.2229	0.2500	0.7500	0.1232	0.0500	0.1500	0.0500	0.0500	0.1500	0.1500	0.1500	0	0
Newaukum Creek	I322B	Strontium, Dissolved	µg/L	80	Acute	None	100.0	2	116.0000	2.8284	114.0000	118.0000	1.4500	1.4250	1.4750	1.4275	1.4375	1.4500	1.4625	1.4725	0	2
Newaukum Creek	I322B	Strontium, Dissolved	µg/L	49	Chronic	None	100.0	2	116.0000	2.8284	114.0000	118.0000	2.3673	2.3265	2.4082	2.3306	2.3469	2.3673	2.3878	2.4041	0	2
Newaukum Creek	I322B	TSS	mg/L	244	Acute	None	90.3	72	9.0318	9.4754	0.2500	52.2000	0.0370	0.0010	0.2139	0.0017	0.0115	0.0203	0.0496	0.1074	0	0
Newaukum Creek	I322B	TSS	mg/L	22	Chronic	None	90.3	72	9.0318	9.4754	0.2500	52.2000	0.4105	0.0114	2.3727	0.0186	0.1273	0.2255	0.5500	1.1916	0	7
Newaukum Creek	I322B	Vanadium, Dissolved	µg/L	725	Acute	None	98.6	74	0.7045	0.1673	0.1500	1.1000	0.0010	0.0002	0.0015	0.0006	0.0008	0.0010	0.0011	0.0013	0	0
Newaukum Creek	I322B	Vanadium, Dissolved	µg/L	400	Chronic	None	98.6	74	0.7045	0.1673	0.1500	1.1000	0.0018	0.0004	0.0028	0.0012	0.0015	0.0018	0.0020	0.0024	0	0
Newaukum Creek	I322B	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	82	20.6568	6.0599	9.8600	34.7000	0.4453	0.2412	0.8402	0.2879	0.3532	0.4141	0.5207	0.7366	0	0
Newaukum Creek	I322B	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	82	20.6568	6.0599	9.8600	34.7000	0.4417	0.2393	0.8334	0.2856	0.3504	0.4107	0.5165	0.7307	0	0
Newaukum Creek	J322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	88.9	36	0.0350	0.0454	0.0050	0.1930	0.0021	0.0002	0.0110	0.0003	0.0010	0.0014	0.0018	0.0067	0	0
Newaukum Creek	J322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	88.9	36	0.0350	0.0454	0.0050	0.1930	0.0161	0.0023	0.0878	0.0023	0.0064	0.0087	0.0113	0.0716	0	0
Newaukum Creek	J322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	36	1190.8611	327.3712	732.0000	2260.0000	0.0014	0.0009	0.0027	0.0010	0.0012	0.0013	0.0017	0.0020	0	0
Newaukum Creek	J322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	36	1190.8611	327.3712	732.0000	2260.0000	0.1448	0.0890	0.2748	0.1004	0.1201	0.1301	0.1669	0.2040	0	0
Newaukum Creek	J322	TSS	mg/L	244	Acute	None	100.0	36	7.3528	7.5764	1.1000	38.2000	0.0301	0.0045	0.1566	0.0067	0.0138	0.0215	0.0307	0.0970	0	0
Newaukum Creek	J322	TSS	mg/L	22	Chronic	None	100.0	36	7.3528	7.5764	1.1000	38.2000	0.3342	0.0500	1.7364	0.0739	0.1534	0.2386	0.3409	1.0761	0	3
Newaukum Creek	N322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	48.7	39	0.0135	0.0176	0.0050	0.0831	0.0011	0.0002	0.0068	0.0003	0.0003	0.0008	0.0012	0.0022	0	0
Newaukum Creek	N322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	48.7	39	0.0135	0.0176	0.0050	0.0831	0.0065	0.0023	0.0394	0.0023	0.0023	0.0034	0.0069	0.0182	0	0
Newaukum Creek	N322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	39	1090.6923	118.2015	809.0000	1370.0000	0.0013	0.0010	0.0017	0.0011	0.0013	0.0013	0.0014	0.0016	0	0
Newaukum Creek	N322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	39	1090.6923	118.2015	809.0000	1370.0000	0.1326	0.0984	0.1666	0.1105	0.1271	0.1301	0.1386	0.1619	0	0
Newaukum Creek	N322	TSS	mg/L	244	Acute	None	100.0	39	9.7205	11.1104	1.4000	59.5000	0.0398	0.0057	0.2439	0.0065	0.0168	0.0262	0.0445	0.1353	0	0
Newaukum Creek	N322	TSS	mg/L	22	Chronic	None	100.0	39	9.7205	11.1104	1.4000	59.5000	0.4418	0.0636	2.7045	0.0723	0.1864	0.2909	0.4932	1.5005	0	4
Newaukum Creek	S322	Aluminum, Total	µg/L	750	Acute	None	100.0	90	1050.4922	1739.4400	17.1000	10500.0000	1.4007	0.0228	14.0000	0.0281	0.2610	0.6900	1.5600	4.4820	0	33
Newaukum Creek	S322	Aluminum, Total	µg/L	87	Chronic	None	100.0	90	1050.4922	1739.4400	17.1000	10500.0000	12.0746	0.1966	120.6897	0.2423	2.2500	5.9483	13.4483	38.6379	0	72
Newaukum Creek	S322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	36.6	82	0.0092	0.0067	0.0050	0.0313	0.0006	0.0003	0.0021	0.0003	0.0003	0.0003	0.0008	0.0016	0	0
Newaukum Creek	S322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	36.6	82	0.0092	0.0067	0.0050	0.0313	0.0042	0.0022	0.0142	0.0023	0.0023	0.0023	0.0055	0.0111	0	0
Newaukum Creek	S322	Antimony, Dissolved	µg/L	88	Acute	None	7.2	83	0.2334	0.0597	0.0180	0.2500	0.0027	0.0002	0.0028	0.0003	0.0028	0.0028	0.0028	0.0028	0	0
Newaukum Creek	S322	Antimony, Dissolved	µg/L	30	Chronic	None	7.2	83	0.2334	0.0597	0.0180	0.2500	0.0078	0.0006	0.0083	0.0008	0.0083	0.0083	0.0083	0.0083	0	0
Newaukum Creek	S322	Arsenic, Dissolved	µg/L	360	Acute	None	10.1	89	0.2592	0.0535	0.2300	0.7150	0.0007	0.0006	0.0020	0.0007	0.0007	0.0007	0.0007	0.0008	0	0
Newaukum Creek	S322	Arsenic, Dissolved	µg/L	190	Chronic	None	10.1	89	0.2592	0.0535	0.2300	0.7150	0.0014	0.0012	0.0038	0.0013	0.0013	0.0013	0.0013	0.0015	0	0
Newaukum Creek	S322	Barium, Dissolved	µg/L	7250	Acute	None	100.0	89	2.2842	1.1923	1.4100	12.7000	0.0003	0.0002	0.0018	0.0002	0.0003	0.0003	0.0003	0.0004	0	0
Newaukum Creek	S322	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	89	2.2842	1.1923	1.4100	12.7000	0.0016	0.0010	0.0088	0.0011	0.0013	0.0014	0.0017	0.0020	0	0
Newaukum Creek	S322	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	89	0.0454	0.0136	0.0050	0.0500	0.0719	0.0053	0.1094	0.0087	0.0578	0.0686	0.0969	0.1041	0	0
Newaukum Creek	S322	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	89	0.0454	0.0136	0.0050	0.0500	0.4059	0.0337	0.5668	0.0481	0.3584	0.4055	0.5194	0.5469	0	0
Newaukum Creek	S322	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	7.9	89	0.1953	0.0530	0.0250	0.4560	0.0009	0.0001	0.0025	0.0006	0.0007	0.0009	0.0011	0.0012	0	0
Newaukum Creek	S322	Chromium, Dissolved	µg/L	14.7	Acute	None	7.9	89	0.1953	0.0530	0.0250	0.4560	0.0133	0.0017	0.0310	0.0078	0.0136	0.0136	0.0136	0.0136	0	0
Newaukum Creek	S322	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	7.9	89	0.1953	0.0530	0.0250	0.4560	0.0070	0.0006	0.0189	0.0047	0.0056	0.0070	0.0086	0.0093	0	0
Newaukum Creek	S322	Chromium, Dissolved	µg/L	9.62	Chronic	None	7.9	89	0.1953	0.0530	0.0250	0.4560	0.0203	0.0026	0.0474	0.0119	0.0208	0.0208	0.0208	0.0208	0	0
Newaukum Creek	S322	Cobalt, Dissolved	µg/L	660	Acute	None	10.1	89	0.0959	0.0277	0.0220	0.2780	0.0001	0.0000	0.0004	0.0001	0.0002	0.0002	0.0002	0.0002	0	0
Newaukum Creek	S322	Cobalt, Dissolved	µg/L	132	Chronic	None	10.1	89	0.0959	0.0277	0.0220	0.2780	0.0007	0.0002	0.0021	0.0003	0.0008	0.0008	0.0008	0.0008	0	0
Newaukum Creek	S322	Copper, Dissolved	µg/L		Acute	hardness-dependent	97.8	89	0.7991	0.5407	0.2000	5.1000	0.1889	0.0375	1.3803	0.0666	0.0966	0.1857	0.2331	0.3011	0	1
Newaukum Creek	S322	Copper, Dissolved	µg/L		Chronic	hardness-dependent	97.8	89	0.7991	0.5407	0.2000	5.1000	0.2541	0.0516	1.8367	0.0934	0.1296	0.2501	0.3084	0.4002	0	1
Newaukum Creek	S322	Iron, Total	µg/L		Acute	None	100.0	90	947.9444	1558.6072	60.0000	9450.0000	-	-	-	-	-	-	-	-	0	0
Newaukum Creek	S322	Iron, Total	µg/L	1000	Chronic	None	100.0	90	947.9444	1558.6072	60.0000	9450.0000	0.9479	0.0600	9.4500	0.0635	0.2200	0.4615	0.9595	3.0255	0	21
Newaukum Creek	S322	Lead, Dissolved	µg/L		Acute	hardness-dependent	4.5	89	0.0946	0.0294	0.0125	0.2600	0.0055	0.0005	0.0164	0.0009	0.0040	0.0051	0.0073	0.0081	0	0
Newaukum Creek	S322	Lead, Dissolved	µg/L		Chronic	hardness-dependent	4.5	89	0.0946	0.0294	0.0125	0.2600	0.1418	0.0117	0.4197	0.0224	0.1034	0.1296	0.1874	0.2091	0	0
Newaukum Creek	S322	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	89	2.4274	1.3052	1.0900	13.6000	0.0010	0.0005	0.0058	0.0006	0.0009	0.0010	0.0011	0.0014	0	0
Newaukum Creek	S322	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	89	2.4274	1.3052	1.0900	13.6000	0.0052	0.0023	0.0289	0.0031	0.0043	0.0049	0.0055	0.0069	0	0
Newaukum Creek	S322	Mercury, Total	µg/L	2.1	Acute	None	35.6	90	0.0048	0.0050	0.0008	0.0282	0.0023	0.0004	0.0134	0.0010	0.0012	0.0012	0.0028	0.0068	0	0
Newaukum Creek	S322	Mercury, Total	µg/L	1.302	Chronic	None	35.6	90	0.0048	0.0050	0.0008	0.0282	0.0037	0.0006	0.0217	0.0017	0.0019	0.0019	0.0045	0.0110	0	0
Newaukum Creek	S322	Molybdenum, Dissolved	µg/L	35000	Acute	None	10.1	89	0.2486	0.0651	0.0869	0.7750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Newaukum Creek	S322	Molybdenum, Dissolved	µg/L	2250	Chronic	None	10.1	89	0.2486	0.0651	0.0869	0.7750	0.0001	0.0000	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Newaukum Creek	S322	Nickel, Dissolved	µg/L		Acute	hardness-dependent	24.7	89	0.1939	0.1114	0.1500	0.9800	0.0011	0.0006	0.0067	0.0006	0.0007	0.0010	0.0011	0.0024	0	0
Newaukum Creek	S322	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	24.7	89	0.1939	0.1114	0.1500	0.9800	0.0102	0.0053	0.0601	0.0056	0.0066	0.0089	0.0102	0.0212	0	0
Newaukum Creek	S322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	82	1208.8756	771.6612	52.3000	3650.0000	0.0015	0.0001	0.0044	0.0001	0.0008	0.0013	0.0020	0.0031	0	0
Newaukum Creek	S322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	82	1208.8756	771.6612	52.3000	3650.0000	0.1470	0.0064	0.4438	0.0067	0.0823	0.1337	0.2030	0.3160	0	0
Newaukum Creek	S322	Selenium, Total	µg/L	20	Acute	None	0.0	90	0.7000	0.1508	0.2500	0.7500	0.0350	0.0125	0.0375	0.0125	0.0375	0.0375	0.0375	0.0375	0	0
Newaukum Creek	S322	Selenium, Total	µg/L	5	Chronic	None	0.0	90	0.7000	0.1508	0.2500	0.7500	0.1400	0.0500	0.1500	0.0500	0.1500	0.1500	0.1500	0.1500	0	0
Newaukum Creek	S322	TSS	mg/L	244	Acute	None	90.1	81	21.8063	45.0809	0.2500	308.0000	0.0894	0.0010	1.2623	0.0012	0.0168	0.0351	0.0770	0.2951	0	1
Newaukum Creek	S322	TSS	mg/L	22	Chronic	None	90.1	81	21.8063	45.0809	0.2500	308.0000	0.9912	0.0114	14.0000	0.0136	0.1859	0.3895	0.8545	3.2727	0	16
Newaukum Creek	S322	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	89	0.9323	0.1823	0.5300	1.7100	0.0013	0.0007	0.0024	0.0010	0.0012	0.0013	0.0014	0.0017	0	0
Newaukum Creek	S322	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	89	0.9323	0.1823	0.5300	1.7100	0.0023	0.0013	0.0043	0.0018	0.0021	0.0023	0.0025	0.0032	0	0
Newaukum Creek	S322	Zinc, Dissolved	µg/L		Acute	hardness-dependent	65.2	89	0.7215	1.4514	0.2500	13.0000	0.0170	0.0040	0.3543	0.0044	0.0071	0.0114	0.0171	0.0252	0	0
Newaukum Creek	S322	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	65.2	89	0.7215	1.4514	0.2500	13.0000	0.0169	0.0039	0.3514	0.0043	0.0070	0.0113	0.0169	0.0250	0	0
Newaukum Creek	WH322	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	90.9	22	0.0579	0.0639	0.0050	0.1960	0.0030	0.0003	0.0093	0.0005	0.0009	0.0018	0.0042	0.0090	0	0
Newaukum Creek	WH322	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	90.9	22	0.0579	0.0639	0.0050	0.1960	0.0269	0.0023	0.0889	0.0025	0.0062	0.0110	0.0404	0.0849	0	0
Newaukum Creek	WH322	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	22	1823.9091	679.4262	986.0000	3490.0000	0.0022	0.0012	0.0042	0.0013	0.0015	0.0022	0.0025	0.0041	0	0
Newaukum Creek	WH322	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	22	1823.9091	679.4262	986.0000	3490.0000	0.2218	0.1199	0.4243	0.1314	0.1495	0.2237	0.2520	0.4133	0	0
Newaukum Creek	WH322	TSS	mg/L	244	Acute	None	100.0	22	3.0873	2.9312	0.8000	9.5000	0.0127	0.0033	0.0389	0.0037	0.0043	0.0064	0.0217	0.0381	0	0
Newaukum Creek	WH322	TSS	mg/L	22	Chronic	None	100.0	22	3.0873	2.9312	0.8000	9.5000	0.1403	0.0364	0.4318	0.0409	0.0481	0.0705	0.2409	0.4230	0	0
Soos Creek	A320	2,4-D	µg/L	700	Acute	None	0.0	17	0.0125	0.0050	0.0075	0.0200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	2,4-D	µg/L	50	Chronic	None	0.0	17	0.0125	0.0050	0.0075	0.0200	0.0003	0.0002	0.0004	0.0002	0.0002	0.0002	0.0003	0.0004	0	0
Soos Creek	A320	4-Methylphenol	µg/L	700	Acute	None	0.0	10	0.1280	0.0059	0.1200	0.1400	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0
Soos Creek	A320	4-Methylphenol	µg/L	140	Chronic	None	0.0	10	0.1280	0.0059	0.1200	0.1400	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010	0	0
Soos Creek	A320	Acenaphthene	µg/L	30	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0002	0.0002	0.0008	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Soos Creek	A320	Acenaphthene	µg/L	6	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0010	0.0008	0.0042	0.0008	0.0008	0.0008	0.0008	0.0016	0	0
Soos Creek	A320	Aluminum, Total	µg/L	750	Acute	None	100.0	22	194.0545	274.3387	23.7000	1240.0000	0.2587	0.0316	1.6533	0.0337	0.0599	0.1367	0.2633	0.8052	0	1
Soos Creek	A320	Aluminum, Total	µg/L	87	Chronic	None	100.0	22	194.0545	274.3387	23.7000	1240.0000	2.2305	0.2724	14.2529	0.2907	0.5167	1.1782	2.2701	6.9414	0	13
Soos Creek	A320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	64.0	100	0.0197	0.0214	0.0050	0.1330	0.0012	0.0002	0.0065	0.0003	0.0004	0.0008	0.0015	0.0037	0	0
Soos Creek	A320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	64.0	100	0.0197	0.0214	0.0050	0.1330	0.0092	0.0022	0.0612	0.0023	0.0024	0.0058	0.0112	0.0243	0	0
Soos Creek	A320	Anthracene	µg/L	0.635	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0096	0.0074	0.0394	0.0075	0.0076	0.0079	0.0079	0.0148	0	0
Soos Creek	A320	Anthracene	µg/L	0.127	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0482	0.0370	0.1969	0.0373	0.0382	0.0394	0.0394	0.0740	0	0
Soos Creek	A320	Antimony, Dissolved	µg/L	88	Acute	None	52.9	34	0.1520	0.0959	0.0410	0.2500	0.0017	0.0005	0.0028	0.0005	0.0006	0.0015	0.0028	0.0028	0	0
Soos Creek	A320	Antimony, Dissolved	µg/L	30	Chronic	None	52.9	34	0.1520	0.0959	0.0410	0.2500	0.0051	0.0014	0.0083	0.0015	0.0017	0.0044	0.0083	0.0083	0	0
Soos Creek	A320	Arsenic, Dissolved	µg/L	360	Acute	None	100.0	37	0.8980	0.1983	0.5490	1.2400	0.0025	0.0015	0.0034	0.0017	0.0020	0.0026	0.0030	0.0032	0	0
Soos Creek	A320	Arsenic, Dissolved	µg/L	190	Chronic	None	100.0	37	0.8980	0.1983	0.5490	1.2400	0.0047	0.0029	0.0065	0.0031	0.0037	0.0050	0.0056	0.0060	0	0
Soos Creek	A320	Barium, Dissolved	µg/L	7250	Acute	None	100.0	36	4.8769	0.6983	3.7000	6.1700	0.0007	0.0005	0.0009	0.0005	0.0006	0.0007	0.0007	0.0008	0	0
Soos Creek	A320	Barium, Dissolved	µg/L	1450	Chronic	None	100.0	36	4.8769	0.6983	3.7000	6.1700	0.0034	0.0026	0.0043	0.0026	0.0031	0.0034	0.0036	0.0042	0	0
Soos Creek	A320	Benzo(a)pyrene	µg/L	0.75	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0082	0.0063	0.0333	0.0063	0.0065	0.0067	0.0067	0.0125	0	0
Soos Creek	A320	Benzo(a)pyrene	µg/L	0.15	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0408	0.0313	0.1667	0.0316	0.0323	0.0333	0.0333	0.0627	0	0
Soos Creek	A320	Benzo(b)fluoranthene	µg/L	512	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Benzo(b)fluoranthene	µg/L	102.4	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Soos Creek	A320	Benzo(k)fluoranthene	µg/L	0.7	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0087	0.0067	0.0357	0.0068	0.0069	0.0071	0.0071	0.0134	0	0
Soos Creek	A320	Benzo(k)fluoranthene	µg/L	0.14	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0437	0.0336	0.1786	0.0339	0.0346	0.0357	0.0357	0.0671	0	0
Soos Creek	A320	Bis(2-Ethylhexyl)Phthalate	µg/L	400	Acute	None	100.0	17	1.3008	1.2385	0.2450	5.1600	0.0033	0.0006	0.0129	0.0006	0.0009	0.0021	0.0046	0.0070	0	0
Soos Creek	A320	Bis(2-Ethylhexyl)Phthalate	µg/L	360	Chronic	None	100.0	17	1.3008	1.2385	0.2450	5.1600	0.0036	0.0007	0.0143	0.0007	0.0010	0.0024	0.0051	0.0078	0	0
Soos Creek	A320	Butylbenzylphthalate	µg/L	390	Acute	None	94.1	17	0.0451	0.0267	0.0049	0.0841	0.0001	0.0000	0.0002	0.0000	0.0001	0.0001	0.0002	0.0002	0	0
Soos Creek	A320	Butylbenzylphthalate	µg/L	60	Chronic	None	94.1	17	0.0451	0.0267	0.0049	0.0841	0.0008	0.0001	0.0014	0.0002	0.0004	0.0008	0.0011	0.0014	0	0
Soos Creek	A320	Cadmium, Dissolved	µg/L		Acute	hardness-dependent	0.0	39	0.0246	0.0226	0.0050	0.0500	0.0267	0.0041	0.0654	0.0041	0.0045	0.0054	0.0542	0.0642	0	0
Soos Creek	A320	Cadmium, Dissolved	µg/L		Chronic	hardness-dependent	0.0	39	0.0246	0.0226	0.0050	0.0500	0.1685	0.0278	0.3917	0.0281	0.0299	0.0341	0.3426	0.3865	0	0
Soos Creek	A320	Caffeine	µg/L	95000	Acute	None	41.2	17	0.0155	0.0110	0.0050	0.0370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Caffeine	µg/L	19000	Chronic	None	41.2	17	0.0155	0.0110	0.0050	0.0370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Carbazole	µg/L	465	Acute	None	0.0	17	0.0154	0.0115	0.0120	0.0600	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Carbazole	µg/L	93	Chronic	None	0.0	17	0.0154	0.0115	0.0120	0.0600	0.0002	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Soos Creek	A320	Chromium, Dissolved	µg/L	14.7	Acute	hardness-dependent	66.7	39	0.2192	0.0842	0.1000	0.4300	0.0007	0.0003	0.0016	0.0003	0.0005	0.0007	0.0008	0.0013	0	0
Soos Creek	A320	Chromium, Dissolved	µg/L	14.7	Acute	None	66.7	39	0.2192	0.0842	0.1000	0.4300	0.0149	0.0068	0.0293	0.0080	0.0122	0.0136	0.0156	0.0280	0	0
Soos Creek	A320	Chromium, Dissolved	µg/L	9.62	Chronic	hardness-dependent	66.7	39	0.2192	0.0842	0.1000	0.4300	0.0055	0.0020	0.0124	0.0024	0.0041	0.0053	0.0059	0.0097	0	0
Soos Creek	A320	Chromium, Dissolved	µg/L	9.62	Chronic	None	66.7	39	0.2192	0.0842	0.1000	0.4300	0.0228	0.0104	0.0447	0.0123	0.0187	0.0208	0.0239	0.0428	0	0
Soos Creek	A320	Chrysene	µg/L	0.35	Acute	None	0.0	17	0.0154	0.0115	0.0120	0.0600	0.0439	0.0343	0.1714	0.0343	0.0343	0.0357	0.0371	0.0663	0	0
Soos Creek	A320	Chrysene	µg/L	0.07	Chronic	None	0.0	17	0.0154	0.0115	0.0120	0.0600	0.2197	0.1714	0.8571	0.1714	0.1714	0.1786	0.1857	0.3314	0	0
Soos Creek	A320	Cobalt, Dissolved	µg/L	660	Acute	None	57.9	38	0.0669	0.0292	0.0340	0.1000	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0002	0	0
Soos Creek	A320	Cobalt, Dissolved	µg/L	132	Chronic	None	57.9	38	0.0669	0.0292	0.0340	0.1000	0.0005	0.0003	0.0008	0.0003	0.0003	0.0004	0.0008	0.0008	0	0
Soos Creek	A320	Copper, Dissolved	µg/L		Acute	hardness-dependent	100.0	39	0.9504	0.6228	0.3000	2.6900	0.1468	0.0362	0.4582	0.0409	0.0730	0.1217	0.2065	0.3175	0	0
Soos Creek	A320	Copper, Dissolved	µg/L		Chronic	hardness-dependent	100.0	39	0.9504	0.6228	0.3000	2.6900	0.2057	0.0520	0.6365	0.0585	0.1034	0.1688	0.2848	0.4479	0	0
Soos Creek	A320	Diazinon	µg/L	0.0963	Acute	None	0.0	17	0.0229	0.0050	0.0205	0.0420	0.2376	0.2129	0.4361	0.2129	0.2181	0.2285	0.2336	0.2908	0	0
Soos Creek	A320	Dichloroprop	µg/L	250	Acute	None	0.0	17	0.0104	0.0034	0.0055	0.0175	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Soos Creek	A320	Dichloroprop	µg/L	50	Chronic	None	0.0	17	0.0104	0.0034	0.0055	0.0175	0.0002	0.0001	0.0004	0.0001	0.0002	0.0002	0.0002	0.0003	0	0
Soos Creek	A320	Diethyl Phthalate	µg/L	6000	Acute	None	100.0	17	0.0316	0.0176	0.0140	0.0827	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Diethyl Phthalate	µg/L	1200	Chronic	None	100.0	17	0.0316	0.0176	0.0140	0.0827	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Soos Creek	A320	Dimethyl Phthalate	µg/L	14500	Acute	None	0.0	10	0.0070	0.0063	0.0047	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Dimethyl Phthalate	µg/L	2900	Chronic	None	0.0	10	0.0070	0.0063	0.0047	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Di-N-Butyl Phthalate	µg/L	240	Acute	None	100.0	17	0.0702	0.0401	0.0210	0.1820	0.0003	0.0001	0.0008	0.0001	0.0002	0.0003	0.0003	0.0006	0	0

Table A-5.
Summary Statistics and Hazard Quotients by Basin, Station, and Parameter (Shaded Cells Highlight HQs > 1.0)

									Concentration				Hazard Quotient									
Basin	Locator	Parameter	Units	SV	SV Type	SV Flag	FOD (%)	Sample Size	Mean	SD	Min	Max	Mean	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of HQs>1 based on detection limit	# of HQs>1
Soos Creek	A320	Di-N-Butyl Phthalate	µg/L	48	Chronic	None	100.0	17	0.0702	0.0401	0.0210	0.1820	0.0015	0.0004	0.0038	0.0004	0.0011	0.0014	0.0015	0.0030	0	0
Soos Creek	A320	Di-N-Octyl Phthalate	µg/L	60	Acute	None	10.0	10	0.0077	0.0065	0.0047	0.0250	0.0001	0.0001	0.0004	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Soos Creek	A320	Di-N-Octyl Phthalate	µg/L	12	Chronic	None	10.0	10	0.0077	0.0065	0.0047	0.0250	0.0006	0.0004	0.0021	0.0004	0.0004	0.0004	0.0004	0.0016	0	0
Soos Creek	A320	Endosulfan	µg/L	0.22	Acute	None	0.0	17	0.0025	0.0001	0.0024	0.0029	0.0113	0.0107	0.0130	0.0107	0.0109	0.0111	0.0116	0.0122	0	0
Soos Creek	A320	Endosulfan	µg/L	0.056	Chronic	None	0.0	17	0.0025	0.0001	0.0024	0.0029	0.0443	0.0420	0.0509	0.0420	0.0429	0.0438	0.0455	0.0480	0	0
Soos Creek	A320	Fluoranthene	µg/L	18	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0003	0.0003	0.0014	0.0003	0.0003	0.0003	0.0003	0.0005	0	0
Soos Creek	A320	Fluoranthene	µg/L	3.55	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0017	0.0013	0.0070	0.0013	0.0014	0.0014	0.0014	0.0026	0	0
Soos Creek	A320	Iron, Total	µg/L		Acute	None	100.0	39	891.2564	2159.0698	130.0000	13600.0000	-	-	-	-	-	-	-	-	0	0
Soos Creek	A320	Iron, Total	µg/L	1000	Chronic	None	100.0	39	891.2564	2159.0698	130.0000	13600.0000	0.8913	0.1300	13.6000	0.1300	0.1850	0.2910	0.9380	1.9020	0	9
Soos Creek	A320	Isophorone	µg/L	60000	Acute	None	0.0	10	0.0070	0.0063	0.0047	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Isophorone	µg/L	12000	Chronic	None	0.0	10	0.0070	0.0063	0.0047	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Lead, Dissolved	µg/L		Acute	hardness-dependent	35.9	39	0.0643	0.0445	0.0125	0.2100	0.0024	0.0003	0.0086	0.0003	0.0009	0.0026	0.0037	0.0046	0	0
Soos Creek	A320	Lead, Dissolved	µg/L		Chronic	hardness-dependent	35.9	39	0.0643	0.0445	0.0125	0.2100	0.0618	0.0087	0.2198	0.0088	0.0225	0.0670	0.0962	0.1185	0	0
Soos Creek	A320	Manganese, Dissolved	µg/L	2350	Acute	None	100.0	22	8.0845	2.1727	2.3200	11.2000	0.0034	0.0010	0.0048	0.0025	0.0029	0.0033	0.0043	0.0047	0	0
Soos Creek	A320	Manganese, Dissolved	µg/L	470	Chronic	None	100.0	22	8.0845	2.1727	2.3200	11.2000	0.0172	0.0049	0.0238	0.0126	0.0144	0.0166	0.0215	0.0234	0	0
Soos Creek	A320	Mercury, Total	µg/L	2.1	Acute	None	56.4	39	0.0449	0.0491	0.0007	0.1000	0.0214	0.0003	0.0476	0.0004	0.0008	0.0025	0.0476	0.0476	0	0
Soos Creek	A320	Mercury, Total	µg/L	1.302	Chronic	None	56.4	39	0.0449	0.0491	0.0007	0.1000	0.0345	0.0005	0.0768	0.0007	0.0012	0.0041	0.0768	0.0768	0	0
Soos Creek	A320	Molybdenum, Dissolved	µg/L	35000	Acute	None	57.9	38	0.2195	0.0460	0.1260	0.2750	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
Soos Creek	A320	Molybdenum, Dissolved	µg/L	2250	Chronic	None	57.9	38	0.2195	0.0460	0.1260	0.2750	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0
Soos Creek	A320	Naphthalene	µg/L	500	Acute	None	5.9	17	0.0162	0.0118	0.0120	0.0600	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0	0
Soos Creek	A320	Naphthalene	µg/L	100	Chronic	None	5.9	17	0.0162	0.0118	0.0120	0.0600	0.0002	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0003	0	0
Soos Creek	A320	Nickel, Dissolved	µg/L		Acute	hardness-dependent	100.0	39	0.5619	0.1846	0.3600	1.4000	0.0022	0.0013	0.0050	0.0014	0.0016	0.0021	0.0028	0.0033	0	0
Soos Creek	A320	Nickel, Dissolved	µg/L		Chronic	hardness-dependent	100.0	39	0.5619	0.1846	0.3600	1.4000	0.0202	0.0119	0.0448	0.0124	0.0148	0.0186	0.0254	0.0300	0	0
Soos Creek	A320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	100	959.2700	194.0506	532.0000	1470.0000	0.0012	0.0006	0.0018	0.0008	0.0010	0.0011	0.0013	0.0016	0	0
Soos Creek	A320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	100	959.2700	194.0506	532.0000	1470.0000	0.1166	0.0647	0.1787	0.0827	0.1030	0.1136	0.1307	0.1593	0	0
Soos Creek	A320	Pentachlorophenol	µg/L		Acute	pH and temperature-dependent	0.0	17	0.2238	0.2044	0.0600	0.5000	0.0160	0.0033	0.0446	0.0036	0.0045	0.0059	0.0298	0.0387	0	0
Soos Creek	A320	Pentachlorophenol	µg/L		Chronic	pH and temperature-dependent	0.0	17	0.2238	0.2044	0.0600	0.5000	0.0209	0.0043	0.0582	0.0047	0.0059	0.0077	0.0388	0.0504	0	0
Soos Creek	A320	Phenanthrene	µg/L	29.82	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0002	0.0002	0.0008	0.0002	0.0002	0.0002	0.0002	0.0003	0	0
Soos Creek	A320	Phenanthrene	µg/L	6.325	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0010	0.0007	0.0040	0.0007	0.0008	0.0008	0.0008	0.0015	0	0
Soos Creek	A320	Phenol	µg/L	22.5	Acute	None	11.8	17	0.1561	0.1099	0.0470	0.3700	0.0069	0.0021	0.0164	0.0021	0.0022	0.0071	0.0109	0.0125	0	0
Soos Creek	A320	Phenol	µg/L	4.5	Chronic	None	11.8	17	0.1561	0.1099	0.0470	0.3700	0.0347	0.0104	0.0822	0.0105	0.0111	0.0356	0.0544	0.0627	0	0
Soos Creek	A320	Pyrene	µg/L	45.45	Acute	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0001	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0002	0	0
Soos Creek	A320	Pyrene	µg/L	9.09	Chronic	None	0.0	17	0.0061	0.0049	0.0047	0.0250	0.0007	0.0005	0.0028	0.0005	0.0005	0.0006	0.0006	0.0010	0	0
Soos Creek	A320	Selenium, Total	µg/L	20	Acute	None	0.0	39	0.4679	0.2512	0.2500	0.7500	0.0234	0.0125	0.0375	0.0125	0.0125	0.0125	0.0375	0.0375	0	0
Soos Creek	A320	Selenium, Total	µg/L	5	Chronic	None	0.0	39	0.4679	0.2512	0.2500	0.7500	0.0936	0.0500	0.1500	0.0500	0.0500	0.0500	0.1500	0.1500	0	0
Soos Creek	A320	TSS	mg/L	244	Acute	None	100.0	100	10.4906	35.5195	1.0300	347.0000	0.0430	0.0042	1.4221	0.0058	0.0107	0.0143	0.0255	0.1512	0	1
Soos Creek	A320	TSS	mg/L	22	Chronic	None	100.0	100	10.4906	35.5195	1.0300	347.0000	0.4768	0.0468	15.7727	0.0647	0.1182	0.1584	0.2830	1.6766	0	9
Soos Creek	A320	Vanadium, Dissolved	µg/L	725	Acute	None	100.0	37	0.5894	0.1512	0.4210	1.3000	0.0008	0.0006	0.0018	0.0006	0.0007	0.0008	0.0009	0.0010	0	0
Soos Creek	A320	Vanadium, Dissolved	µg/L	400	Chronic	None	100.0	37	0.5894	0.1512	0.4210	1.3000	0.0015	0.0011	0.0033	0.0011	0.0012	0.0014	0.0016	0.0018	0	0
Soos Creek	A320	Zinc, Dissolved	µg/L		Acute	hardness-dependent	100.0	39	1.0395	0.5338	0.2500	2.5000	0.0172	0.0034	0.0496	0.0055	0.0094	0.0141	0.0231	0.0357	0	0
Soos Creek	A320	Zinc, Dissolved	µg/L		Chronic	hardness-dependent	100.0	39	1.0395	0.5338	0.2500	2.5000	0.0171	0.0034	0.0492	0.0054	0.0093	0.0140	0.0229	0.0354	0	0
Soos Creek	B320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	57.6	33	0.0118	0.0081	0.0050	0.0323	0.0010	0.0003	0.0036	0.0003	0.0005	0.0008	0.0016	0.0022	0	0
Soos Creek	B320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	57.6	33	0.0118	0.0081	0.0050	0.0323	0.0063	0.0023	0.0147	0.0023	0.0024	0.0052	0.0082	0.0139	0	0
Soos Creek	B320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	33	739.0000	352.1056	392.0000	1690.0000	0.0009	0.0005	0.0020	0.0005	0.0006	0.0007	0.0011	0.0017	0	0
Soos Creek	B320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	33	739.0000	352.1056	392.0000	1690.0000	0.0898	0.0477	0.2055	0.0480	0.0619	0.0717	0.1133	0.1668	0	0
Soos Creek	B320	TSS	mg/L	244	Acute	None	96.9	32	6.7513	11.0978	0.2500	56.3000	0.0277	0.0010	0.2307	0.0027	0.0049	0.0080	0.0244	0.0859	0	0
Soos Creek	B320	TSS	mg/L	22	Chronic	None	96.9	32	6.7513	11.0978	0.2500	56.3000	0.3069	0.0114	2.5591	0.0300	0.0545	0.0886	0.2705	0.9527	0	2
Soos Creek	G320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	63.6	55	0.0137	0.0142	0.0050	0.0922	0.0007	0.0001	0.0035	0.0002	0.0003	0.0006	0.0009	0.0015	0	0
Soos Creek	G320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	63.6	55	0.0137	0.0142	0.0050	0.0922	0.0067	0.0022	0.0427	0.0023	0.0027	0.0055	0.0072	0.0145	0	0
Soos Creek	G320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	100.0	55	431.9309	451.1411	49.4000	1640.0000	0.0005	0.0001	0.0020	0.0001	0.0001	0.0002	0.0007	0.0016	0	0
Soos Creek	G320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	100.0	55	431.9309	451.1411	49.4000	1640.0000	0.0525	0.0060	0.1994	0.0081	0.0126	0.0210	0.0740	0.1639	0	0
Soos Creek	G320	TSS	mg/L	244	Acute	None	100.0	55	4.1396	3.8285	0.8000	20.2000	0.0170	0.0033	0.0828	0.0056	0.0084	0.0127	0.0182	0.0450	0	0
Soos Creek	G320	TSS	mg/L	22	Chronic	None	100.0	55	4.1396	3.8285	0.8000	20.2000	0.1882	0.0364	0.9182	0.0623	0.0932	0.1409	0.2023	0.4986	0	0
Soos Creek	L320	Ammonia-nitrogen	mg/L		Acute	pH and temperature-dependent	62.8	43	0.0193	0.0363	0.0050	0.1820	0.0010	0.0002	0.0095	0.0002	0.0003	0.0006	0.0009	0.0011	0	0
Soos Creek	L320	Ammonia-nitrogen	mg/L		Chronic	pH and temperature-dependent	62.8	43	0.0193	0.0363	0.0050	0.1820	0.0089	0.0023	0.0806	0.0023	0.0024	0.0050	0.0083	0.0112	0	0
Soos Creek	L320	Nitrite+Nitrate-Nitrogen	µg/L	827900	Acute	None	90.7	43	168.3628	188.7890	10.0000	782.0000	0.0002	0.0000	0.0009	0.0000	0.0000	0.0001	0.0003	0.0006	0	0
Soos Creek	L320	Nitrite+Nitrate-Nitrogen	µg/L	8225	Chronic	None	90.7	43	168.3628	188.7890	10.0000	782.0000	0.0205	0.0012	0.0951	0.0012	0.0037	0.0112	0.0316	0.0597	0	0

Table A-6.
Acute Screening Values for Chemicals With Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	WQS/WQC	Acute Screening Value (µg/L)	Comment	Reference
Inorganics				
Aluminum	WQC	750		USEPA 2002
Antimony	PWQC	88		USEPA 1991
Arsenic	WQS	360		WAC 173-201A-040
Cadmium	WQS	0.82	Hardness = 25 mg/L	WAC 173-201A-040
Chromium (III)	WQS	176	Hardness = 25 mg/L	WAC 173-201A-040
Chromium (VI)	WQS	14.7		WAC 173-201A-040
Copper	WQS	4.61	Hardness = 25 mg/L	WAC 173-201A-040
Lead	WQS	13.9	Hardness = 25 mg/L	WAC 173-201A-040
Mercury	WQS	2.1		WAC 173-201A-040
Nickel	WQS	438.06	Hardness = 25 mg/L	WAC 173-201A-040
Selenium	WQS	20		WAC 173-201A-040
Silver	WQS	0.32	Hardness = 25 mg/L	WAC 173-201A-040
Zinc	WQS	35.4	Hardness = 25 mg/L	WAC 173-201A-040
Conventionals				
Ammonia (unionized)	WQS	128	pH = 7.5, T = 15°C	WAC 173-201A-040
Ammonia (total)	WQS	14900	pH = 7.5, T = 15°C	WAC 173-201A-040
Chlorine (residual)	WQS	19		WAC 173-201A-040
Semi-Volatile Organics				
Bis(2-ethylhexyl)phthalate	PWQC	400	Solubility limit	USEPA 1987, 2002
Pentachlorophenol	WQS	15	pH = 7.5	WAC 173-201A-040
Phenanthrene	PWQC	29.82		USEPA 1988
Pesticides				
Aldrin	WQS	2.5		WAC 173-201A-040
Chlordane	WQS	2.4		WAC 173-201A-040
Chlorpyrifos	WQS	0.083		WAC 173-201A-040
Diazinon	PWQC	0.0963		USEPA 2002
Dieldrin	WQS	2.5		WAC 173-201A-040
Endosulfan I	WQS	0.22		WAC 173-201A-040
Endosulfan II	WQS	0.22		WAC 173-201A-040
Endrin	WQS	0.18		WAC 173-201A-040
gamma-BHC (Lindane)	WQS	2.0		WAC 173-201A-040
Heptachlor	WQS	0.52		WAC 173-201A-040
Heptachlor epoxide	WQC	0.52		USEPA 2002
Parathion, ethyl-	WQC	0.065		USEPA 2002
Toxaphene	WQC	0.73		WAC 173-201A-040

WQS = Wash. St. water quality standard

WQC = U.S. EPA water quality criterion

PWQC = Proposed U.S. EPA water quality criterion

[1]For Class AA waters.

Table A-7.
Chronic Screening Values for Chemicals with
Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	WQS/WQC	Chronic Screening Value (µg/L)	Comment	Reference
Inorganics				
Aluminum	WQC	87		USEPA 2002
Antimony	PWQC	30		USEPA 1991
Arsenic	WQS	190		WAC 173-201A-040
Cadmium	WQS	0.37	Hardness = 25 mg/L	WAC 173-201A-040
Chromium (III)	WQS	57.2	Hardness = 25 mg/L	WAC 173-201A-040
Chromium (VI)	WQS	9.62		WAC 173-201A-040
Copper	WQS	3.47	Hardness = 25 mg/L	WAC 173-201A-040
Lead	WQS	0.54	Hardness = 25 mg/L	WAC 173-201A-040
Mercury	WQS	1.302		WAC 173-201A-040
Nickel	WQS	48.65	Hardness = 25 mg/L	WAC 173-201A-040
Selenium	WQS	5		WAC 173-201A-040
Zinc	WQS	32.3	Hardness = 25 mg/L	WAC 173-201A-040
Conventionals				
Ammonia (unionized)	WQS	22	pH = 7.5, T = 15°C	WAC 173-201A-040
Ammonia (total)	WQS	2450	pH = 7.5, T = 15°C	WAC 173-201A-040
Chlorine (residual)	WQS	11		WAC 173-201A-040
Semi-Volatile Organics				
Bis(2-ethylhexyl)phthalate	PWQC	360		USEPA 1987
Pentachlorophenol	WQS	9.5	pH = 7.5	WAC 173-201A-040
Phenanthrene	PWQC	6.325		USEPA 1988
Pesticides				
Aldrin	WQS	0.29	Final Chronic Value	USEPA 1980a
Chlordane	WQS	0.17	Final Chronic Value	USEPA 1980b
Chlorpyrifos	WQS	0.041		WAC 173-201A-040
Dieldrin	WQS	0.29	Final Chronic Value	USEPA 1980a
Endosulfan I	WQS	0.056		WAC 173-201A-040
Endosulfan II	WQS	0.056		WAC 173-201A-040
Endrin	WQS	0.045	Final Chronic Value	USEPA 1980c
gamma-BHC (Lindane)	WQS	0.08		WAC 173-201A-040
Heptachlor	WQS	0.0065	Final Chronic Value	USEPA 1980d
Heptachlor epoxide	WQC	0.0065	Final Chronic Value	USEPA 1980d
Malathion	WQC	0.1		USEPA 2002
Methoxychlor	WQC	0.03		USEPA 2002
Parathion, ethyl-	WQC	0.013		USEPA 2002
Toxaphene	WQC	0.039	Final Chronic Value	USEPA 1986

WQS = Wash. St. water quality standard
WQC = U.S. EPA water quality criterion
PWQC = Proposed U.S. EPA water quality criterion

Table A-8.
Acute Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration (hours)	Exposure Type	Endpoint	Effect	Control	LC/EC50 (µg/L)	Acute Screening Value[1] (µg/L)	Reference
Inorganics										
Barium	Daphnia magna (Water flea)	Neonate	48	S	EC50	Immobilization	I	14,500	7,250	Biesinger and Christiansen 1972
Beryllium	Daphnia magna (Water flea)	Larvae	96	S	LC50	Mortality	I	50	25	Ewell et al. 1986
Cobalt	Daphnia hyalina (Water flea)	Adult	48	S	LC50	Mortality	S	1,320	660	Baudouin and Scoppa 1974
Fluoride ion (as F-)	Ceratopsyche bronta (Caddisfly)	Last instar	96	S	EC50	Immobilization	S	7,690	3,845	Camargo et al. 1992
Iron	Ephemerella subvaria (Mayfly)	NR	96	S	LC50	Mortality	S	320	160	Warnick and Bell 1969
Lithium	Ptychocheilus lucius (Colorado pikeminnow)	Swim up fry	96	S	LC50	Mortality	C	17,000	8,500	Hamilton 1995
Manganese	Daphnia magna (Water flea)	Neonate	48	S	EC50	Immobilization	I	4700	2,350	Baird et al. 1991
Molybdenum	Pimephales promelas (Fathead minnow)	NR	96	S	LC50	Mortality	I	70,000	35,000	Tarzwell and Henderson 1960
Strontium	Gastrophryne carolinensis (Toad)	Embryo/larvae	168	R	LC50	Mortality	C	160	80	Birge et al. 1979
Thallium, Total	Caenorhabditis elegans (nematode)	NR	96	S	LC50	Mortality	NR	123000	61,500	Williams and Dusenbery 1990
Tin, Total	Daphnia magna (Water flea)	NR	48	S	EC50	Immobilization	I	21,560	10,780	Khangarot and Ray 1989
Titanium	Daphnia magna (Water flea)	<24 hr	48	S	EC50	Immobilization	NR	>1,000,000	>500,000	Haley and Kurnas 1993
Vanadium	Daphnia magna (Water flea)	<24 hr	48	S	LC50	Immobilization	I	1450	725	Kimball 1978
Volatile Organics										
1,1,1-Trichloroethane	Pimephales promelas (Fathead minnow)	1.04 g, 49.0 mm	96	F	EC50	Immobilization	S	11,100	5,550	Alexander et al. 1978
1,1,2,2-Tetrachloroethane	Daphnia magna (Water flea)	<24 hrs	48	S	LC50	Mortality	S	9300	4,650	LeBlanc 1980
1,1,2-Trichloroethane	Daphnia magna (Water flea)	<24 hrs	48	S	LC50	Mortality	S	18,000	9,000	LeBlanc 1980
1,1,2-Trichloroethylene	Oryzias latipes (Medaka)	3 cm, 0.3 g	48	S	LC50	Mortality	I	1,900	950	Yoshioka et al. 1986
1,1-Dichloroethylene	Daphnia magna (Water flea)	First Instar	48	S	LC50	Mortality	I	11,600	5,800	Dill et al. 1980
1,2,4-Trichlorobenzene	Tetrahymena pyriformis (Ciliate)	0.2 ml	24	S	LC50	Growth	I	910	455	Yoshioka et al. 1985
1,2-Dichloroethane	Gammarus fasciatus (Amphipod)	Mature	96	S	LC50	Mortality	I	100,000	50,000	Johnson and Finley 1980
1,2-Dichloropropane	Ceriodaphnia dubia (Water flea)		48	S	EC50	ITX		13,559	6,780	Rose et al. 1998
2-Butanone	Pimephales promelas (Fathead minnow)	31d	96	F	LC50	Mortality	S	3220000	1,610,000	Brooke et al. 1984
2-Hexanone	Pimephales promelas (Fathead minnow)	31 d	96	F	LC50	Mortality	S	428,000	214,000	Geiger et al. 1986
Acetone	Tetrahymena pyriformis (Ciliate)	NR	48	NR	IC50	Population	NR	232	116	Schultz et al. 1995
Benzene	Oncorhynchus kisutch (Coho salmon)	Juvenile	1	F	EC50	Avoidance	I	1,740	870	Maynard and Webber 1981
Bromodichloromethane	Tetrahymena pyriformis (Ciliate)	0.2 mL	24	S	EC50	Growth	I	240000	120,000	Yoshioka et al. 1985
Bromoform	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	I	29000	14,500	Buccafusco et al. 1981
Bromomethane	Oryzias latipes (Medaka)	28-35 days	96	R	LC50	Mortality	S	700	350	Canton et al. 1980
Carbon disulfide	Daphnia magna (Water flea)	NR	48	R	LC50	Mortality	I	2,100	1,050	Van Leeuwen et al. 1985
Carbon tetrachloride	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	I	27,000	13,500	Buccafusco et al. 1981
Chlorobenzene	Micropterus salmoides (Largemouth bass)		84	F	LC50	MOR		340	170	Birge et al. 1979
Chlorodibromomethane	Cyprinus carpio (Common carp)	Egg	72-120	R	LC50	MOR	S	34,000	17,000	Mattice et al. 1981
Chloroform	Oncorhynchus mykiss (Rainbow trout)	Juvenile	20 min	F	MATC	Avoidance	C	7,050	7,050	Birge et al. 1993
Chloromethane (Methyl chloride)	Lepomis macrochirus (Bluegill)	33-75 mm	96	S	LC50	Mortality	I	550000	275,000	Dawson et al. 1977
Ethyl benzene	Daphnia magna (Water flea)	4-6 day	48	S	EC50	Immobilization	S	2120	1,060	Bobra et al. 1983
Ethylene dibromide (1,2-Dibromoethane)	Oryzias latipes (Medaka)	Juvenile	96	F	LC50	Mortality	C	32,100	16,050	Holcombe et al. 1995
Hexachloroethane	Oncorhynchus mykiss (Rainbow trout)	66.4 CM, 4.3 G	96	F	EC50	Equilibrium	S	840	420	Ahmad et al. 1984
m/p-Xylene	Oncorhynchus mykiss (Rainbow trout)	NR	96	R	LC50	Mortality	I	2600	1,300	Galassi et al. 1988
Methylene chloride	Pimephales promelas (Fathead minnow)	1.04 g, 49.0 mm	96	F	EC50	Immobilization	S	99,000	49,500	Alexander et al. 1978
o-Xylene	Daphnia magna (Water flea)	Neonate	48	F	EC50	Immobilization	I	3820	1,910	Holcombe et al. 1987
Styrene	Pimephales promelas (Fathead minnow)	30 d	96	F	LC50	Mortality	S	4,020	2,010	Geiger et al. 1990
Tetrachloroethene	Jordanella floridae (Flagfish)	Juvenile	96	R	LC50	Mortality	I	4,000	2,000	Smith et al. 1991
Toluene	Oncorhynchus kisutch (Coho salmon)	Juvenile	1	F	EC50	Avoidance	I	1,650	825	Maynard and Webber 1981
trans-1,2-Dichloroethylene	Daphnia magna (Water flea)	<24 hr	48	S	LC50	Mortality	S	220,000	110,000	Leblanc 1980
Trichloroethene	Jordanella floridae (Flagfish)	Juvenile	96	R	LC50	Mortality	I	3,100	1,550	Smith et al. 1991
Vinyl acetate	Pimephales promelas (Fathead minnow)	24 hrs	96	S	LC50	Mortality	S	14,000	7,000	Pickering and Henderson 1977
Vinyl chloride	Tetrahymena pyriformis (Ciliate)	NR	9	S	IC50	Growth	NR	405,000	202,500	Sauvant et al. 1995
Xylene	Oncorhynchus mykiss (Rainbow trout)	NR	96	R	LC50	Mortality	I	2600	1,300	Galassi et al. 1988
Semi-Volatile Organics/Phenols										
1,2-Dichlorobenzene	Ceriodaphnia dubia (Water flea)	NR	48	S	EC50	Immobilization	NR	662	331	Rose et al. 1998
1,2-Diphenylhydrazine	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	I	250	125	Buccafusco et al. 1981
1,3-Dichlorobenzene	Chironomus thummi (Midge)		96	R	NOEC	Behavior		37	37	Van der Zandt et al. 1994

Table A-8.
Acute Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration (hours)	Exposure Type	Endpoint	Effect	Control	LC/EC50 (µg/L)	Acute Screening Value[1] (µg/L)	Reference
1,4-Dichlorobenzene	Oncorhynchus mykiss (Rainbow trout)	52.7 cm, 2.1 g	96	F	LC50	Mortality	S	1,120	560	Ahmad et al. 1984
2,4,5-Trichlorophenol	Oncorhynchus mykiss (Rainbow trout)		24	R	LOEC	Growth		34	34	Neville 1995
2,4,6-Trichlorophenol	Oryzias latipes (Medaka)		48	S	LC50	Mortality		180	90	Yoshioka et al. 1986
2,4-Dichlorophenol	Daphnia magna (Water flea)	NR	48	S	LC50	Mortality	I	2.6	1.31	Carlson et al. 1975
2,4-Dimethylphenol	Daphnia magna (Water flea)	< 24 hr	48	S	LC50	Mortality	S	2,100	1,050	LeBlanc 1980
2,4-Dinitrophenol	Notopterus notopterus (Asiatic knifefish)		96	R	LC50	Mortality		60	30	Dalela et al. 1980
2,4-Dinitrotoluene	Gasterosteus aculeatus (Threespine stickleback)	4-5 week	96	R	LC50	Mortality	I	6,300	3,150	Van Den Dikkenberg et al. 1989
2,6-Dinitrotoluene	Daphnia magna (Water flea)		24	S	LC50	Mortality		15,000	7,500	Bringmann and Kuhn 1977
2-Chloroethylvinyl ether	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	I	350,000	175,000	Buccafusco et al. 1981
2-Chloronaphthalene	Daphnia magna (Water flea)	4-6 d	48	S	EC50	Immobilization	S	1,646	823	Abernethy et al. 1986
2-Chlorophenol	Poecilia reticulata (Guppy)		24	NR	LC50	Mortality		1,720	860	Benoit-Guyod et al. 1984
2-Methylnaphthalene	Oncorhynchus mykiss (Rainbow trout)	2.92 g/6.0 cm	96	R	EC50	Mortality	V	1456	728	Kennedy 1990
2-Methylphenol	Daphnia magna (Water flea)	NR	48	NR	LC50	Mortality	I	5,000	2,500	Parkhurst et al. 1979
2-Nitroaniline	Daphnia magna (Water flea)	<24 hr	48	R	EC50	Immobilization	C	4,890	2,445	Danish EPA 1999
2-Nitrophenol	Oryzias latipes (Medaka)		48	S	LC50	Mortality		1,600	800	Yoshioka et al. 1986
3,3'-Dichlorobenzidine	Daphnia magna (Water flea)	<24 hr	48	R	EC50	Mortality	C	1,050	525	Brooke 1991
3-Methylphenol	Oncorhynchus mykiss (Rainbow trout)	6.0 g, 79 mm	96	F	LC50	Mortality	C	8,900	4,450	Bergman and Anderson 1977
3-Nitroaniline	Daphnia magna (Water flea)		48	S	EC50	Immobilization		980	490	Ramos et al. 1998
4,6-Dinitro-O-cresol	Oncorhynchus mykiss (Rainbow trout)		96	S	LC50	Mortality		66	33	Johnson and Finley 1980
4-Bromophenyl Phenyl Ether	Daphnia magna (Water flea)		48	S	LC50	Mortality		360	180	LeBlanc 1980
4-Chloro-3-methylphenol	Oncorhynchus mykiss (Rainbow trout)	0.3 g	96	R	LC50	Mortality	I	917	459	USEPA 1995
4-Chloroaniline	Daphnia magna (Water flea)		48	S	LC50	Mortality		50	25	Maas-Diepeveen and Van Leeuwen 1986
4-Chlorophenyl Phenyl Ether	Salvelinus fontinalis (Brook trout)	2-5 g	96	R	LC50	Mortality	I	730	365	Chui et al. 1990
4-Methyl-2-pentanone	Pimephales promelas (Fathead minnow)	29 d	96	F	LC50	Mortality	S	505,000	252,500	Brooke et al. 1984
4-Methylphenol	Daphnia magna (Water flea)	NR	48	NR	LC50	Mortality	I	1,400	700	Parkhurst et al. 1979
4-Nitroaniline	Daphnia magna (Water flea)	<24 hrs	48	R	EC50	Immobilization	C	17,000	8,500	Pedersen et al. 1998
4-Nitrophenol	Oryzias latipes (Medaka)		48	S	LC50	Mortality		1,100	550	Yoshioka et al. 1986
Acenaphthene	Paratanytarsus (Midge)	Larvae	48	S	LC50	Mortality	I	60	30	Lemke and Anderson 1984
Acrylonitrile	Ctenopharyngodon idella (Grass carp)	3140 mg	96	R	LC50	Mortality	C	4,960	2,480	Zhang et al. 1996
Aniline	Oncorhynchus mykiss (Rainbow trout)	Juvenile	96	F	LC50	Mortality	C	30	15.00	Spehar 1987
Anthracene	Lepomis macrochirus (Bluegill)	Juvenile	96	F	LC50	Mortality	I	1.27	0.64	McCloskey and Oris 1991
Aroclor 1016	Oncorhynchus mykiss (Rainbow trout)	Embryo-larvae	96	R	LC50	Mortality	S	1	0.54	Birge et al. 1978
Aroclor 1221	Rasbora heteromorpha (Red rasbora)	1-3 CM	96	F	LC50	Mortality	I	1,050	525	Tooby et al. 1975
Aroclor 1232	Rasbora heteromorpha (Red rasbora)	1-3 CM	96	F	LC50	Mortality	I	320	160	Tooby et al. 1975
Aroclor 1242	Rana pipiens (Leopard frog)	Larvae	96	R	LC50	Mortality	I	2	1.07	Birge et al. 1978
Aroclor 1248	Gammarus fasciatus (Amphipod)	Mature	96	S	LC50	Mortality	I	52	26	Johnson and Finley 1980
Aroclor 1254	Oncorhynchus mykiss (Rainbow trout)	Embryo-larvae	96	R	LC50	Mortality	S	0.32	0.16	Birge et al. 1978
Aroclor 1260	Oncorhynchus clarki (Cutthroat trout)	Juvenile	96	S	LC50	Mortality	I	25,000	12,500	Swedburg 1969
Benzidine	Daphnia magna (Water flea)		48	S	EC50	Immobilization		600	300	Kuhn et al. 1989
Benzo(a)anthracene	Daphnia pulex (Water flea)	1.9-2.1 mm	96	S	LC50	Mortality	I	10	5.00	Trucco et al. 1983
Benzo(a)pyrene	Daphnia magna (Water flea)	Neonate	4	R	LC50	Mortality	I	1.5	0.75	Newsted and Giesy 1987
Benzo(b)fluoranthene	Daphnia magna (Water flea)	Juvenile	24	S	EC50	Immobilization	V	1024	512	Wernersson and Dave 1997
Benzo(g,h,i)perylene	Daphnia magna (Water flea)	Neonate	14	R	LC50	Mortality	I	0.2	0.10	Newsted and Giesy 1987
Benzo(k)fluoranthene	Daphnia magna (Water flea)	Neonate	13	R	LC50	Mortality	I	1.4	0.70	Newsted and Giesy 1987
Benzoic acid	Xenopus laevis (Clawed toad)	Embryo	96	R	LC50	Mortality	C	1,290,800	645,400	Dawson et al. 1996
Benzyl alcohol	Lepomis macrochirus (Bluegill)	33-75 mm	96	S	LC50	Mortality	I	10,000	5,000	Dawson et al. 1977
Benzyl butyl phthalate	Pimephales promelas (Fathead minnow)	Juvenile	96	S	LC50	Mortality	C	780	390	Adams et al. 1995
bis(2-Chloroethoxy)Methane	Pimephales promelas (Fathead minnow)	NR	96	S	LC50	Mortality	I	184,000	92,000	Gersich and Mayes 1986
bis(2-Chloroethyl)Ether	Oncorhynchus mykiss (Rainbow trout)	NR	48	S	LC50	Mortality	C	91,000	45,500	Shumway and Palensky 1973
Chrysene	Daphnia magna (Water flea)	Neonate	24	R	LC50	Mortality	I	0.7	0.35	Newsted and Giesy 1987
Dibenzo(a,h)anthracene	Daphnia magna (Water flea)	Neonate	3.1	R	LC50	Mortality	I	0.4	0.20	Newsted and Giesy 1987
Dibenzofuran	Pimephales promelas (Fathead minnow)	30 days	96	F	LC50	Mortality	C	1,050	525.00	Brooke 1991
Diethylphthalate	Oncorhynchus mykiss	Juvenile, 39-62 mm	96	F	LC50	Mortality	C	12000	6,000	Adams et al. 1995
Dimethylphthalate	Cyprinodon variegatus (Sheepshead minnow)	Juvenile	96	S	LC50	Mortality	C	29,000	14,500	Adams et al. 1995

Table A-8.
Acute Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration (hours)	Exposure Type	Endpoint	Effect	Control	LC/EC50 (µg/L)	Acute Screening Value[1] (µg/L)	Reference
Di-n-butylphthalate	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	C	480	240	Adams et al. 1995
Di-n-octylphthalate	Paratanytarsus parthenogenetica (Midge)	2nd or 3rd instar	96	S	LC50	Mortality	I	>120	>60	Adams et al. 1995
Fluoranthene	Ictalurus punctatus (Channel catfish)	24-45 D	96	S	LC50	Mortality	S	36	18	Gendusa 1990
Fluorene	Daphnia pulex (Water flea)	Neonate	48	S	EC50	Immobilization	I	212	106	Smith et al. 1988
Hexachlorobenzene	Daphnia magna (Water flea)	NR	24		EC0	Equilibrium	NR	5	5	Scheubel 2001
Hexachlorobutadiene	Carassius auratus (Goldfish)	6.3 G	96	R	LC50	Mortality	I	90	45	Leeuwangh et al. 1975
Hexachlorocyclopentadiene	Pimephales promelas (Fathead minnow)	Larvae	96	F	LC50	Mortality	S	7	3.5	Spehar et al. 1979
Isophorone	Daphnia magna (Water flea)	<24 hr	48	S	LC50	Mortality	S	120,000	60,000	LeBlanc 1980
Naphthalene	Daphnia pulex (Water flea)	<24h	96	S	LC50	Mortality	I	1000	500	Trucco et al. 1983
Nitrobenzene	Oryzias latipes (Medaka)	3 cm, 0.3 G	48	S	LC50	Mortality	I	1,800	900	Yoshioka et al. 1986
N-Nitrosodimethylamine	Gammarus limnaeus (Amphipod)	3-5 mm	96	F	LC50	Mortality	I	280,000	140,000	Draper and Fisher 1980
N-Nitrosodiphenylamine	Lepomis macrochirus (Bluegill)	Juvenile	96	S	LC50	Mortality	I	5,800	2,900	Buccafusco et al. 1981
Phenol	Gammarus pulex (Amphipod)	6 mg or 1.3 mg	96	R	LC50	Mortality	S	45	22.5	Stephenson 1983
Pyrene	Daphnia magna (Water flea)	<24h	48	S	EC50	Immobilization	S	90.9	45.45	Abernethy et al. 1986
Pyridine	Oncorhynchus gorbuscha (Pink salmon)	3.5 cm, 0.2 g	96	S	LC50	Mortality	S	1100	550	Wan et al. 1987
Pesticides										
2,4,5-T	Keratella cochlearis (Rotifer)		48	R	LC50	Mortality		100	50	Vancil 1976
2,4,5-TP (Silvex)	Pteronarcys californicus (Stonefly)		96	S	LC50	Mortality		340	170	Sanders and Cope 1968
2,4-D	Oncorhynchus mykiss (Rainbow trout)	Swim up fry	96	S	LC50	Mortality	I	1,400	700	Johnson and Finley 1980
2,4-DB	Oncorhynchus mykiss (Rainbow trout)	0.8 g	96	S	LC50	Mortality	NR	1,970	985	Mayer and Ellersieck 1986
4,4'-DDD	Gammarus fasciatus (Scud)		96	S	LC50	Mortality		0.6	0.3	Sanders 1972
4,4'-DDE	Chironomus thummi (Midge)		24	S	EC50	Immobilization		1	0.5	Lydy et al. 1990
4,4'-DDT	Orconectes nais (Crayfish)	96 hr	96	S	LC50	Mortality		0.18	0.09	Sanders 1972
Acrolein	Xenopus laevis (Clawed toad)		96	F	LC50	Mortality		7	3.5	Holcombe et al. 1987
Alachlor	Selenastrum capricornutum (Green Algae)	NR	96	S	EC50	Growth	NR	6	3	Fairchild et al. 1997
Benfluralin	Lepomis macrochirus (Bluegill)	NR	96	F	LC50	Mortality	NR	65	32.5	Office of Pesticide Programs 2000
BHC, alpha-	Carassius auratus (Goldfish)		48	S	LC50*	Mortality		120	60	Hashimoto and Nishiuchi 1981
BHC, beta-	Danio rerio (Zebra danio)		96	S	LC50	Mortality		1,520	760	Oliveira-Filho and Paumgartten 1997
BHC, delta-	Danio rerio (Zebra danio)	NR	48	F	LC50	Mortality	NR	120	60	Slooff 1978
Carbazole	Pimephales promelas (Fathead minnow)	30 days	96	F	LC50	Mortality	C	930	465	Brooke 1991
Chlorpropham	Oncorhynchus mykiss (Rainbow trout)	NR	96	NR	LC50	Mortality	I	3,020	1,510	USEPA 1995
Dalapon	Lepomis macrochirus (Bluegill)	1.0 g	96	S	LC50	Mortality	I	105,000	52,500	Johnson and Finley 1980
Dicamba	Gammarus lacustris (Amphipod)	Adult	96	S	LC50	Mortality	K	3,900	1,950	Office of Pesticide Programs 2000
Dichloroprop	Oncorhynchus mykiss (Rainbow trout)	1.84 g	96	S	LC50	Mortality	K	500	250	Office of Pesticide Programs 2000
Dinoseb	Ictalurus punctatus (Channel catfish)	1 yr	96	S	LC50	Mortality	I	28	14	Skelley 1989
Disulfoton	Daphnia magna (Water flea)	NR	72		EC50	Equilibrium	NR	3.3	1.65	Matthias 1990
Endosulfan sulfate	Daphnia carinata (Water flea)	<24h	48	R	EC50	Mortality	NR	756	378	Barry et al. 1995
Ethalfluralin	Daphnia magna (Water flea)	NR	48	R	EC50	Immobilization	NR	18.1	9.05	Office of Pesticide Programs 2000
Fipronil	Lepomis macrochirus (Bluegill)	NR	96	F	LC50	Mortality	NR	25	12.5	Office of Pesticide Programs 2000
Fonofos	Daphnia magna (Water flea)	NR	48	S	EC50	Immobilization	NR	2	1	Office of Pesticide Programs 2000
Linuron	Lemna minor (Duckweed)	NR	120	S	EC50	Abundance	NR	7	4	Stephenson & Kane 1984
Malathion	Gammarus fasciatus (Amphipod)	NR	96	F	LC50	Mortality	C	0.5	0.25	Sanders 1972
MCPA	Poecilia reticulata (Guppy)	2.24-2.43 cm	48	NR	LC50	Mortality	I	100	50	Havlikova et al. 1981
MCPP	Rasbora heteromorpha (Red rasbora)	1.3-3 cm	48	R	LC50	Mortality	I	11,000	5,500	Alabaster 1969
Methoxychlor	Orconectes nais (Crayfish)	NR	96	S	LC50	Mortality	NR	0.5	0.25	Sanders 1972
Methyl azinphos	Gammarus fasciatus (Scud)	NR	96	S	LC50	Mortality	NR	0.1	0.05	Mayer & Ellersieck 1986
Parathion, methyl-	Daphnia magna (Water flea)		48	S	EC50	Immobilization		0.14	0.07	Johnson and Finley 1980
Pendimethalin	Selenastratum capricornutum (Green Algae)	NR	120	S	EC50	Abundance	NR	5	3	Office of Pesticide Programs 2000
Permethrin	Daphnia magna (Water flea)	NR	48	S	EC50	Immobilization	NR	0.039	0.0195	Office of Pesticide Programs 2000
Phorate	Gammarus fasciatus (Scud)	NR	96	S	LC50	Mortality	NR	0.6	0.30	Office of Pesticide Programs 2000
Propanil	Carassius auratus (Goldfish)	NR	48	NR	LC50	Mortality	NR	350	175	Nishiuchi & Hashimoto 1967
Simazine	Morone saxatilis (Striped bass)	60 mm, 2.7 g	96	S	LC50	Mortality	I	250	125	Wellborn 1969
Thiobencarb	Chlorella saccharophila (Green Algae)	NR	96	S	EC50	Growth	NR	17	9	Sabater and Carrasco 1996

Table A-8.
Acute Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration (hours)	Exposure Type	Endpoint	Effect	Control	LC/EC50 (µg/L)	Acute Screening Value[1] (µg/L)	Reference
Other Chemicals										
Caffeine	Xenopus laevis (Clawed toad)	Embryo	120	S	LC50	Mortality	C	190,000	95,000	DeYoung et al. 1996
Testosterone	Brachionus calyciflorus (Rotifer)	NR	72	NR	EC50	Reproduction	NR	4442	2,221	Radix et al. 2002
Physical Parameters										
Total Suspended Solids (mg/L)	Oncorhynchus tshawytscha (Chinook salmon)	Smolts	96	NR	LC50	Mortality	NR	488	244	Stober et al. 1981
Conventionals										
Nitrate Nitrogen (NO3-N)	Xenopus laevis (Frog)	Tadpole	96	S	LC50	Mortality	S	1,655,800	827,900	Schuytema and Nebeker 1999
Nitrite Nitrogen (NO2-N)	Rana pretiosa (Oregon spotted frog)	Larvae (1 week old)	96	S	LC50	Mortality	C	6,820	3,410	Marco et al. 1999

LC50 = Median lethal concentration
EC50 = Median effect concentration
MATC = Maximum acceptable toxicant concentration (geometric mean on NOEC and LOEC).
NR = Not reported
Exposure Type Codes:
S = Static
R = Renewal
F = Flow-through
Control Codes (As Defined in AQUIRE):
C = Concurrent control (The control is run concurrent with the exposure tank(s), the dilution water is the same as for the test exposure.)
S = Satisfactory control
I = Indeterminate control
M = Multiple controls reported (e.g., negative, solvent)
[1]Per Stephan et al. (1985), acute screening value is the LC/EC50 value divided by two (with the exception of chloroform for which the MATC was used).

Table A-9.
Chronic Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration	Exposure Type	Measured Effect	Control	Result (µg/L)				Chronic Screening Value[1] (µg/L)	Reference
							Acute LC/EC50	Chronic EC50	Chronic NOEC	Chronic LOEC		
Inorganics												
Barium	Daphnia magna (Water flea)	Neonate	48 hr	S	Immobilization	I	14,500	-	-	-	1,450	Biesinger and Christiansen 1972
Beryllium	Daphnia magna (Water flea)	Larvae	96 hr	S	Mortality	I	50	-	-	-	5.0	Ewell et al. 1986
Cobalt	Daphnia hyalina (Water flea)	Adult	48 hr	S	Mortality	S	1,320	-	-	-	132	Baudouin and Scoppa 1974
Fluoride ion (as F-)	Ceratopsyche bronta (Caddisfly)	Last instar	96 hr	S	Immobilization	S	7690	-	-	-	769	Camargo et al. 1992
Iron	Ephemerella subvaria (Mayfly)	NR	96 hr	S	Mortality	S	320	-	-	-	32.0	Warnick and Bell 1969
Lithium	Ptychocheilus lucius (Colorado pikeminnow)	Swim up fry	96 hr	S	Mortality	C	17,000	-	-	-	1,700	Hamilton 1995
Manganese	Daphnia magna (Water flea)	Neonate	48 hr	S	Immobilization	S	4700	-	-	-	470	Baird et al. 1991
Molybdenum	Gymnodinium splendens (Dinoflagellate)	Growing culture	48 hr	S	Growth	I	-	4,500	-	-	2,250	Wilson and Freeburg 1980
Silver	-	-	-	-	-	-	0.32	-	-	-	0.032	Estimated[2]
Strontium	Oncorhynchus mykiss (Rainbow trout)	Embryo/larvae	32 d	NR	Mortality	NR	-	-	49	-	49	Birge et al. 1981
Thallium, Total	Selenastrum capricornutum (Green algae)	NR	96 hr	NR	Population	NR	-	130	-	-	65	USEPA 1978
Tin, Total	Gastrophryne carolinensis (Narrow-mouthed toad)	Eggs	7 d	R	Mortality	C	-	90	-	-	45	Birge et al. 1978
Titanium	Chlorella vulgaris (Green algae)	NR	3-4 mo	NR	Growth	C	-	-	6,500	16,000	10,198	Den Dooren de Jong 1965
Vanadium	Daphnia magna	<24 hr	21 d	S	Growth	I	-	-	400	-	400	Van Leeuwen et al. 1988
Volatile Organics												
1,1,1-Trichloroethane	Daphnia magna (Water flea)	< 24 hr	17 d	R	Reproduction	S	-	-	1,300	-	1,300	Thompson and Carmichael 1989
1,1,2,2-Tetrachloroethane	Daphnia magna (Water flea)	<24 hrs	48 hr	S	Mortality	S	9300	-	-	-	930	LeBlanc 1980
1,1,2-Trichloroethane	Daphnia magna (Water flea)	<24 hrs	48 hr	S	Mortality	S	18000	-	-	-	1800	Smith et al. 1991
1,1-Dichloroethylene	Daphnia magna (Water flea)	First Instar	48 hr	S	Mortality	I	11,600	-	-	-	1,160	Dill et al. 1980
1,2,4-Trichlorobenzene	Pimephales promelas (Fathead minnow)	Larvae	30 day	F	Mortality	M	-	-	210		210	LeBlanc 1984
1,2-Dichloroethane	Gammarus fasciatus (Amphipod)	Mature	96 hr	S	Mortality	I	100,000	-	-	-	10,000	Johnson and Finley 1980
1,2-Dichloropropane	Ceriodaphnia dubia (Water flea)		48 hr	S	Immobilization		13,559				1,356	Rose et al. 1998
2-Butanone	Pimephales promelas (Fathead minnow)	31d	96 hr	F	Mortality	S	3220000	-	-	-	322,000	Brooke et al. 1984
2-Hexanone	Tetrahymena pyriformis (Ciliate)	NR	48 hr	NR	Growth	NR	-	3,000	-	-	1,500	Schultz et al. 1995
Acetone	Tetrahymena pyriformis (Ciliate)	NR	48 hr	NR	Population	NR	-	232	-	-	116	Schultz et al. 1995
Benzene	Oncorhynchus kisutch (Coho salmon)	Juvenile	1 hr	F	Avoidance	I	1,740	-	-	-	174	Maynard and Webber 1981
Bromodichloromethane	Tetrahymena pyriformis (Ciliate)	0.2 mL	24 hr	S	Growth	I	240,000	-	-	-	24,000	Yoshioka et al. 1985
Bromoform	Lepomis macrochirus (Bluegill)	Juvenile	96 96	S	Mortality	I	29000	-	-	-	2,900	Buccafusco et al. 1981
Bromomethane	Oryzias latipes (Medaka)	NR	3 mo	R	Growth	I	-	-	320	-	320	Wester et al. 1988
Carbon disulfide	Daphnia magna (Water flea)	NR	48 hr	R	Mortality	I	2,100	-	-	-	210	Van Leeuwen et al. 1985
Carbon tetrachloride	Rana catesbeiana (Bullfrog)	Embryo	8 d	F	Development	S	-	900	-	-	450	Yoshioka et al. 1986
Chlorobenzene	Micropterus salmoides (Largemouth bass)		7.5 d	F	Mortality		-	50	-	-	25	Birge et al. 1979
Chlorodibromomethane	Cyprinus carpio (Common carp)	Egg	3-5 d	R	Mortality	S	34,000	-	-	-	3,400	Mattice et al. 1981
Chloroform	Rana pipiens (Leopard frog)	Embryo	120 hr	F	Development	S	-	4,560	-	-	2,280	Birge et al. 1980
Chloromethane (Methyl chloride)	Lepomis macrochirus (Bluegill)	33-75 mm	96 hr	S	Mortality	I	550,000	-	-	-	55,000	Dawson et al. 1977
Ethyl benzene	Daphnia magna (Water flea)	4-6 day	48 hr	S	Mortality	S	2120	-	-	-	212	Benville and Korn 1977
Ethylene dibromide (1,2-Dibromoethane)	Oryzias latipes (Medaka)	Larvae	28 d	F	Growth	C	-	-	7,480	-	7,480	Holcombe et al. 1995
Hexachloroethane	Oncorhynchus mykiss (Rainbow trout)	66.4 CM, 4.3 G	96 hr	F	Equilibrium	S	840	-	-	-	84	Ahmad et al. 1984
m/p-Xylene (mixed m- and p- isomers)[7]	Oncorhynchus mykiss (Rainbow trout)	NR	96 hr	R	Mortality	I	2,600	-	-	-	260	Galassi et al. 1988
Methylene chloride	Pimephales promelas (Fathead minnow)	1.04 g, 49.0 mm	96 hr	F	Immobilization	S	99,000	-	-	-	9900	Alexander et al. 1978
o-Xylene	Daphnia magna (Water flea)	Neonate	48 hr	F	Immobilization	I	3,820	-	-	-	382	Benville and Korn 1977
Styrene	Selenastrum capricornutum (Green algae)	1.0 E+4 cells/mL	96 hr	S	Population	C	-	-	63	280	133	Cushman et al. 1997
Tetrachloroethene	Jordanella floridae (Flagfish)	Juvenile	96 hr	R	Mortality	I	4,000	-	-	-	400	Smith et al. 1991
Toluene	Oncorhynchus kisutch (Coho salmon)	Juvenile	1 hr	F	Avoidance	I	1,650	-	-	-	165	Maynard and Webber 1981
trans-1,2-Dichloroethylene	Daphnia magna (Water flea)	<24 hrs	48 hr	S	Mortality	S	220,000	-	-	-	22,000	Leblanc 1980
Trichloroethene	Oryzias latipes (Medaka)	3 cm, 0.3 g	48 hr	S	Mortality	I	1900	-	-	-	190	Yoshioka et al. 1986
Vinyl acetate	Pimephales promelas (Fathead minnow)	24 hrs	96 hr	S	Mortality	S	14000	-	-	-	1,400	Pickering and Henderson 1966
Vinyl chloride	Tetrahymena pyriformis (Ciliate)	NR	9 hr	S	Growth	NR	405,000		-	-	40,500	Sauvant et al. 1995
Xylene	Oncorhynchus mykiss (Rainbow trout)	NR	96 hr	R	Mortality	I	2600	-	-	-	260	Galassi et al. 1988
Semi-Volatile Organics/Phenols												
1,2-Dichlorobenzene	Ceriodaphnia dubia (Water flea)	NR	48 hr	S	Immobilization	NR	662	-	-	-	66.2	Rose et al. 1998
1,2-Diphenylhydrazine	Lepomis macrochirus (Bluegill)	Juvenile	96 hr	S	Mortality	I	250	-	-	-	25	Buccafusco et al. 1981
1,3-Dichlorobenzene	Chironomus thummi (Midge)		96 hr	R	Behavior		37	-	-		3.675	Van der Zandt et al. 1994

Table A-9.
Chronic Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration	Exposure Type	Measured Effect	Control	Result (µg/L)				Chronic Screening Value[1] (µg/L)	Reference
							Acute LC/EC50	Chronic EC50	Chronic NOEC	Chronic LOEC		
1,4-Dichlorobenzene	Oncorhynchus mykiss (Rainbow trout)	52.7 cm, 2.1 g	96 hr	F	Mortality	S	1120	-	-	-	112	Ahmad et al. 1984
2,4,5-Trichlorophenol	Oncorhynchus mykiss (Rainbow trout)		12 d	R	Growth		-	-	-	34	34	Neville 1995
2,4,6-Trichlorophenol	Oryzias latipes (Medaka)		48 hr	S	Mortality		180				18	Yoshioka et al. 1986
2,4-Dichlorophenol	Daphnia magna (Water flea)	NR	48 hr	S	Mortality	I	2.6	-	-	-	0.26	Carlson et al. 1975
2,4-Dimethylphenol	Daphnia magna (Water flea)	< 24 hr	48 hr	S	Mortality	S	2,100	-	-	-	210	LeBlanc 1980
2,4-Dinitrophenol	Notopterus notopterus (Asiatic knifefish)		96 hr	R	Mortality		60				6	Dalela et al. 1980
2,4-Dinitrotoluene	Daphnia magna (Water flea)	<= 24 hrs	21 d	R	Reproduction	S	-	-	20	-	20	Kuhn et al. 1989
2,6-Dinitrotoluene	Daphnia magna (Water flea)		21 d	R	Reproduction		-	-	60	-	60	Kuhn et al. 1989
2-Chloroethylvinyl ether	Lepomis macrochirus (Bluegill)	Juvenile	96 hr	S	Mortality	I	350,000	-	-	-	35000	Buccafusco et al. 1981
2-Chloronaphthalene	Daphnia magna (Water flea)	4-6 d	48 hr	S	Immobilization	S	1,646	-	-	-	165	Abernethy et al. 1986
2-Chlorophenol	Poecilia reticulata (Guppy)		24 hr	NR	Mortality		1,720	-	-	-	172	Benoit-Guyod et al. 1984
2-Methylnaphthalene	Oncorhynchus mykiss	2.92 g/6.0 cm	96 hr	R	Mortality	V	1456	-	-	-	145.6	Kennedy 1990
2-Methylphenol	Daphnia magna (Water flea)	NR	48 hr	NR	Mortality	I	5,000	-	-	-	500	Parkhurst et al. 1979
2-Nitroaniline	Daphnia magna (Water flea)	<24 hr	48 hr	R	Immobilization	C	4,890	-	-	-	489	Danish EPA 1999
2-Nitrophenol	Oryzias latipes (Medaka)		48 hr	S	Mortality		1,600	-	-	-	160	Yoshioka et al. 1986
3,3'-Dichlorobenzidine	Daphnia magna (Water flea)	<24 hr	48 hr	R	Immobilization	C	1,050	-	-	-	105	Brooke 1991
3-Methylphenol	Oncorhynchus mykiss (Rainbow trout)	6.0 g, 79 mm	96 hr	F	Mortality	C	8,900	-	-	-	890	Bergman and Anderson 1977
3-Nitroaniline	Daphnia magna (Water flea)		48 hr	S	Immobilization		980				98	Ramos et al. 1998
4,6-Dinitro-O-cresol	Oncorhynchus mykiss (Rainbow trout)		96 hr	S	Mortality		66				6.6	Johnson and Finley 1980
4-Bromophenyl Phenyl Ether	Daphnia magna (Water flea)		48 hr	S	Mortality		360	-	-	-	36	LeBlanc 1980
4-Chloro-3-methylphenol	Oncorhynchus mykiss (Rainbow trout)	0.3 g	96 hr	R	Mortality	I	917	-	-	-	91.7	USEPA 1995
4-Chloroaniline	Daphnia magna (Water flea)		21 d	R	Reproduction		-	-	10	-	10	Kuhn et al. 1989
4-Chlorophenyl Phenyl Ether	Salvelinus fontinalis (Brook trout)	2-5 g	96 hr	R	Mortality	I	730	-	-	-	73	Chui et al. 1990
4-Methyl-2-pentanone	Pimephales promelas (Fathead minnow)	29 d	96 hr	F	Mortality	S	505,000	-	-	-	50,500	Brooke et al. 1984
4-Methylphenol	Daphnia magna (Water flea)	NR	48 hr	NR	Mortality	I	1,400	-	-	-	140	Parkhurst et al. 1979
4-Nitroaniline	Daphnia magna (Water flea)	<24 hrs	48 hr	R	Immobilization	C	17000	-	-	-	1,700	Pedersen et al. 1998
4-Nitrophenol	Oryzias latipes (Medaka)		48 hr	S	Mortality		1,100	-	-	-	110	Yoshioka et al. 1986
Acenaphthene	Paratanytarsus (Midge)	Larvae	48 hr	S	Mortality	I	60	-	-	-	6	Lemke and Anderson 1984
Acrylonitrile	Ctenopharyngodon idella (Grass carp)	3140 mg	96 hr	R	Mortality	C	4,960	-	-	-	496	Zhang et al. 1996
Aniline	Oncorhynchus mykiss (Rainbow trout)	Juvenile	96 hr	F	Mortality	C	30	-	-	-	3	Spehar 1987
Anthracene	Lepomis macrochirus (Bluegill)	Juvenile	96 hr	F	Mortality	I	1.27	-	-	-	0.127	McCloskey and Oris 1991
Aroclor 1016	Oncorhynchus mykiss (Rainbow trout)	EMBRYO TO LARVA	96 hr	R	Mortality		1.08				0.108	Birge et al. 1978
Aroclor 1221	Daphnia magna (Water flea)	<24 H	21 d	S	Reproduction	I	-	125	-	-	62.5	Nebeker and Puglisi 1974
Aroclor 1232	Daphnia magna (Water flea)	<24 H	21 d	S	Reproduction	I	-	66	-	-	33	Nebeker and Puglisi 1974
Aroclor 1242	Rana pipiens (Leopard frog)	LARVA	96 hr	R	Mortality		2.13	-	-	-	0.213	Birge et al. 1978
Aroclor 1248	Oncorhynchus mykiss (Rainbow trout)	NR	25 d	F	Mortality	I	-	3.4	-	-	1.70	Mayer et al. 1977
Aroclor 1254	Oncorhynchus mykiss (Rainbow trout)	EMBRYO TO LARVA	96 hr	R	Mortality		0.32	-	-	-	0.032	Birge et al. 1978
Aroclor 1260	Pimephales promelas (Fathead minnow)	LARVAE, < 8 H	30 d	F	Mortality	S	-	3.3	-	-	1.65	DeFoe et al. 1978
Benzidine	Daphnia magna (Water flea)		48	S	Immobilization		600	-	-	-	60	Kuhn et al. 1989
Benzo(a)anthracene	Daphnia pulex (Water flea)	1.9-2.1 mm	96 hr	S	Mortality	I	10	-	-	-	1	Trucco et al. 1983
Benzo(a)pyrene	Daphnia magna (Water flea)	Neonate	4 hr	R	Mortality	I	1.5	-	-	-	0.15	Newsted and Giesy 1987
Benzo(b)fluoranthene	Daphnia magna (Water flea)	Juvenile	24 hr	S	Immobilization	V	1,024	-	-	-	102	Wernersson and Dave 1997
Benzo(g,h,i)perylene	Daphnia magna (Water flea)	Neonate	14 hr	R	Mortality	I	0.2	-	-	-	0.02	Newsted and Giesy 1987
Benzo(k)fluoranthene	Daphnia magna (Water flea)	Neonate	13 hr	R	Mortality	I	1.4	-	-	-	0.14	Newsted and Giesy 1987
Benzoic acid	Xenopus laevis (Clawed toad)	Embryo	96 hr	R	Development	C	-	433,000	-	-	216,500	Dawson et al. 1996
Benzyl alcohol	Lepomis macrochirus (Bluegill)	33-75 mm	96 hr	S	Mortality	I	10,000	-	-	-	1,000	Dawson et al. 1977
Benzyl butyl phthalate	Selenastrum capricornutum (Green algae)	NR	96 hr	NR	Population	I	-	120	-	-	60	USEPA 1978
bis(2-Chloroethoxy)Methane	Pimephales promelas (Fathead minnow)	NR	96 hr	S	Mortality	I	184,000	-	-	-	18,400	Gersich and Mayes 1986
bis(2-Chloroethyl)Ether	Oncorhynchus mykiss (Rainbow trout)	NR	48 hr	S	Mortality	C	91,000	-	-	-	9,100	Shumway and Palensky 1973
Chrysene	Daphnia magna (Water flea)	Neonate	24 hr	R	Mortality	I	0.7	-	-	-	0.07	Newsted and Giesy 1987
Dibenzo(a,h)anthracene	Daphnia magna (Water flea)	Neonate	3.1 hr	R	Mortality	I	0.4	-	-	-	0.04	Newsted and Giesy 1987
Dibenzofuran	Pimephales promelas (Fathead minnow)	30 days	96 hr	F	Mortality	C	1,050	-	-	-	105	Brooke 1991
Diethylphthalate	Oncorhynchus mykiss	Juvenile, 39-62 mm	96 hr	F	Mortality	C	12000	-	-	-	1200	Adams et al. 1995
Dimethylphthalate	Cyprinodon variegatus (Sheepshead minnow)	Juvenile	96 hr	S	Mortality	C	29,000	-	-	-	2,900	Adams et al. 1995

Table A-9.
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Chemical	Species	Lifestage/ Size	Exposure Duration	Exposure Type	Measured Effect	Control	Result (µg/L)				Chronic Screening Value[1] (µg/L)	Reference
							Acute LC/EC50	Chronic EC50	Chronic NOEC	Chronic LOEC		
Di-n-butylphthalate	Lepomis macrochirus (Bluegill)	Juvenile	96 hr	S	Mortality	C	480	-	-	-	48	Adams et al. 1995
Di-n-octylphthalate	Paratanytarsus parthenogenetica (Midge)	2nd or 3rd instar	96 hr	S	Mortality	I	>120	-	-	-	>12	Adams et al. 1995
Fluoranthene	Pimephales promelas (Fathead minnow)	3-14 day	30 d	R	Mortality	S	-	7.1	-	-	3.55	Gendusa 1990
Fluorene	Daphnia pulex (Water flea)	Neonate	48 hr	S	Immobilization	I	212	-	-	-	21.2	Smith et al. 1988
Hexachlorobenzene	Daphnia magna (Water flea)	NR	21 d		Reproduction	NR	-	-	0.04	-	0.04	Scheubel 2001
Hexachlorobutadiene	Danio rerio (Zebra danio)	NR	14 d	F	Behavior	NR	-	-	5	-	5	Roderer 1990
Hexachlorocyclopentadiene	Pimephales promelas (Fathead minnow)	LARVAE, 1 D	30 d	F	Mortality	S	-	6.7	-	-	3.35	Spehar et al. 1979
Indeno(1,2,3-cd)pyrene											NA	
Isophorone	Daphnia magna (Water flea)	<24 hr	48 hr	S	Mortality	S	120,000	-	-	-	12,000	LeBlanc 1980
Naphthalene	Daphnia pulex (Water flea)	<24h	96 hr	S	Mortality	I	1000	-	-	-	100	Gaur 1988
Nitrobenzene	Oryzias latipes (Medaka)	3 cm, 0.3 G	48 hr	S	Mortality	I	1,800	-	-	-	180	Yoshioka et al. 1986
N-Nitrosodimethylamine	Selenastrum capricornutum (Green algae)	NR	96 hr	S	Growth	I	-	4,000	-	-	2,000	Draper and Brewer 1979
N-Nitrosodi-N-Propylamine											NA	
N-Nitrosodiphenylamine	Lepomis macrochirus (Bluegill)	Juvenile	96 hr	S	Mortality	I	5,800	-	-	-	580	Buccafusco et al. 1981
Phenol	Gammarus pulex (Amphipod)	6 mg or 1.3 mg	96 hr	R	Mortality	S	45	-	-	-	4.5	Stephenson 1983
Pyrene	Daphnia magna (Water flea)	<24h	48 hr	S	Immobilization	S	90.9	-	-	-	9.09	Abernethy et al. 1986
Pyridine	Oncorhynchus gorbuscha (Pink salmon)	3.5 cm, 0.2 g	96 hr	S	Mortality	S	1100	-	-	-	110	Wan et al. 1987
Pesticides												
2,4,5-T	Keratella cochlearis (Rotifer)		48 hr	R	Mortality		100	-	-	-	10	Vancil 1976
2,4,5-TP (Silvex)	Pteronarcys californicus (Stonefly)		96 hr	S	Mortality		340				34	Sanders and Cope 1968
2,4-D	Oncorhynchus mykiss (Rainbow trout)	0.5-1.0 g	96 hr	S	Behavior	I	-	-	-	50	50	Little et al. 1990
2,4-DB	Oncorhynchus mykiss (Rainbow trout)	0.8 g	96 hr	S	Mortality	NR	1,970	-	-	-	197	Mayer and Ellersieck 1986
4,4'-DDD	Gammarus fasciatus (Scud)		96 hr	S	Mortality		0.6	-	-	-	0.06	Sanders 1972
4,4'-DDE	Chironomus thummi (Midge)		24 hr	S	Immobilization		1	-	-	-	0.10	Lydy et al. 1990
4,4'-DDT	Orconectes nais (Crayfish)		96 hr	S	Mortality		0.18	-	-	-	0.02	Sanders 1972
Acrolein	Xenopus laevis (Clawed toad)		96 hr	F	Mortality		7	-	-	-	0.7	Holcombe et al. 1987
Alachlor	Najas sp. (Water nymph)	NR	14 d	NR	Growth	NR	-	213	-	188	188	Fairchild et al. 1994
Benfluralin	Lepomis macrochirus (Bluegill)	NR	96 hr	F	Mortality	NR	65	-	-	-	6.5	Office of Pesticide Programs 2000
BHC, alpha-	Carassius auratus (Goldfish)		48 hr	S	Mortality		120	-	-	-	12	Hashimoto and Nishiuchi 1981
BHC, beta-	Oryzias latipes (Medaka)		3 mo	R	Behavior		-	32	-	-	16	Wester and Canton 1986
BHC, delta-	Danio rerio (Zebra danio)	NR	48 hr	F	Mortality	NR	120	-	-	-	12	Fernandez et al. 1996
Carbazole	Pimephales promelas (Fathead minnow)	30 day	96 hr	F	Mortality	C	930				93	Brooke 1991
Chlorpropham	Oncorhynchus mykiss (Rainbow trout)	NR	96 hr	NR	Mortality	I	3,020	-	-	-	302	USEPA 1995
Dalapon	Lepomis macrochirus (Bluegill)	1.0 g	96 hr	S	Mortality	I	105,000	-	-	-	10,500	Johnson and Finley 1980
Dicamba	Anabaena flosaquae (Blue-green algae)	NR	120 hr	S	Immobilization	K	-	61	-	-	30.5	Office of Pesticide Programs 2000
Dichloroprop	Oncorhynchus mykiss (Rainbow trout)	1.84 g	96 hr	S	Mortality	K	500	-	-	-	50	Office of Pesticide Programs 2000
Dinoseb	Ictalurus punctatus (Channel catfish)	1 YR	96 hr	S	Mortality	I	28	-	-	-	2.8	Skelley 1989
Disulfoton	Daphnia magna (Water flea)	NR	21 d		Reproduction	NR	-	-	0.1	-	0.1	Matthias 1990
Endosulfan sulfate	Daphnia carinata (Water flea)	<24h	48 hr	R	Mortality	NR	756	-	-	-	75.6	Dinnel et al. 1982
Endrin aldehyde											NA	
Ethalfluralin	Daphnia magna (Water flea)	NR	48 hr	R	Immobilization	NR	18.1	-	-	-	1.81	Office of Pesticide Programs 2000
Fipronil	Lepomis macrochirus (Bluegill)	NR	96 hr	F	Mortality	NR	25	-	-	-	2.5	Office of Pesticide Programs 2000
Fonofos	Daphnia magna (Water flea)	NR	30 d	F	Mortality	NR	-	-	-	0.42	0.42	Fairchild et al. 1992
Linuron	Lemna minor (Duckweed)	NR	120 hr	S	Abundance	NR	7	-		-	0.70	Stephenson & Kane 1984
MCPA	Poecilia reticulata (Guppy)	2.24-2.43 CM	48 hr	NR	Mortality	I	100				10	Little et al. 1990
MCPP	Rasbora heteromorpha (Harlequinfish)	Juvenile	48 hr	R	Mortality	NR	11000	-	-	-	1100	Alabaster 1969
Methyl azinphos	Daphnia magna (Water flea)	NR	21 d	R	Immobilization	NR	-	0.26	-	0.1	0.1	Dortland 1980
Parathion, methyl-	Oncorhynchus mykiss (Rainbow trout)	0.5-1.0 g	96 hr	S	Behavior		-	-	-	0.01	0.01	Little et al. 1990
Pendimethalin	Selenastratum capricornutum (Green Algae)	NR	120 hr	S	Abundance	NR	5.4				0.54	Office of Pesticide Programs 2000
Permethrin	Daphnia magna (Water flea)	NR	48 hr	S	Immobilization	NR	0.039	-	-	-	0.0039	Office of Pesticide Programs 2000
Phorate	Gammarus fasciatus (Scud)	NR	96 hr	S	Mortality	NR	0.6	-	-	-	0.06	Office of Pesticide Programs 2000
Propanil	Carassius auratus (Goldfish)	NR	48 hr	NR	Mortality	NR	350	-	-	-	35	Nishiuchi & Hashimoto 1967
Simazine	Selenastrum capricornutum (Green algae)	NR	2-3 wk	S	Biomass	S	-	0.614	-	-	0.307	Turbak et al. 1986
Thiobencarb	Daphnia magna (Water flea)	NR	21 d	S	Immobilization	NR	-	9	-	-	4.5	Office of Pesticide Programs 2000

Table A-9.
Chronic Screening Values for Chemicals Lacking Existing Washington State Water Quality Standards or USEPA Ambient Water Quality Criteria

Chemical	Species	Lifestage/ Size	Exposure Duration	Exposure Type	Measured Effect	Control	Result (µg/L)				Chronic Screening Value[1] (µg/L)	Reference
							Acute LC/EC50	Chronic EC50	Chronic NOEC	Chronic LOEC		
Tricamba											NA	
Other												
Caffeine	Xenopus laevis (Clawed toad)	Embryo	120 hr	S	Mortality	C	190,000	-	-	-	19,000	De Young et al. 1996
Testosterone	Ceriodaphnia dubia (Water flea)	NR	6-7 d	R	Reproduction	NR	-	-	2500	5000	3,536	Tatarazako et al. 2002
Physical Parameters												
Total Suspended Solids (mg/L)	Ceriodaphnia dubia (Water flea)	NR	21 d	NR	Population	NR	-	-	10	50	22	Kirk and Gilbert 1990
Conventionals												
Nitrate Nitrogen (NO3-N)	Rana pretiosa (Frog)	Larvae	15 d	S	Mortality	S	-	16,450	-	-	8,225	Schuytema and Nebeker 1999
Nitrite Nitrogen (NO2-N)	Rana pretiosa (Oregon spotted frog)	Larvae (1 week old)	96 hr	S	Mortality	C	6,820	-	-	-	682	Marco et al. 1999

LC50 = Median lethal concentration
EC50 = Median effect concentration
NOEC = No observable effect concentration
LOEC = Lowest observable effect concentration
NR = Not reported
Exposure Type Codes:
S = Static
R = Renewal
F = Flow-through
Control Codes (As Defined in AQUIRE):
C = Concurrent control (The control is run concurrent with the exposure tank(s), the dilution water is the same as for the test exposure.)
S = Satisfactory control
I = Indeterminate control
M = Multiple controls reported (e.g., negative, solvent)
Concentration Codes:
M = Measured
U = Unmeasured
NA = Not available
[1]If acute LC/EC50 value is shown, chronic screening value is derived from acute value using a generic ACR of 10 (U.S. EPA 1991).
[2]Estimated from acute WQS using a generic ACR of 10.

Table A-10.
Results for Dissolved Oxygen

Basin	Locator	Standard	# of Samples	# less than Standard	% less than Standard
Black River	0317	8	77	56	73
Black River	A317	8	23	17	74
Black River	A326	8	24	0	0
Black River	B317	8	12	6	50
Black River	C317	8	22	11	50
Covington Creek	C320	8	72	0	0
Covington Creek	R320	8	32	0	0
Covington Creek	S320	8	34	0	0
Duwamish River	0305	6.5	127	15	12
Duwamish River	0307	6.5	125	20	16
Duwamish River	0309	6.5	51	1	2
Duwamish River	A307	6.5	16	0	0
Duwamish River	UDUWAM	6.5	46	0	0
Jenkins Creek	D320	8	55	0	0
Longfellow Creek	C370	8	79	3	4
Longfellow Creek	J370	8	66	1	2
Longfellow Creek	K370	8	8	1	13
Lower Green River - East	A330	8	23	0	0
Lower Green River - West	0311	8	51	6	12
Lower Green River - West	A310_3106	8	88	11	13
Lower Green River - West	EC09A080	8	55	0	0
Lower Green River - West	G319	8	26	1	4
Lower Green River - West	MULLEN3	8	1	1	100
Lower Green River - West	MULLEN5	8	1	1	100
Middle Green River	0321	8	68	1	1
Middle Green River	A319	8	52	0	0
Middle Green River	A341	9.5	8	0	0
Middle Green River	B319	8	78	0	0
Middle Green River	EC09A190	9.5	12	0	0
Middle Green River	F321	8	78	0	0
Mill Creek	A315	8	92	57	62
Newaukum Creek	0322	8	99	1	1
Newaukum Creek	AA322	8	32	0	0
Newaukum Creek	AB322	8	34	0	0
Newaukum Creek	AC322	8	34	22	65
Newaukum Creek	AD322	8	41	0	0
Newaukum Creek	AE322	8	37	0	0
Newaukum Creek	AF322	8	36	0	0
Newaukum Creek	AG322	8	38	0	0
Newaukum Creek	AH322	8	14	0	0
Newaukum Creek	AI322	8	33	0	0
Newaukum Creek	AJ322	8	68	0	0
Newaukum Creek	AK322	8	30	2	7
Newaukum Creek	B322	8	14	10	71
Newaukum Creek	D322	8	26	3	12
Newaukum Creek	F322	8	59	0	0
Newaukum Creek	H322	8	38	0	0
Newaukum Creek	I322B	8	22	2	9
Newaukum Creek	J322	8	39	0	0
Newaukum Creek	N322	8	42	0	0
Newaukum Creek	S322	8	9	0	0
Newaukum Creek	WH322	8	23	2	9
Soos Creek	A320	8	103	0	0
Soos Creek	B320	8	35	0	0
Soos Creek	G320	8	52	1	2
Soos Creek	L320	8	60	33	55
Soos Creek	Q320	8	66	24	36
Soos Creek	U320	8	35	8	23
Soos Creek	Y320	8	20	3	15
Upper Green River	E319	9.5	27	2	7

Table A-11.
Results for pH

			pH Statistics									pH<6.5		pH>8.5	
Sub-Basin	Locator	n	Mean	SD	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of Samples	% of Samples	# of Samples	% of Samples
Black River	0317	81	6.8	0.2	6.2	7.3	6.4	6.6	6.8	7.0	7.1	6	7%	0	0%
Black River	A317	85	7.0	0.1	6.5	7.2	6.7	7.0	7.0	7.0	7.1	0	0%	0	0%
Black River	A326	53	7.3	0.4	7.0	8.1	7.0	7.0	7.0	7.7	8.0	0	0%	0	0%
Black River	B317	38	7.0	0.1	6.6	7.2	6.7	7.0	7.0	7.0	7.1	0	0%	0	0%
Black River	C317	25	7.1	0.2	6.8	7.6	6.8	6.9	7.0	7.3	7.5	0	0%	0	0%
Covington Creek	C320	75	7.2	0.3	6.5	7.8	6.6	7.1	7.3	7.4	7.7	0	0%	0	0%
Covington Creek	R320	30	7.3	0.2	6.9	7.7	7.0	7.2	7.3	7.3	7.6	0	0%	0	0%
Covington Creek	S320	34	7.3	0.1	7.0	7.7	7.2	7.3	7.3	7.3	7.5	0	0%	0	0%
Duwamish River	0305	118	7.7	0.2	6.6	8.0	7.1	7.6	7.7	7.8	7.9	0	0%	0	0%
Duwamish River	0307	116	7.6	0.3	6.6	8.6	7.0	7.5	7.6	7.7	7.9	0	0%	2	2%
Duwamish River	0309	54	7.0	0.3	6.2	7.8	6.5	6.8	7.1	7.2	7.4	2	4%	0	0%
Duwamish River	A307	109	7.5	0.1	6.9	8.0	7.5	7.5	7.5	7.5	7.7	0	0%	0	0%
Jenkins Creek	D320	57	7.3	0.3	6.7	7.9	6.9	7.1	7.3	7.4	7.6	0	0%	0	0%
Longfellow Creek	C370	87	7.8	0.4	6.9	8.7	7.0	7.7	7.9	8.0	8.1	0	0%	2	2%
Longfellow Creek	J370	66	7.7	0.3	6.6	8.3	7.0	7.5	7.7	7.9	8.0	0	0%	0	0%
Longfellow Creek	K370	16	7.7	0.0	7.7	7.7	7.7	7.7	7.7	7.7	7.7	0	0%	0	0%
Longfellow Creek	L370	17	7.7	0.0	7.7	7.7	7.7	7.7	7.7	7.7	7.7	0	0%	0	0%
Lower Green River - East	A330	24	7.6	0.3	7.1	8.3	7.1	7.4	7.7	7.8	8.2	0	0%	0	0%
Lower Green River - East	D319	9	7.6	0.0	7.6	7.6	7.6	7.6	7.6	7.6	7.6	0	0%	0	0%
Lower Green River - West	0311	59	7.1	0.3	6.2	7.5	6.7	6.9	7.1	7.2	7.5	1	2%	0	0%
Lower Green River - West	A310_3106	203	7.0	0.2	6.2	7.6	6.7	7.0	7.0	7.0	7.4	2	1%	0	0%
Lower Green River - West	EC09A080	56	7.4	0.1	7.1	7.8	7.2	7.3	7.4	7.4	7.6	0	0%	0	0%
Lower Green River - West	G319	26	6.8	0.3	5.7	7.4	6.5	6.7	6.8	7.0	7.2	1	4%	0	0%
Lower Green River - West	MULLEN1	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Lower Green River - West	MULLEN2	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Lower Green River - West	MULLEN3	2	7.1	0.2	6.9	7.2	6.9	7.0	7.1	7.1	7.2	0	0%	0	0%
Lower Green River - West	MULLEN4	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Lower Green River - West	MULLEN5	2	7.1	0.2	6.9	7.2	6.9	7.0	7.1	7.1	7.2	0	0%	0	0%
Lower Green River - West	MULLEN6	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Lower Green River - West	MULLEN7	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Lower Green River - West	MULLEN8	2	7.2	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	0	0%	0	0%
Middle Green River	0321	72	7.3	0.3	6.6	7.9	6.9	7.1	7.3	7.5	7.7	0	0%	0	0%
Middle Green River	A319	54	7.2	0.3	6.5	7.7	6.7	7.0	7.3	7.4	7.5	0	0%	0	0%
Middle Green River	A341	20	7.5	0.2	7.0	8.0	7.2	7.4	7.4	7.5	7.7	0	0%	0	0%
Middle Green River	B319	93	7.4	0.3	6.4	8.0	6.9	7.3	7.4	7.7	7.9	1	1%	0	0%
Middle Green River	EC09A190	12	7.6	0.2	7.1	8.0	7.2	7.4	7.6	7.7	7.9	0	0%	0	0%
Middle Green River	F321	82	7.6	0.3	6.6	8.2	7.2	7.4	7.6	7.7	7.9	0	0%	0	0%
Middle Green River	UDUWAM	47	7.4	0.1	7.0	7.8	7.2	7.4	7.5	7.5	7.6	0	0%	0	0%
Mill Creek	A315	104	6.9	0.3	6.2	7.6	6.5	6.8	6.9	7.1	7.5	3	3%	0	0%
Newaukum Creek	0322	185	7.5	0.2	6.5	8.4	7.3	7.4	7.4	7.7	7.9	0	0%	0	0%
Newaukum Creek	AA322	33	7.8	0.4	7.2	8.6	7.3	7.4	7.7	7.9	8.5	0	0%	2	6%
Newaukum Creek	AB322	35	7.5	0.3	7.0	8.0	7.0	7.4	7.4	7.6	8.0	0	0%	0	0%

Table A-11.
Results for pH

Sub-Basin	Locator	n	pH Statistics									pH<6.5		pH>8.5	
			Mean	SD	Min	Max	5th %ile	25th %ile	50th %ile	75th %ile	95th %ile	# of Samples	% of Samples	# of Samples	% of Samples
Newaukum Creek	AC322	34	7.2	0.3	6.5	7.8	6.6	7.1	7.2	7.4	7.6	0	0%	0	0%
Newaukum Creek	AD322	34	7.4	0.5	6.5	9.8	6.8	7.2	7.4	7.5	7.8	0	0%	1	3%
Newaukum Creek	AE322	35	7.3	0.2	6.6	7.7	6.9	7.2	7.4	7.4	7.5	0	0%	0	0%
Newaukum Creek	AF322	32	7.3	0.3	6.7	7.7	6.7	7.2	7.4	7.4	7.6	0	0%	0	0%
Newaukum Creek	AG322	38	7.4	0.3	6.9	8.0	7.0	7.3	7.4	7.6	7.8	0	0%	0	0%
Newaukum Creek	AH322	15	7.3	0.2	6.8	7.6	6.9	7.2	7.4	7.4	7.5	0	0%	0	0%
Newaukum Creek	AI322	33	7.5	0.2	6.9	7.9	7.1	7.4	7.4	7.7	7.8	0	0%	0	0%
Newaukum Creek	AJ322	67	7.5	0.3	6.9	8.1	7.1	7.3	7.4	7.7	8.0	0	0%	0	0%
Newaukum Creek	AK322	21	7.3	0.2	6.7	7.7	7.1	7.2	7.4	7.5	7.6	0	0%	0	0%
Newaukum Creek	B322	63	7.3	0.3	6.5	7.5	6.6	7.4	7.4	7.4	7.4	0	0%	0	0%
Newaukum Creek	D322	122	7.4	0.1	6.9	7.6	7.1	7.4	7.4	7.4	7.4	0	0%	0	0%
Newaukum Creek	F322	59	7.3	0.4	6.0	8.4	6.8	7.1	7.4	7.5	7.6	1	2%	0	0%
Newaukum Creek	H322	37	7.3	0.3	6.7	7.8	6.8	7.2	7.4	7.5	7.7	0	0%	0	0%
Newaukum Creek	I322B	84	7.3	0.2	6.8	7.6	7.0	7.4	7.4	7.4	7.4	0	0%	0	0%
Newaukum Creek	J322	36	7.4	0.2	6.7	7.8	7.0	7.3	7.4	7.5	7.7	0	0%	0	0%
Newaukum Creek	N322	39	7.5	0.3	6.9	8.0	7.1	7.4	7.4	7.8	7.9	0	0%	0	0%
Newaukum Creek	S322	95	7.4	0.1	7.4	8.0	7.4	7.4	7.4	7.4	7.6	0	0%	0	0%
Newaukum Creek	WH322	22	7.3	0.3	6.5	7.7	6.8	7.1	7.4	7.5	7.7	0	0%	0	0%
Soos Creek	A320	116	7.4	0.3	6.8	8.0	7.0	7.2	7.4	7.6	7.8	0	0%	0	0%
Soos Creek	B320	34	7.5	0.3	7.2	8.0	7.2	7.2	7.2	7.9	8.0	0	0%	0	0%
Soos Creek	G320	55	7.2	0.3	6.3	7.7	6.8	7.0	7.3	7.4	7.5	1	2%	0	0%
Soos Creek	L320	44	7.2	0.2	6.5	7.6	7.0	7.1	7.2	7.2	7.2	0	0%	0	0%
Soos Creek	Q320	66	7.0	0.3	6.1	7.5	6.4	6.7	7.0	7.2	7.3	5	8%	0	0%
Soos Creek	U320	37	7.2	0.1	6.8	7.6	7.0	7.2	7.2	7.2	7.5	0	0%	0	0%
Soos Creek	Y320	73	7.1	0.2	6.2	7.4	6.7	7.2	7.2	7.2	7.2	1	1%	0	0%
Upper Green River	E319	76	7.4	0.2	6.1	7.9	7.2	7.4	7.4	7.4	7.8	1	1%	0	0%

n = Sample Size
SD = Standard Deviation
%ile = Percentile

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Black River	1999	Fall	*E. Coli*	475.18	col/100mL	1200	4	4	100%
Black River	1999	Spring	*E. Coli*	65.06	col/100mL	94	4	0	0%
Black River	1999	Summer	*E. Coli*	134.64	col/100mL	420	3	1	33%
Black River	1999	Winter	*E. Coli*	148.41	col/100mL	330	5	1	20%
Black River	2000	Fall	*E. Coli*	91.35	col/100mL	1400	5	2	40%
Black River	2000	Spring	*E. Coli*	525.64	col/100mL	3200	4	2	50%
Black River	2000	Summer	*E. Coli*	240.09	col/100mL	450	4	2	50%
Black River	2000	Winter	*E. Coli*	177.34	col/100mL	500	5	2	40%
Black River	2001	Fall	*E. Coli*	1609.69	col/100mL	5400	7	7	100%
Black River	2001	Spring	*E. Coli*	835.15	col/100mL	6400	8	6	75%
Black River	2001	Summer	*E. Coli*	320.41	col/100mL	1300	3	1	33%
Black River	2001	Winter	*E. Coli*	17.29	col/100mL	22	4	0	0%
Black River	2002	Fall	*E. Coli*	650.22	col/100mL	12000	21	17	81%
Black River	2002	Spring	*E. Coli*	359.28	col/100mL	12000	20	13	65%
Black River	2002	Summer	*E. Coli*	263.35	col/100mL	390	8	5	63%
Black River	2002	Winter	*E. Coli*	195.58	col/100mL	1900	20	11	55%
Black River	2003	Fall	*E. Coli*	811.68	col/100mL	3900	38	33	87%
Black River	2003	Spring	*E. Coli*	196.44	col/100mL	1300	19	9	47%
Black River	2003	Summer	*E. Coli*	242.93	col/100mL	900	10	6	60%
Black River	2003	Winter	*E. Coli*	214.08	col/100mL	4500	35	18	51%
Covington Creek	1999	Fall	*E. coli*	11.25	col/100 mL	88	8	0	0%
Covington Creek	1999	Spring	*E. coli*	8.62	col/100 mL	260	11	1	9%
Covington Creek	1999	Summer	*E. coli*	30.14	col/100 mL	310	11	1	9%
Covington Creek	1999	Winter	*E. coli*	3.75	col/100 mL	13	8	0	0%
Covington Creek	2000	Fall	*E. coli*	14.12	col/100 mL	1200	10	2	20%
Covington Creek	2000	Spring	*E. coli*	15.91	col/100 mL	250	10	1	10%
Covington Creek	2000	Summer	*E. coli*	27.23	col/100 mL	150	9	0	0%
Covington Creek	2000	Winter	*E. coli*	5.98	col/100 mL	28	9	0	0%
Covington Creek	2001	Fall	*E. coli*	24.96	col/100 mL	43	4	0	0%
Covington Creek	2001	Spring	*E. coli*	26.99	col/100 mL	140	7	0	0%
Covington Creek	2001	Summer	*E. coli*	72.61	col/100 mL	300	6	1	17%
Covington Creek	2001	Winter	*E. coli*	4.69	col/100 mL	21	9	0	0%
Covington Creek	2002	Fall	*E. coli*	61.83	col/100 mL	140	2	0	0%
Covington Creek	2002	Spring	*E. coli*	29.39	col/100 mL	100	6	0	0%
Covington Creek	2002	Summer	*E. coli*	68.73	col/100 mL	77	3	0	0%
Covington Creek	2002	Winter	*E. coli*	7.96	col/100 mL	15	3	0	0%
Covington Creek	2003	Fall	*E. coli*	44.27	col/100 mL	80	4	0	0%
Covington Creek	2003	Spring	*E. coli*	25.56	col/100 mL	100	4	0	0%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Covington Creek	2003	Summer	*E. coli*	127.81	col/100 mL	210	4	0	0%
Covington Creek	2003	Winter	*E. coli*	38.12	col/100 mL	61	5	0	0%
Duwamish (Longfellow Creek)	1999	Fall	*E. coli*	918.49	col/100 mL	2200	5	5	100%
Duwamish (Longfellow Creek)	1999	Spring	*E. coli*	188.75	col/100 mL	320	6	4	67%
Duwamish (Longfellow Creek)	1999	Summer	*E. coli*	207.78	col/100 mL	360	5	3	60%
Duwamish (Longfellow Creek)	1999	Winter	*E. coli*	223.57	col/100 mL	700	5	2	40%
Duwamish (Longfellow Creek)	2000	Fall	*E. coli*	380.58	col/100 mL	970	9	7	78%
Duwamish (Longfellow Creek)	2000	Spring	*E. coli*	199.71	col/100 mL	980	6	3	50%
Duwamish (Longfellow Creek)	2000	Summer	*E. coli*	522.32	col/100 mL	1300	9	9	100%
Duwamish (Longfellow Creek)	2000	Winter	*E. coli*	670.25	col/100 mL	2100	8	6	75%
Duwamish (Longfellow Creek)	2001	Fall	*E. coli*	1962.32	col/100 mL	21000	6	5	83%
Duwamish (Longfellow Creek)	2001	Spring	*E. coli*	988.90	col/100 mL	4500	6	5	83%
Duwamish (Longfellow Creek)	2001	Summer	*E. coli*	166.35	col/100 mL	490	6	2	33%
Duwamish (Longfellow Creek)	2001	Winter	*E. coli*	382.93	col/100 mL	17000	7	3	43%
Duwamish (Longfellow Creek)	2002	Fall	*E. coli*	850.94	col/100 mL	2400	5	4	80%
Duwamish (Longfellow Creek)	2002	Spring	*E. coli*	375.63	col/100 mL	680	9	8	89%
Duwamish (Longfellow Creek)	2002	Summer	*E. coli*	367.66	col/100 mL	780	9	7	78%
Duwamish (Longfellow Creek)	2002	Winter	*E. coli*	87.87	col/100 mL	460	9	2	22%
Duwamish (Longfellow Creek)	2003	Fall	*E. coli*	252.24	col/100 mL	11000	7	3	43%
Duwamish (Longfellow Creek)	2003	Spring	*E. coli*	343.51	col/100 mL	1100	6	4	67%
Duwamish (Longfellow Creek)	2003	Summer	*E. coli*	327.02	col/100 mL	970	6	3	50%
Duwamish (Longfellow Creek)	2003	Winter	*E. coli*	124.71	col/100 mL	450	7	2	29%
Duwamish River	1999	Fall	*E. coli*	21.23	col/100 mL	80	10	0	0%
Duwamish River	1999	Spring	*E. coli*	19.52	col/100 mL	110	15	0	0%
Duwamish River	1999	Summer	*E. coli*	27.09	col/100 mL	98	15	0	0%
Duwamish River	1999	Winter	*E. coli*	48.47	col/100 mL	200	14	0	0%
Duwamish River	2000	Fall	*E. coli*	16.11	col/100 mL	73	15	0	0%
Duwamish River	2000	Spring	*E. coli*	32.65	col/100 mL	180	14	0	0%
Duwamish River	2000	Summer	*E. coli*	29.82	col/100 mL	160	15	0	0%
Duwamish River	2000	Winter	*E. coli*	16.85	col/100 mL	90	7	0	0%
Duwamish River	2001	Fall	*E. coli*	47.31	col/100 mL	2800	18	4	22%
Duwamish River	2001	Spring	*E. coli*	20.06	col/100 mL	170	13	0	0%
Duwamish River	2001	Summer	*E. coli*	59.73	col/100 mL	540	13	2	15%
Duwamish River	2001	Winter	*E. coli*	9.97	col/100 mL	40	15	0	0%
Duwamish River	2002	Fall	*E. coli*	136.72	col/100 mL	3500	40	16	40%
Duwamish River	2002	Spring	*E. coli*	97.66	col/100 mL	11000	31	12	39%
Duwamish River	2002	Summer	*E. coli*	42.27	col/100 mL	340	18	3	17%
Duwamish River	2002	Winter	*E. coli*	62.89	col/100 mL	2000	31	8	26%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Duwamish River	2003	Fall	*E. coli*	77.36	col/100 mL	2500	18	5	28%
Duwamish River	2003	Spring	*E. coli*	26.27	col/100 mL	310	19	3	16%
Duwamish River	2003	Summer	*E. coli*	30.37	col/100 mL	460	16	1	6%
Duwamish River	2003	Winter	*E. coli*	57.66	col/100 mL	550	30	5	17%
Jenkins Creek	1999	Fall	*E. coli*	39.40	col/100 mL	47	2	0	0%
Jenkins Creek	1999	Spring	*E. coli*	21.31	col/100 mL	33	4	0	0%
Jenkins Creek	1999	Summer	*E. coli*	20.46	col/100 mL	30	3	0	0%
Jenkins Creek	1999	Winter	*E. coli*	31.29	col/100 mL	59	3	0	0%
Jenkins Creek	2000	Fall	*E. coli*	40.08	col/100 mL	230	3	0	0%
Jenkins Creek	2000	Spring	*E. coli*	22.32	col/100 mL	67	2	0	0%
Jenkins Creek	2000	Summer	*E. coli*	48.53	col/100 mL	56	3	0	0%
Jenkins Creek	2000	Winter	*E. coli*	18.72	col/100 mL	41	4	0	0%
Jenkins Creek	2001	Fall	*E. coli*	24.46	col/100 mL	35	2	0	0%
Jenkins Creek	2001	Spring	*E. coli*	71.25	col/100 mL	260	2	1	50%
Jenkins Creek	2001	Summer	*E. coli*	121.55	col/100 mL	370	3	1	33%
Jenkins Creek	2001	Winter	*E. coli*	18.76	col/100 mL	33	4	0	0%
Jenkins Creek	2002	Fall	*E. coli*	45.83	col/100 mL	50	2	0	0%
Jenkins Creek	2002	Spring	*E. coli*	30.58	col/100 mL	49	3	0	0%
Jenkins Creek	2002	Summer	*E. coli*	58.95	col/100 mL	89	3	0	0%
Jenkins Creek	2002	Winter	*E. coli*	15.25	col/100 mL	23	2	0	0%
Jenkins Creek	2003	Fall	*E. coli*	50.39	col/100 mL	100	3	0	0%
Jenkins Creek	2003	Spring	*E. coli*	32.18	col/100 mL	59	3	0	0%
Jenkins Creek	2003	Summer	*E. coli*	88.80	col/100 mL	210	3	0	0%
Jenkins Creek	2003	Winter	*E. coli*	16.15	col/100 mL	23	3	0	0%
Lower Green River - East	2002	Fall	*E. coli*	39.53	col/100 mL	64	4	0	0%
Lower Green River - East	2002	Spring	*E. coli*	76.31	col/100 mL	590	4	1	25%
Lower Green River - East	2002	Summer	*E. coli*	95.00	col/100 mL	95	1	0	0%
Lower Green River - East	2002	Winter	*E. coli*	42.74	col/100 mL	330	5	1	20%
Lower Green River - East	2003	Fall	*E. coli*	308.03	col/100 mL	610	4	3	75%
Lower Green River - East	2003	Spring	*E. coli*	27.97	col/100 mL	160	6	0	0%
Lower Green River - East	2003	Summer	*E. coli*	54.85	col/100 mL	60	3	0	0%
Lower Green River - East	2003	Winter	*E. coli*	26.37	col/100 mL	130	6	0	0%
Lower Green River - West	1999	Fall	*E. Coli*	51.25	col/100mL	150	6	0	0%
Lower Green River - West	1999	Spring	*E. Coli*	22.81	col/100mL	1400	7	1	14%
Lower Green River - West	1999	Summer	*E. Coli*	47.69	col/100mL	160	7	0	0%
Lower Green River - West	1999	Winter	*E. Coli*	81.06	col/100mL	310	7	1	14%
Lower Green River - West	2000	Fall	*E. Coli*	27.46	col/100mL	230	6	0	0%
Lower Green River - West	2000	Spring	*E. Coli*	84.63	col/100mL	610	5	1	20%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Lower Green River - West	2000	Summer	*E. Coli*	70.45	col/100mL	160	6	0	0%
Lower Green River - West	2000	Winter	*E. Coli*	54.08	col/100mL	160	7	0	0%
Lower Green River - West	2001	Fall	*E. Coli*	87.93	col/100mL	700	5	1	20%
Lower Green River - West	2001	Spring	*E. Coli*	277.40	col/100mL	430	6	3	50%
Lower Green River - West	2001	Summer	*E. Coli*	48.89	col/100mL	84	6	0	0%
Lower Green River - West	2001	Winter	*E. Coli*	11.08	col/100mL	20	6	0	0%
Lower Green River - West	2002	Fall	*E. Coli*	186.12	col/100mL	1000	24	12	50%
Lower Green River - West	2002	Spring	*E. Coli*	67.73	col/100mL	900	25	7	28%
Lower Green River - West	2002	Summer	*E. Coli*	135.34	col/100mL	280	10	2	20%
Lower Green River - West	2002	Winter	*E. Coli*	23.77	col/100mL	170	21	0	0%
Lower Green River - West	2003	Fall	*E. Coli*	87.98	col/100mL	380	17	3	18%
Lower Green River - West	2003	Spring	*E. Coli*	31.81	col/100mL	110	18	0	0%
Lower Green River - West	2003	Summer	*E. Coli*	117.87	col/100mL	320	14	1	7%
Lower Green River - West	2003	Winter	*E. Coli*	46.24	col/100mL	190	39	0	0%
Middle Green River	1999	Fall	*E. coli*	26.18	col/100 mL	410	14	1	7%
Middle Green River	1999	Spring	*E. coli*	19.64	col/100 mL	3400	15	1	7%
Middle Green River	1999	Summer	*E. coli*	14.93	col/100 mL	55	13	0	0%
Middle Green River	1999	Winter	*E. coli*	11.44	col/100 mL	68	15	0	0%
Middle Green River	2000	Fall	*E. coli*	16.16	col/100 mL	850	17	2	12%
Middle Green River	2000	Spring	*E. coli*	38.29	col/100 mL	600	10	3	30%
Middle Green River	2000	Summer	*E. coli*	28.39	col/100 mL	340	14	1	7%
Middle Green River	2000	Winter	*E. coli*	17.49	col/100 mL	130	16	0	0%
Middle Green River	2001	Fall	*E. coli*	68.26	col/100 mL	1800	15	5	33%
Middle Green River	2001	Spring	*E. coli*	55.40	col/100 mL	4700	12	4	33%
Middle Green River	2001	Summer	*E. coli*	18.84	col/100 mL	200	14	0	0%
Middle Green River	2001	Winter	*E. coli*	2.18	col/100 mL	42	13	0	0%
Middle Green River	2002	Fall	*E. coli*	13.00	col/100 mL	140	14	0	0%
Middle Green River	2002	Spring	*E. coli*	14.66	col/100 mL	410	20	1	5%
Middle Green River	2002	Summer	*E. coli*	16.67	col/100 mL	300	15	1	7%
Middle Green River	2002	Winter	*E. coli*	12.34	col/100 mL	440	23	1	4%
Middle Green River	2003	Fall	*E. coli*	25.82	col/100 mL	260	18	1	6%
Middle Green River	2003	Spring	*E. coli*	10.71	col/100 mL	120	18	0	0%
Middle Green River	2003	Summer	*E. coli*	31.27	col/100 mL	170	15	0	0%
Middle Green River	2003	Winter	*E. coli*	10.57	col/100 mL	200	23	0	0%
Mill Creek	1999	Fall	*E. coli*	214.25	col/100 mL	290	4	3	75%
Mill Creek	1999	Spring	*E. coli*	265.22	col/100 mL	4500	4	1	25%
Mill Creek	1999	Summer	*E. coli*	348.92	col/100 mL	410	3	3	100%
Mill Creek	1999	Winter	*E. coli*	2019.11	col/100 mL	11000	4	4	100%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Mill Creek	2000	Fall	*E. coli*	424.66	col/100 mL	7600	4	2	50%
Mill Creek	2000	Spring	*E. coli*	296.90	col/100 mL	4600	3	1	33%
Mill Creek	2000	Summer	*E. coli*	584.87	col/100 mL	650	3	3	100%
Mill Creek	2000	Winter	*E. coli*	166.16	col/100 mL	2500	4	2	50%
Mill Creek	2001	Fall	*E. coli*	586.49	col/100 mL	6500	3	2	67%
Mill Creek	2001	Spring	*E. coli*	489.82	col/100 mL	4500	4	3	75%
Mill Creek	2001	Summer	*E. coli*	450.71	col/100 mL	610	3	3	100%
Mill Creek	2001	Winter	*E. coli*	61.92	col/100 mL	94	3	0	0%
Mill Creek	2002	Fall	*E. coli*	286.38	col/100 mL	460	6	3	50%
Mill Creek	2002	Spring	*E. coli*	157.38	col/100 mL	2300	5	1	20%
Mill Creek	2002	Summer	*E. coli*	575.83	col/100 mL	1100	4	4	100%
Mill Creek	2002	Winter	*E. coli*	280.69	col/100 mL	3900	6	3	50%
Mill Creek	2003	Fall	*E. coli*	305.72	col/100 mL	4000	7	4	57%
Mill Creek	2003	Spring	*E. coli*	186.35	col/100 mL	2500	8	4	50%
Mill Creek	2003	Summer	*E. coli*	1008.43	col/100 mL	4600	3	3	100%
Mill Creek	2003	Winter	*E. coli*	445.48	col/100 mL	2800	10	6	60%
Newaukum Creek	1999	Fall	*E. coli*	89.45	col/100 mL	950	42	16	38%
Newaukum Creek	1999	Spring	*E. coli*	42.85	col/100 mL	8700	34	3	9%
Newaukum Creek	1999	Summer	*E. coli*	170.59	col/100 mL	4300	49	17	35%
Newaukum Creek	1999	Winter	*E. coli*	467.75	col/100 mL	4700	36	23	64%
Newaukum Creek	2000	Fall	*E. coli*	137.48	col/100 mL	4500	55	17	31%
Newaukum Creek	2000	Spring	*E. coli*	401.53	col/100 mL	16000	54	28	52%
Newaukum Creek	2000	Summer	*E. coli*	211.24	col/100 mL	15000	53	23	43%
Newaukum Creek	2000	Winter	*E. coli*	118.28	col/100 mL	6000	53	23	43%
Newaukum Creek	2001	Fall	*E. coli*	1309.06	col/100 mL	21000	91	81	89%
Newaukum Creek	2001	Spring	*E. coli*	413.83	col/100 mL	41000	64	34	53%
Newaukum Creek	2001	Summer	*E. coli*	231.40	col/100 mL	1700	36	17	47%
Newaukum Creek	2001	Winter	*E. coli*	72.27	col/100 mL	3700	75	19	25%
Newaukum Creek	2002	Fall	*E. coli*	120.78	col/100 mL	12000	66	24	36%
Newaukum Creek	2002	Spring	*E. coli*	528.83	col/100 mL	30000	35	20	57%
Newaukum Creek	2002	Summer	*E. coli*	267.13	col/100 mL	2000	16	9	56%
Newaukum Creek	2002	Winter	*E. coli*	123.78	col/100 mL	4400	63	26	41%
Newaukum Creek	2003	Fall	*E. coli*	165.57	col/100 mL	45000	49	21	43%
Newaukum Creek	2003	Spring	*E. coli*	92.27	col/100 mL	3700	30	8	27%
Newaukum Creek	2003	Summer	*E. coli*	149.63	col/100 mL	810	14	3	21%
Newaukum Creek	2003	Winter	*E. coli*	119.74	col/100 mL	7000	84	37	44%
Soos Creek	1999	Fall	*E. coli*	105.68	col/100 mL	530	23	5	22%
Soos Creek	1999	Spring	*E. coli*	44.73	col/100 mL	4500	15	1	7%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Soos Creek	1999	Summer	*E. coli*	90.97	col/100 mL	800	21	3	14%
Soos Creek	1999	Winter	*E. coli*	48.55	col/100 mL	120	19	0	0%
Soos Creek	2000	Fall	*E. coli*	45.29	col/100 mL	1000	22	3	14%
Soos Creek	2000	Spring	*E. coli*	135.64	col/100 mL	2100	21	9	43%
Soos Creek	2000	Summer	*E. coli*	80.90	col/100 mL	560	22	4	18%
Soos Creek	2000	Winter	*E. coli*	108.36	col/100 mL	15000	22	5	23%
Soos Creek	2001	Fall	*E. coli*	639.10	col/100 mL	5700	24	18	75%
Soos Creek	2001	Spring	*E. coli*	314.00	col/100 mL	6400	20	14	70%
Soos Creek	2001	Summer	*E. coli*	91.86	col/100 mL	220	16	0	0%
Soos Creek	2001	Winter	*E. coli*	43.12	col/100 mL	1400	20	5	25%
Soos Creek	2002	Fall	*E. coli*	55.04	col/100 mL	1100	18	2	11%
Soos Creek	2002	Spring	*E. coli*	199.30	col/100 mL	5500	15	8	53%
Soos Creek	2002	Summer	*E. coli*	150.87	col/100 mL	440	11	4	36%
Soos Creek	2002	Winter	*E. coli*	126.50	col/100 mL	1300	25	12	48%
Soos Creek	2003	Fall	*E. coli*	139.95	col/100 mL	1600	17	6	35%
Soos Creek	2003	Spring	*E. coli*	73.70	col/100 mL	480	14	1	7%
Soos Creek	2003	Summer	*E. coli*	113.71	col/100 mL	860	13	5	38%
Soos Creek	2003	Winter	*E. coli*	52.35	col/100 mL	1000	24	1	4%
Upper Green River	2001	Fall	*E. coli*	6.65	col/100 mL	27	3	0	0%
Upper Green River	2002	Fall	*E. coli*	1.75	col/100 mL	5	6	0	0%
Upper Green River	2002	Spring	*E. coli*	0.86	col/100 mL	5	4	0	0%
Upper Green River	2002	Summer	*E. coli*	2.00	col/100 mL	2	1	0	0%
Upper Green River	2002	Winter	*E. coli*	2.90	col/100 mL	13	6	0	0%
Upper Green River	2003	Fall	*E. coli*	18.10	col/100 mL	43	7	0	0%
Upper Green River	2003	Spring	*E. coli*	0.94	col/100 mL	2	6	0	0%
Upper Green River	2003	Summer	*E. coli*	0.41	col/100 mL	1	2	0	0%
Upper Green River	2003	Winter	*E. coli*	1.73	col/100 mL	6	9	0	0%
Black River	1999	Fall	Fecal Coliform	339.93	col/100mL	600	4	4	100%
Black River	1999	Spring	Fecal Coliform	76.75	col/100mL	140	4	2	50%
Black River	1999	Summer	Fecal Coliform	118.96	col/100mL	410	3	1	33%
Black River	1999	Winter	Fecal Coliform	141.64	col/100mL	260	5	4	80%
Black River	2000	Fall	Fecal Coliform	108.63	col/100mL	1600	5	2	40%
Black River	2000	Spring	Fecal Coliform	355.93	col/100mL	2200	4	4	100%
Black River	2000	Summer	Fecal Coliform	216.73	col/100mL	660	4	4	100%
Black River	2000	Winter	Fecal Coliform	223.26	col/100mL	500	7	6	86%
Black River	2001	Fall	Fecal Coliform	2772.32	col/100mL	34000	7	7	100%
Black River	2001	Spring	Fecal Coliform	883.68	col/100mL	4600	8	7	88%
Black River	2001	Summer	Fecal Coliform	253.84	col/100mL	600	3	2	67%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Black River	2001	Winter	Fecal Coliform	19.13	col/100mL	37	4	0	0%
Black River	2002	Fall	Fecal Coliform	516.25	col/100mL	4700	21	17	81%
Black River	2002	Spring	Fecal Coliform	641.78	col/100mL	210000	20	14	70%
Black River	2002	Summer	Fecal Coliform	416.35	col/100mL	3600	8	8	100%
Black River	2002	Winter	Fecal Coliform	198.47	col/100mL	1900	20	12	60%
Black River	2003	Fall	Fecal Coliform	783.84	col/100mL	2800	35	35	100%
Black River	2003	Spring	Fecal Coliform	223.55	col/100mL	690	15	11	73%
Black River	2003	Summer	Fecal Coliform	193.51	col/100mL	750	7	6	86%
Black River	2003	Winter	Fecal Coliform	230.74	col/100mL	5600	36	25	69%
Covington Creek	1999	Fall	Fecal Coliform	11.20	col/100 mL	57	8	0	0%
Covington Creek	1999	Spring	Fecal Coliform	11.01	col/100 mL	220	11	2	18%
Covington Creek	1999	Summer	Fecal Coliform	31.17	col/100 mL	280	11	1	9%
Covington Creek	1999	Winter	Fecal Coliform	5.10	col/100 mL	18	7	0	0%
Covington Creek	2000	Fall	Fecal Coliform	11.29	col/100 mL	740	10	2	20%
Covington Creek	2000	Spring	Fecal Coliform	16.26	col/100 mL	170	10	2	20%
Covington Creek	2000	Summer	Fecal Coliform	27.39	col/100 mL	170	9	3	33%
Covington Creek	2000	Winter	Fecal Coliform	6.98	col/100 mL	44	9	0	0%
Covington Creek	2001	Fall	Fecal Coliform	27.94	col/100 mL	37	4	0	0%
Covington Creek	2001	Spring	Fecal Coliform	15.29	col/100 mL	80	9	0	0%
Covington Creek	2001	Summer	Fecal Coliform	80.46	col/100 mL	260	6	2	33%
Covington Creek	2001	Winter	Fecal Coliform	4.04	col/100 mL	19	9	0	0%
Covington Creek	2002	Fall	Fecal Coliform	40.53	col/100 mL	68	2	0	0%
Covington Creek	2002	Spring	Fecal Coliform	27.28	col/100 mL	85	6	0	0%
Covington Creek	2002	Summer	Fecal Coliform	85.11	col/100 mL	94	3	0	0%
Covington Creek	2002	Winter	Fecal Coliform	7.17	col/100 mL	12	3	0	0%
Covington Creek	2003	Fall	Fecal Coliform	34.77	col/100 mL	59	4	0	0%
Covington Creek	2003	Spring	Fecal Coliform	24.76	col/100 mL	91	4	0	0%
Covington Creek	2003	Summer	Fecal Coliform	133.08	col/100 mL	210	4	3	75%
Covington Creek	2003	Winter	Fecal Coliform	21.83	col/100 mL	30	5	0	0%
Duwamish (Longfellow Creek)	1999	Fall	Fecal Coliform	1170.25	col/100 mL	3200	6	6	100%
Duwamish (Longfellow Creek)	1999	Spring	Fecal Coliform	213.84	col/100 mL	590	6	5	83%
Duwamish (Longfellow Creek)	1999	Summer	Fecal Coliform	263.67	col/100 mL	600	5	5	100%
Duwamish (Longfellow Creek)	1999	Winter	Fecal Coliform	232.38	col/100 mL	900	5	4	80%
Duwamish (Longfellow Creek)	2000	Fall	Fecal Coliform	423.38	col/100 mL	960	9	9	100%
Duwamish (Longfellow Creek)	2000	Spring	Fecal Coliform	615.23	col/100 mL	6500	8	7	88%
Duwamish (Longfellow Creek)	2000	Summer	Fecal Coliform	825.52	col/100 mL	2100	9	9	100%
Duwamish (Longfellow Creek)	2000	Winter	Fecal Coliform	678.40	col/100 mL	1900	8	8	100%
Duwamish (Longfellow Creek)	2001	Fall	Fecal Coliform	1778.02	col/100 mL	39000	7	6	86%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Duwamish (Longfellow Creek)	2001	Spring	Fecal Coliform	4492.16	col/100 mL	5700	4	4	100%
Duwamish (Longfellow Creek)	2001	Summer	Fecal Coliform	187.25	col/100 mL	460	6	4	67%
Duwamish (Longfellow Creek)	2001	Winter	Fecal Coliform	492.80	col/100 mL	16000	7	7	100%
Duwamish (Longfellow Creek)	2002	Fall	Fecal Coliform	1184.74	col/100 mL	6200	6	6	100%
Duwamish (Longfellow Creek)	2002	Spring	Fecal Coliform	359.36	col/100 mL	600	9	9	100%
Duwamish (Longfellow Creek)	2002	Summer	Fecal Coliform	407.72	col/100 mL	2500	9	9	100%
Duwamish (Longfellow Creek)	2002	Winter	Fecal Coliform	120.63	col/100 mL	530	9	4	44%
Duwamish (Longfellow Creek)	2003	Fall	Fecal Coliform	289.73	col/100 mL	25000	7	5	71%
Duwamish (Longfellow Creek)	2003	Spring	Fecal Coliform	297.32	col/100 mL	680	6	5	83%
Duwamish (Longfellow Creek)	2003	Summer	Fecal Coliform	176.28	col/100 mL	560	4	3	75%
Duwamish (Longfellow Creek)	2003	Winter	Fecal Coliform	160.04	col/100 mL	560	7	4	57%
Duwamish River	1999	Fall	Fecal Coliform	19.44	col/100 mL	64	10	0	0%
Duwamish River	1999	Spring	Fecal Coliform	17.90	col/100 mL	120	15	2	13%
Duwamish River	1999	Summer	Fecal Coliform	27.88	col/100 mL	160	15	1	7%
Duwamish River	1999	Winter	Fecal Coliform	52.52	col/100 mL	230	14	5	36%
Duwamish River	2000	Fall	Fecal Coliform	16.97	col/100 mL	54	15	0	0%
Duwamish River	2000	Spring	Fecal Coliform	34.30	col/100 mL	300	14	1	7%
Duwamish River	2000	Summer	Fecal Coliform	26.31	col/100 mL	100	15	1	7%
Duwamish River	2000	Winter	Fecal Coliform	14.95	col/100 mL	68	15	0	0%
Duwamish River	2001	Fall	Fecal Coliform	49.81	col/100 mL	2800	18	5	28%
Duwamish River	2001	Spring	Fecal Coliform	20.28	col/100 mL	200	13	1	8%
Duwamish River	2001	Summer	Fecal Coliform	38.84	col/100 mL	170	11	1	9%
Duwamish River	2001	Winter	Fecal Coliform	10.86	col/100 mL	46	15	0	0%
Duwamish River	2002	Fall	Fecal Coliform	128.93	col/100 mL	4000	40	23	58%
Duwamish River	2002	Spring	Fecal Coliform	132.78	col/100 mL	21000	31	14	45%
Duwamish River	2002	Summer	Fecal Coliform	43.19	col/100 mL	380	18	8	44%
Duwamish River	2002	Winter	Fecal Coliform	71.92	col/100 mL	2100	31	13	42%
Duwamish River	2003	Fall	Fecal Coliform	56.28	col/100 mL	1600	16	5	31%
Duwamish River	2003	Spring	Fecal Coliform	21.42	col/100 mL	360	17	3	18%
Duwamish River	2003	Summer	Fecal Coliform	25.93	col/100 mL	200	15	3	20%
Duwamish River	2003	Winter	Fecal Coliform	84.49	col/100 mL	1700	35	20	57%
Jenkins Creek	1999	Fall	Fecal Coliform	28.39	col/100 mL	31	2	0	0%
Jenkins Creek	1999	Spring	Fecal Coliform	20.35	col/100 mL	36	4	0	0%
Jenkins Creek	1999	Summer	Fecal Coliform	28.59	col/100 mL	35	3	0	0%
Jenkins Creek	1999	Winter	Fecal Coliform	29.50	col/100 mL	60	3	0	0%
Jenkins Creek	2000	Fall	Fecal Coliform	46.09	col/100 mL	260	3	1	33%
Jenkins Creek	2000	Spring	Fecal Coliform	27.34	col/100 mL	72	2	0	0%
Jenkins Creek	2000	Summer	Fecal Coliform	58.38	col/100 mL	77	3	0	0%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Jenkins Creek	2000	Winter	Fecal Coliform	16.52	col/100 mL	45	4	0	0%
Jenkins Creek	2001	Fall	Fecal Coliform	35.66	col/100 mL	55	2	0	0%
Jenkins Creek	2001	Spring	Fecal Coliform	72.87	col/100 mL	320	2	1	50%
Jenkins Creek	2001	Summer	Fecal Coliform	134.45	col/100 mL	300	3	1	33%
Jenkins Creek	2001	Winter	Fecal Coliform	13.80	col/100 mL	32	4	0	0%
Jenkins Creek	2002	Fall	Fecal Coliform	36.23	col/100 mL	41	2	0	0%
Jenkins Creek	2002	Spring	Fecal Coliform	40.32	col/100 mL	58	3	0	0%
Jenkins Creek	2002	Summer	Fecal Coliform	72.06	col/100 mL	84	3	0	0%
Jenkins Creek	2002	Winter	Fecal Coliform	10.83	col/100 mL	13	2	0	0%
Jenkins Creek	2003	Fall	Fecal Coliform	61.11	col/100 mL	160	3	1	33%
Jenkins Creek	2003	Spring	Fecal Coliform	28.34	col/100 mL	50	3	0	0%
Jenkins Creek	2003	Summer	Fecal Coliform	75.96	col/100 mL	210	3	1	33%
Jenkins Creek	2003	Winter	Fecal Coliform	11.24	col/100 mL	17	3	0	0%
Lower Green River - East	2002	Fall	Fecal Coliform	30.79	col/100 mL	76	4	0	0%
Lower Green River - East	2002	Spring	Fecal Coliform	76.04	col/100 mL	540	4	2	50%
Lower Green River - East	2002	Summer	Fecal Coliform	81.00	col/100 mL	81	1	0	0%
Lower Green River - East	2002	Winter	Fecal Coliform	54.65	col/100 mL	290	5	3	60%
Lower Green River - East	2003	Fall	Fecal Coliform	370.00	col/100 mL	370	1	1	100%
Lower Green River - East	2003	Spring	Fecal Coliform	14.37	col/100 mL	120	3	1	33%
Lower Green River - East	2003	Summer	Fecal Coliform	32.94	col/100 mL	35	2	0	0%
Lower Green River - East	2003	Winter	Fecal Coliform	33.56	col/100 mL	99	4	0	0%
Lower Green River - West	1999	Fall	Fecal Coliform	33.83	col/100mL	140	9	2	22%
Lower Green River - West	1999	Spring	Fecal Coliform	32.23	col/100mL	800	10	1	10%
Lower Green River - West	1999	Summer	Fecal Coliform	47.36	col/100mL	170	10	1	10%
Lower Green River - West	1999	Winter	Fecal Coliform	73.84	col/100mL	260	10	5	50%
Lower Green River - West	2000	Fall	Fecal Coliform	28.07	col/100mL	320	9	2	22%
Lower Green River - West	2000	Spring	Fecal Coliform	56.59	col/100mL	1200	8	1	13%
Lower Green River - West	2000	Summer	Fecal Coliform	60.66	col/100mL	160	9	2	22%
Lower Green River - West	2000	Winter	Fecal Coliform	41.21	col/100mL	340	11	1	9%
Lower Green River - West	2001	Fall	Fecal Coliform	35.26	col/100mL	1200	16	3	19%
Lower Green River - West	2001	Spring	Fecal Coliform	177.97	col/100mL	590	9	6	67%
Lower Green River - West	2001	Summer	Fecal Coliform	67.61	col/100mL	610	9	1	11%
Lower Green River - West	2001	Winter	Fecal Coliform	8.31	col/100mL	210	17	1	6%
Lower Green River - West	2002	Fall	Fecal Coliform	177.39	col/100mL	840	27	19	70%
Lower Green River - West	2002	Spring	Fecal Coliform	69.99	col/100mL	830	28	9	32%
Lower Green River - West	2002	Summer	Fecal Coliform	137.98	col/100mL	320	13	10	77%
Lower Green River - West	2002	Winter	Fecal Coliform	23.63	col/100mL	230	24	6	25%
Lower Green River - West	2003	Fall	Fecal Coliform	58.97	col/100mL	260	14	5	36%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Lower Green River - West	2003	Spring	Fecal Coliform	28.74	col/100mL	68	16	0	0%
Lower Green River - West	2003	Summer	Fecal Coliform	101.95	col/100mL	380	14	5	36%
Lower Green River - West	2003	Winter	Fecal Coliform	54.02	col/100mL	310	45	11	24%
Middle Green River	1999	Fall	Fecal Coliform	23.68	col/100 mL	390	14	3	21%
Middle Green River	1999	Spring	Fecal Coliform	21.08	col/100 mL	2600	15	4	27%
Middle Green River	1999	Summer	Fecal Coliform	18.65	col/100 mL	59	13	0	0%
Middle Green River	1999	Winter	Fecal Coliform	11.61	col/100 mL	70	15	0	0%
Middle Green River	2000	Fall	Fecal Coliform	13.00	col/100 mL	660	17	2	12%
Middle Green River	2000	Spring	Fecal Coliform	44.83	col/100 mL	910	10	3	30%
Middle Green River	2000	Summer	Fecal Coliform	29.16	col/100 mL	260	14	3	21%
Middle Green River	2000	Winter	Fecal Coliform	14.10	col/100 mL	140	18	1	6%
Middle Green River	2001	Fall	Fecal Coliform	53.07	col/100 mL	1800	15	5	33%
Middle Green River	2001	Spring	Fecal Coliform	53.66	col/100 mL	4100	12	5	42%
Middle Green River	2001	Summer	Fecal Coliform	18.47	col/100 mL	340	14	1	7%
Middle Green River	2001	Winter	Fecal Coliform	2.28	col/100 mL	37	13	0	0%
Middle Green River	2002	Fall	Fecal Coliform	8.69	col/100 mL	150	18	2	11%
Middle Green River	2002	Spring	Fecal Coliform	14.28	col/100 mL	330	20	1	5%
Middle Green River	2002	Summer	Fecal Coliform	19.02	col/100 mL	320	15	2	13%
Middle Green River	2002	Winter	Fecal Coliform	11.60	col/100 mL	650	23	2	9%
Middle Green River	2003	Fall	Fecal Coliform	26.62	col/100 mL	220	15	2	13%
Middle Green River	2003	Spring	Fecal Coliform	9.78	col/100 mL	110	17	1	6%
Middle Green River	2003	Summer	Fecal Coliform	25.94	col/100 mL	160	17	2	12%
Middle Green River	2003	Winter	Fecal Coliform	9.63	col/100 mL	90	24	0	0%
Mill Creek	1999	Fall	Fecal Coliform	249.78	col/100 mL	630	4	4	100%
Mill Creek	1999	Spring	Fecal Coliform	264.44	col/100 mL	3600	4	3	75%
Mill Creek	1999	Summer	Fecal Coliform	347.96	col/100 mL	450	3	3	100%
Mill Creek	1999	Winter	Fecal Coliform	1105.84	col/100 mL	1600	3	3	100%
Mill Creek	2000	Fall	Fecal Coliform	379.86	col/100 mL	4200	4	2	50%
Mill Creek	2000	Spring	Fecal Coliform	351.45	col/100 mL	6400	3	2	67%
Mill Creek	2000	Summer	Fecal Coliform	740.06	col/100 mL	890	3	3	100%
Mill Creek	2000	Winter	Fecal Coliform	249.60	col/100 mL	3800	5	3	60%
Mill Creek	2001	Fall	Fecal Coliform	637.88	col/100 mL	9000	3	3	100%
Mill Creek	2001	Spring	Fecal Coliform	492.72	col/100 mL	4100	4	3	75%
Mill Creek	2001	Summer	Fecal Coliform	463.33	col/100 mL	560	3	3	100%
Mill Creek	2001	Winter	Fecal Coliform	63.95	col/100 mL	160	3	1	33%
Mill Creek	2002	Fall	Fecal Coliform	304.38	col/100 mL	540	6	6	100%
Mill Creek	2002	Spring	Fecal Coliform	300.99	col/100 mL	3400	5	4	80%
Mill Creek	2002	Summer	Fecal Coliform	595.38	col/100 mL	1100	4	4	100%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Mill Creek	2002	Winter	Fecal Coliform	218.31	col/100 mL	3500	6	3	50%
Mill Creek	2003	Fall	Fecal Coliform	181.94	col/100 mL	1200	6	4	67%
Mill Creek	2003	Spring	Fecal Coliform	126.46	col/100 mL	530	6	3	50%
Mill Creek	2003	Summer	Fecal Coliform	1205.04	col/100 mL	7700	3	3	100%
Mill Creek	2003	Winter	Fecal Coliform	457.64	col/100 mL	2200	9	9	100%
Newaukum Creek	1999	Fall	Fecal Coliform	77.54	col/100 mL	5100	42	17	40%
Newaukum Creek	1999	Spring	Fecal Coliform	37.90	col/100 mL	6500	36	5	14%
Newaukum Creek	1999	Summer	Fecal Coliform	181.93	col/100 mL	4200	49	35	71%
Newaukum Creek	1999	Winter	Fecal Coliform	283.56	col/100 mL	6500	52	35	67%
Newaukum Creek	2000	Fall	Fecal Coliform	139.23	col/100 mL	5400	55	29	53%
Newaukum Creek	2000	Spring	Fecal Coliform	424.69	col/100 mL	12000	54	34	63%
Newaukum Creek	2000	Summer	Fecal Coliform	219.91	col/100 mL	16000	53	44	83%
Newaukum Creek	2000	Winter	Fecal Coliform	123.94	col/100 mL	5300	54	27	50%
Newaukum Creek	2001	Fall	Fecal Coliform	1378.99	col/100 mL	28000	91	86	95%
Newaukum Creek	2001	Spring	Fecal Coliform	447.99	col/100 mL	54000	64	37	58%
Newaukum Creek	2001	Summer	Fecal Coliform	207.53	col/100 mL	1100	36	26	72%
Newaukum Creek	2001	Winter	Fecal Coliform	75.66	col/100 mL	2200	77	28	36%
Newaukum Creek	2002	Fall	Fecal Coliform	119.42	col/100 mL	39000	66	34	52%
Newaukum Creek	2002	Spring	Fecal Coliform	494.44	col/100 mL	29000	37	27	73%
Newaukum Creek	2002	Summer	Fecal Coliform	235.81	col/100 mL	1200	16	12	75%
Newaukum Creek	2002	Winter	Fecal Coliform	126.59	col/100 mL	4300	63	38	60%
Newaukum Creek	2003	Fall	Fecal Coliform	148.83	col/100 mL	21000	47	25	53%
Newaukum Creek	2003	Spring	Fecal Coliform	69.93	col/100 mL	3200	26	13	50%
Newaukum Creek	2003	Summer	Fecal Coliform	130.27	col/100 mL	320	13	8	62%
Newaukum Creek	2003	Winter	Fecal Coliform	154.85	col/100 mL	25000	91	48	53%
Soos Creek	1999	Fall	Fecal Coliform	131.00	col/100 mL	4100	23	11	48%
Soos Creek	1999	Spring	Fecal Coliform	47.51	col/100 mL	3500	15	4	27%
Soos Creek	1999	Summer	Fecal Coliform	77.73	col/100 mL	1300	21	5	24%
Soos Creek	1999	Winter	Fecal Coliform	72.67	col/100 mL	330	20	6	30%
Soos Creek	2000	Fall	Fecal Coliform	46.87	col/100 mL	2500	22	5	23%
Soos Creek	2000	Spring	Fecal Coliform	162.41	col/100 mL	3600	21	12	57%
Soos Creek	2000	Summer	Fecal Coliform	82.82	col/100 mL	1000	22	7	32%
Soos Creek	2000	Winter	Fecal Coliform	110.11	col/100 mL	16000	23	8	35%
Soos Creek	2001	Fall	Fecal Coliform	758.90	col/100 mL	8900	24	21	88%
Soos Creek	2001	Spring	Fecal Coliform	351.01	col/100 mL	6100	25	22	88%
Soos Creek	2001	Summer	Fecal Coliform	81.88	col/100 mL	340	16	4	25%
Soos Creek	2001	Winter	Fecal Coliform	60.26	col/100 mL	3200	22	8	36%
Soos Creek	2002	Fall	Fecal Coliform	52.88	col/100 mL	950	19	3	16%

Table A-12.
Results for *E. coli* and Fecal Coliforms

Basin	Yr	Season	Parameter	Geomean	Units	Maximum	# of Samples	# Exceeding	% Exceeding
Soos Creek	2002	Spring	Fecal Coliform	183.96	col/100 mL	5300	15	8	53%
Soos Creek	2002	Summer	Fecal Coliform	168.93	col/100 mL	480	11	7	64%
Soos Creek	2002	Winter	Fecal Coliform	133.41	col/100 mL	1200	25	14	56%
Soos Creek	2003	Fall	Fecal Coliform	150.84	col/100 mL	3200	16	7	44%
Soos Creek	2003	Spring	Fecal Coliform	65.43	col/100 mL	280	12	3	25%
Soos Creek	2003	Summer	Fecal Coliform	121.81	col/100 mL	630	13	6	46%
Soos Creek	2003	Winter	Fecal Coliform	48.79	col/100 mL	2500	23	6	26%
Upper Green River	2001	Fall	Fecal Coliform	6.56	col/100 mL	23	3	0	0%
Upper Green River	2002	Fall	Fecal Coliform	1.29	col/100 mL	5	6	0	0%
Upper Green River	2002	Spring	Fecal Coliform	2.08	col/100 mL	4	4	0	0%
Upper Green River	2002	Summer	Fecal Coliform	2.00	col/100 mL	2	1	0	0%
Upper Green River	2002	Winter	Fecal Coliform	2.23	col/100 mL	12	6	0	0%
Upper Green River	2003	Fall	Fecal Coliform	16.94	col/100 mL	29	4	0	0%
Upper Green River	2003	Spring	Fecal Coliform	1.45	col/100 mL	2	2	0	0%
Upper Green River	2003	Summer	Fecal Coliform	3.00	col/100 mL	3	1	0	0%
Upper Green River	2003	Winter	Fecal Coliform	2.17	col/100 mL	9	7	0	0%

col/100 mL = colonies per 100 milliliters

Table A-13.
Comparison of Maximum MDLs for Chemicals Never Detected to Acute and Chronic Screening Values

Chemical	Maximum MDL	# of Samples	# Exceeding SVs	SV	SV Type	Units
1,2,4-Trichlorobenzene	0.05	69	0	210	Chronic	ug/L
1,2,4-Trichlorobenzene	0.05	69	0	455	Acute	ug/L
1,2-Dichlorobenzene	0.25	108	0	66.2	Chronic	ug/L
1,2-Dichlorobenzene	0.25	108	0	331	Acute	ug/L
1,3-Dichlorobenzene	0.25	108	0	3.675	Chronic	ug/L
1,3-Dichlorobenzene	0.25	108	0	36.75	Acute	ug/L
1,4-Dichlorobenzene	0.25	108	0	112	Chronic	ug/L
1,4-Dichlorobenzene	0.25	108	0	560	Acute	ug/L
2,4,5-T	0.071	108	0	10	Chronic	ug/L
2,4,5-T	0.071	108	0	50	Acute	ug/L
2,4,5-TP (Silvex)	0.054	108	0	34	Chronic	ug/L
2,4,5-TP (Silvex)	0.054	108	0	170	Acute	ug/L
2,4,5-Trichlorophenol	0.14	69	0	34	Acute	ug/L
2,4,5-Trichlorophenol	0.14	69	0	34	Chronic	ug/L
2,4,6-Trichlorophenol	0.53	108	0	18	Chronic	ug/L
2,4,6-Trichlorophenol	0.53	108	0	90	Acute	ug/L
2,4-DB	0.073	108	0	197	Chronic	ug/L
2,4-DB	0.073	108	0	985	Acute	ug/L
2,4-Dichlorophenol	0.53	108	39	0.26	Chronic	ug/L
2,4-Dichlorophenol	0.53	108	0	1.305	Acute	ug/L
2,4-Dimethylphenol	1.7	69	0	210	Chronic	ug/L
2,4-Dimethylphenol	1.7	69	0	1050	Acute	ug/L
2,4-Dinitrophenol	1.1	69	0	6	Chronic	ug/L
2,4-Dinitrophenol	1.1	69	0	30	Acute	ug/L
2,4-Dinitrotoluene	0.25	69	0	20	Chronic	ug/L
2,4-Dinitrotoluene	0.25	69	0	3150	Acute	ug/L
2,6-Dinitrotoluene	0.25	69	0	60	Chronic	ug/L
2,6-Dinitrotoluene	0.25	69	0	7500	Acute	ug/L
2-Chloronaphthalene	0.05	108	0	164.6	Chronic	ug/L
2-Chloronaphthalene	0.05	108	0	823	Acute	ug/L
2-Chlorophenol	0.11	69	0	172	Chronic	ug/L
2-Chlorophenol	0.11	69	0	860	Acute	ug/L
2-Methylnaphthalene	0.5	108	0	145.6	Chronic	ug/L
2-Methylnaphthalene	0.5	108	0	728	Acute	ug/L
2-Methylphenol	0.28	69	0	500	Chronic	ug/L
2-Methylphenol	0.28	69	0	2500	Acute	ug/L
2-Nitroaniline	0.5	69	0	489	Chronic	ug/L
2-Nitroaniline	0.5	69	0	2445	Acute	ug/L
2-Nitrophenol	0.057	69	0	160	Chronic	ug/L
2-Nitrophenol	0.057	69	0	800	Acute	ug/L
3,3'-Dichlorobenzidine	3.8	69	0	105	Chronic	ug/L
3,3'-Dichlorobenzidine	3.8	69	0	525	Acute	ug/L
3-Nitroaniline	2.5	69	0	98	Chronic	ug/L
3-Nitroaniline	2.5	69	0	490	Acute	ug/L
4,4'-DDD	0.0057	109	0	0.06	Chronic	ug/L
4,4'-DDD	0.0057	109	0	0.3	Acute	ug/L
4,4'-DDE	0.006	152	0	0.1	Chronic	ug/L
4,4'-DDE	0.006	152	0	0.5	Acute	ug/L
4,4'-DDT	0.0057	109	0	0.018	Chronic	ug/L

Table A-13.
Comparison of Maximum MDLs for Chemicals Never Detected to Acute and Chronic Screening Values

Chemical	Maximum MDL	# of Samples	# Exceeding SVs	SV	SV Type	Units
4,4'-DDT	0.0057	109	0	0.09	Acute	ug/L
4,6-Dinitro-O-Cresol	1.1	69	0	6.6	Chronic	ug/L
4,6-Dinitro-O-Cresol	1.1	69	0	33	Acute	ug/L
4-Bromophenyl Phenyl Ether	0.13	69	0	36	Chronic	ug/L
4-Bromophenyl Phenyl Ether	0.13	69	0	180	Acute	ug/L
4-Chloro-3-Methylphenol	0.28	69	0	91.7	Chronic	ug/L
4-Chloro-3-Methylphenol	0.28	69	0	458.5	Acute	ug/L
4-Chloroaniline	1.3	69	0	10	Chronic	ug/L
4-Chloroaniline	1.3	69	0	25	Acute	ug/L
4-Chlorophenyl Phenyl Ether	0.13	69	0	73	Chronic	ug/L
4-Chlorophenyl Phenyl Ether	0.13	69	0	365	Acute	ug/L
4-Nitroaniline	2.5	69	0	1700	Chronic	ug/L
4-Nitroaniline	2.5	69	0	8500	Acute	ug/L
4-Nitrophenol	0.57	69	0	110	Chronic	ug/L
4-Nitrophenol	0.57	69	0	550	Acute	ug/L
Alachlor	0.004	43	0	3	Acute	ug/L
Alachlor	0.004	43	0	188	Chronic	ug/L
Aldrin	0.0057	109	0	0.29	Chronic	ug/L
Aldrin	0.0057	109	0	2.5	Acute	ug/L
Aroclor 1016	0.057	109	0	0.108	Chronic	ug/L
Aroclor 1016	0.057	109	0	0.54	Acute	ug/L
Aroclor 1221	0.057	109	0	62.5	Chronic	ug/L
Aroclor 1221	0.057	109	0	525	Acute	ug/L
Aroclor 1232	0.057	109	0	33	Chronic	ug/L
Aroclor 1232	0.057	109	0	160	Acute	ug/L
Aroclor 1242	0.057	109	0	0.213	Chronic	ug/L
Aroclor 1242	0.057	109	0	1.065	Acute	ug/L
Aroclor 1248	0.057	109	0	1.7	Chronic	ug/L
Aroclor 1248	0.057	109	0	26	Acute	ug/L
Aroclor 1254	0.057	109	109	0.032	Chronic	ug/L
Aroclor 1254	0.057	109	0	0.16	Acute	ug/L
Aroclor 1260	0.057	109	0	1.65	Chronic	ug/L
Aroclor 1260	0.057	109	0	12500	Acute	ug/L
Benfluralin	0.01	43	0	6.5	Chronic	ug/L
Benfluralin	0.01	43	0	32.5	Acute	ug/L
Benzo(a)anthracene	0.13	108	0	1	Chronic	ug/L
Benzo(a)anthracene	0.13	108	0	5	Acute	ug/L
Benzo(g,h,i)perylene	0.25	108	108	0.02	Chronic	ug/L
Benzo(g,h,i)perylene	0.25	108	3	0.1	Acute	ug/L
Beryllium, Dissolved	0.2	980	0	5	Chronic	ug/L
Beryllium, Dissolved	0.2	980	0	25	Acute	ug/L
BHC, alpha-	0.0057	152	0	12	Chronic	ug/L
BHC, alpha-	0.0057	152	0	60	Acute	ug/L
BHC, beta-	0.0057	109	0	16	Chronic	ug/L
BHC, beta-	0.0057	109	0	760	Acute	ug/L
BHC, delta-	0.0057	109	0	12	Chronic	ug/L
BHC, delta-	0.0057	109	0	60	Acute	ug/L
BHC, gamma- (Lindane)	0.0057	152	0	0.08	Chronic	ug/L
BHC, gamma- (Lindane)	0.0057	152	0	2	Acute	ug/L

Table A-13.
Comparison of Maximum MDLs for Chemicals Never Detected to Acute and Chronic Screening Values

Chemical	Maximum MDL	# of Samples	# Exceeding SVs	SV	SV Type	Units
Bis(2-Chloroethoxy)Methane	0.05	69	0	18400	Chronic	ug/L
Bis(2-Chloroethoxy)Methane	0.05	69	0	92000	Acute	ug/L
Bis(2-Chloroethyl)Ether	0.05	69	0	9100	Chronic	ug/L
Bis(2-Chloroethyl)Ether	0.05	69	0	45500	Acute	ug/L
Chlordane	0.028	70	0	0.17	Chronic	ug/L
Chlordane	0.028	70	0	2.4	Acute	ug/L
Chlorpyrifos	0.067	151	7	0.041	Chronic	ug/L
Chlorpyrifos	0.067	151	0	0.083	Acute	ug/L
Dalapon	0.055	108	0	10500	Chronic	ug/L
Dalapon	0.055	108	0	52500	Acute	ug/L
Dibenzo(a,h)anthracene	0.25	108	108	0.04	Chronic	ug/L
Dibenzo(a,h)anthracene	0.25	108	2	0.2	Acute	ug/L
Dibenzofuran	0.05	108	0	105	Chronic	ug/L
Dibenzofuran	0.05	108	0	525	Acute	ug/L
Dicamba	0.045	108	0	30.5	Chronic	ug/L
Dicamba	0.045	108	0	1950	Acute	ug/L
Dieldrin	0.0057	152	0	0.29	Chronic	ug/L
Dieldrin	0.0057	152	0	2.5	Acute	ug/L
Dinoseb	0.053	108	0	2.8	Chronic	ug/L
Dinoseb	0.053	108	0	14	Acute	ug/L
Disulfoton	0.053	151	0	0.1	Chronic	ug/L
Disulfoton	0.053	151	0	1.65	Acute	ug/L
Endosulfan II	0.0057	109	0	0.056	Chronic	ug/L
Endosulfan II	0.0057	109	0	0.22	Acute	ug/L
Endosulfan sulfate	0.0057	109	0	75.6	Chronic	ug/L
Endosulfan sulfate	0.0057	109	0	378	Acute	ug/L
Endrin	0.0057	109	0	0.045	Chronic	ug/L
Endrin	0.0057	109	0	0.18	Acute	ug/L
Ethalfluralin	0.009	43	0	1.81	Chronic	ug/L
Ethalfluralin	0.009	43	0	9.05	Acute	ug/L
Fipronil	0.007	1	0	2.5	Chronic	ug/L
Fipronil	0.007	1	0	12.5	Acute	ug/L
Fluorene	0.05	108	0	21.2	Chronic	ug/L
Fluorene	0.05	108	0	106	Acute	ug/L
Fonofos	0.003	43	0	0.42	Chronic	ug/L
Fonofos	0.003	43	0	1	Acute	ug/L
Heptachlor	0.0057	109	0	0.0065	Chronic	ug/L
Heptachlor	0.0057	109	0	0.52	Acute	ug/L
Heptachlor epoxide	0.0057	109	0	0.0065	Chronic	ug/L
Heptachlor epoxide	0.0057	109	0	0.52	Acute	ug/L
Hexachlorobenzene	0.13	108	2	0.04	Chronic	ug/L
Hexachlorobenzene	0.13	108	0	5	Acute	ug/L
Hexachlorobutadiene	0.25	69	0	5	Chronic	ug/L
Hexachlorobutadiene	0.25	69	0	45	Acute	ug/L
Hexachloroethane	0.13	69	0	84	Chronic	ug/L
Hexachloroethane	0.13	69	0	420	Acute	ug/L
Linuron	0.035	43	0	0.7	Chronic	ug/L
Linuron	0.035	43	0	3.5	Acute	ug/L
Malathion	0.094	151	0	0.1	Chronic	ug/L

Table A-13.
Comparison of Maximum MDLs for Chemicals Never Detected to Acute and Chronic Screening Values

Chemical	Maximum MDL	# of Samples	# Exceeding SVs	SV	SV Type	Units
Malathion	0.094	151	0	0.25	Acute	ug/L
MCPA	0.044	108	0	10	Chronic	ug/L
MCPA	0.044	108	0	50	Acute	ug/L
MCPP	0.032	108	0	1100	Chronic	ug/L
MCPP	0.032	108	0	5500	Acute	ug/L
Methoxychlor	0.028	109	0	0.03	Chronic	ug/L
Methoxychlor	0.028	109	0	0.25	Acute	ug/L
Methyl azinphos	0.05	43	0	0.05	Acute	ug/L
Methyl azinphos	0.05	43	0	0.1	Chronic	ug/L
Nitrobenzene	0.05	69	0	180	Chronic	ug/L
Nitrobenzene	0.05	69	0	900	Acute	ug/L
N-Nitrosodimethylamine	0.13	69	0	2000	Chronic	ug/L
N-Nitrosodimethylamine	0.13	69	0	140000	Acute	ug/L
N-Nitrosodiphenylamine	1.3	69	0	580	Chronic	ug/L
N-Nitrosodiphenylamine	1.3	69	0	2900	Acute	ug/L
Parathion, ethyl-	0.088	108	108	0.013	Chronic	ug/L
Parathion, ethyl-	0.088	108	7	0.065	Acute	ug/L
Parathion, methyl-	0.071	151	108	0.01	Chronic	ug/L
Parathion, methyl-	0.071	151	2	0.07	Acute	ug/L
Pendimethalin	0.022	43	0	0.54	Chronic	ug/L
Pendimethalin	0.022	43	0	2.7	Acute	ug/L
Permethrin	0.006	43	47	0.0039	Chronic	ug/L
Permethrin	0.006	43	0	0.0195	Acute	ug/L
Phorate	0.065	151	7	0.06	Chronic	ug/L
Phorate	0.065	151	0	0.3	Acute	ug/L
Propanil	0.011	43	0	35	Chronic	ug/L
Propanil	0.011	43	0	175	Acute	ug/L
Silver, Dissolved	4	1138	834	0.031788916	Chronic	ug/L
Testosterone	0.011	53	0	2221	Acute	ug/L
Testosterone	0.011	53	0	3535.533906	Chronic	ug/L
Thallium, Total	200	1053	5	65	Chronic	ug/L
Thallium, Total	200	1053	0	61500	Acute	ug/L
Thiobencarb	0.005	43	0	4.5	Chronic	ug/L
Thiobencarb	0.005	43	0	8.5	Acute	ug/L
Toxaphene	0.057	109	109	0.039	Chronic	ug/L
Toxaphene	0.057	109	0	0.73	Acute	ug/L

MDL = Method Detection Limit
SV = Screening Value