

APPENDIX K
Watershed Sampling

Sampling Sites

Below is a listing of the 13 sampling sites designated for this project. For purposes of tracking at the laboratory, a Locator name, short descriptor, and description of sampling location is given for each site.

LSIN8

Ginder Cr @ SR 169 - #1

Site 1 is located on Ginder Creek, at its intersection with S.R. 169. This site represents the drainage from Ginder Lake, as well as development to the north including the Morgan Creek neighborhood and the John Henry Mine.

LSIN7

Mud Lk Outfall - #2

Site 2 is located just south of Site 1, east of S.R. 169 on the outfall from Mud Lake. Site 2 represents the Mud Lake outfall upstream of the confluence with Ginder Creek. Much of the drainage here originates on or near the John Henry Mine site just east of Black Diamond.

LSJL3

Jones Lk Outfall - #3

Site 3 is located at the outlet of Jones Lake. The monitoring site represents the drainage from Jones Lake and surface water drainage from the greater Lawson Hill/Pacific Str neighborhood.

LSGC4

Ginder Cr @ mouth - #4

Site 4 is located on Ginder Creek and is located upstream of the confluence of Ginder and Rock Creeks. This site represents the water sampled at Sites 1, 2, and 11, in addition to surface waters from the wetlands adjacent to Ginder Creek between Sites 11 and 4.

LSIN1

Rock Cr @ mouth - #5

Site 5 is located at the mouth of Rock Creek where it flows into the southern end of Lake Sawyer. This site is the final monitoring point on Rock Creek and represents the total pollutant load from the entire Rock Creek basin.

LSIN13?? see map

LSIN5

Rock Cr @ Chub Lk Rd - #8

Site 8 is located on Rock Creek at Chub Lake Rd and represents the drainage from Black Diamond Lake and the surrounding bog, Covington Creek Wetland #27 (CC27).

LSRC9

Rock Cr Trib @ Roberts Dr - #9

Site 9 is located on an un-named trib which flows south to its confluence with Rock Creek from a wetland located north of the intersection of Roberts Dr and Morgan St. This site represents the surface waters from the upstream wetland.

LSIN2

Rock Cr @ Morganville Br/Roberts Dr - #10

Site 10 is located on Rock Creek at the Roberts Drive Bridge. Sampling will occur on the downstream side of the bridge. This site represents the water sampled at Sites 8, 9, and 12, in addition to surface waters entering the Rock Creek from the adjacent wetlands downstream of Sites 8, 9, and 12.

LSGC11

Ginder Cr @ Roberts Dr - #11

Site 11 is located on Ginder Creek at Roberts Drive. The sampling site is located downstream of the confluence of Ginder Creek and the Mud Lake Outfall. This site represents the drainage from Ginger Lake, the Mud Lake Outfall, the development to the north which includes the Morgan Creek neighborhood, and the John Henry Mine.

LSIN3

Rock Cr @ Abrams Ave - #12

Site 12 is located on Rock Creek upstream of Abrams Ave. Sampling occurs 350-400 ft downstream of the confluence of Ginder and Rock Creeks. This site represents the water sampled at Sites 3 and 4 in addition to surface waters entering the Rock Creek from the adjacent wetlands downstream of Sites 3 and 4.

LSLH13

Lawson culvert @ Lawson & 5th - #13

Site 13 is located on the SW corner of the intersection of Lawson St. and 5th Ave. Sampling occurs just downstream of two culverts which conveys surface water into Ginder and Rocks Creeks from the residential Lawson Hill area.

LSGL14

SE Ginder Lk Rd, Wetland CC8 - #14

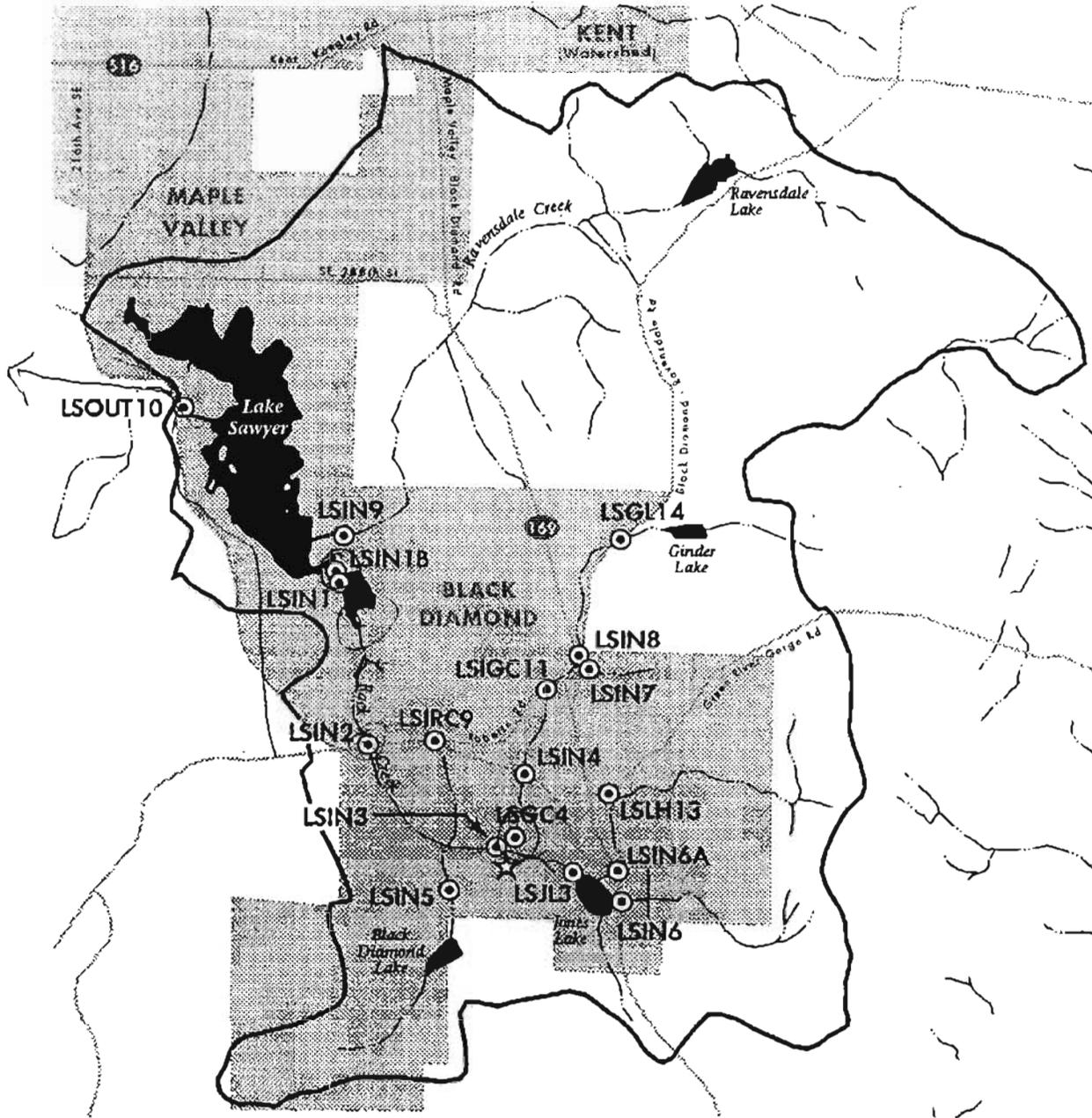
Site 14 is located on the Ginder Creek off the south-side of the Black-Diamond Ravensdale Rd. This site represents the drainage from Ginder Lake and the surrounding bog, Covington Creek Wetland #8 (CC8).

LSINOUTDUP

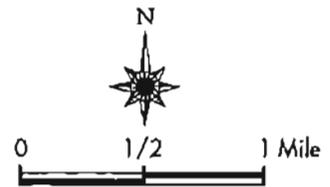
Field Duplicate

Field duplicate for QA/QC.

Sawyer Watershed Sampling Locations by King County Lab Locator Number

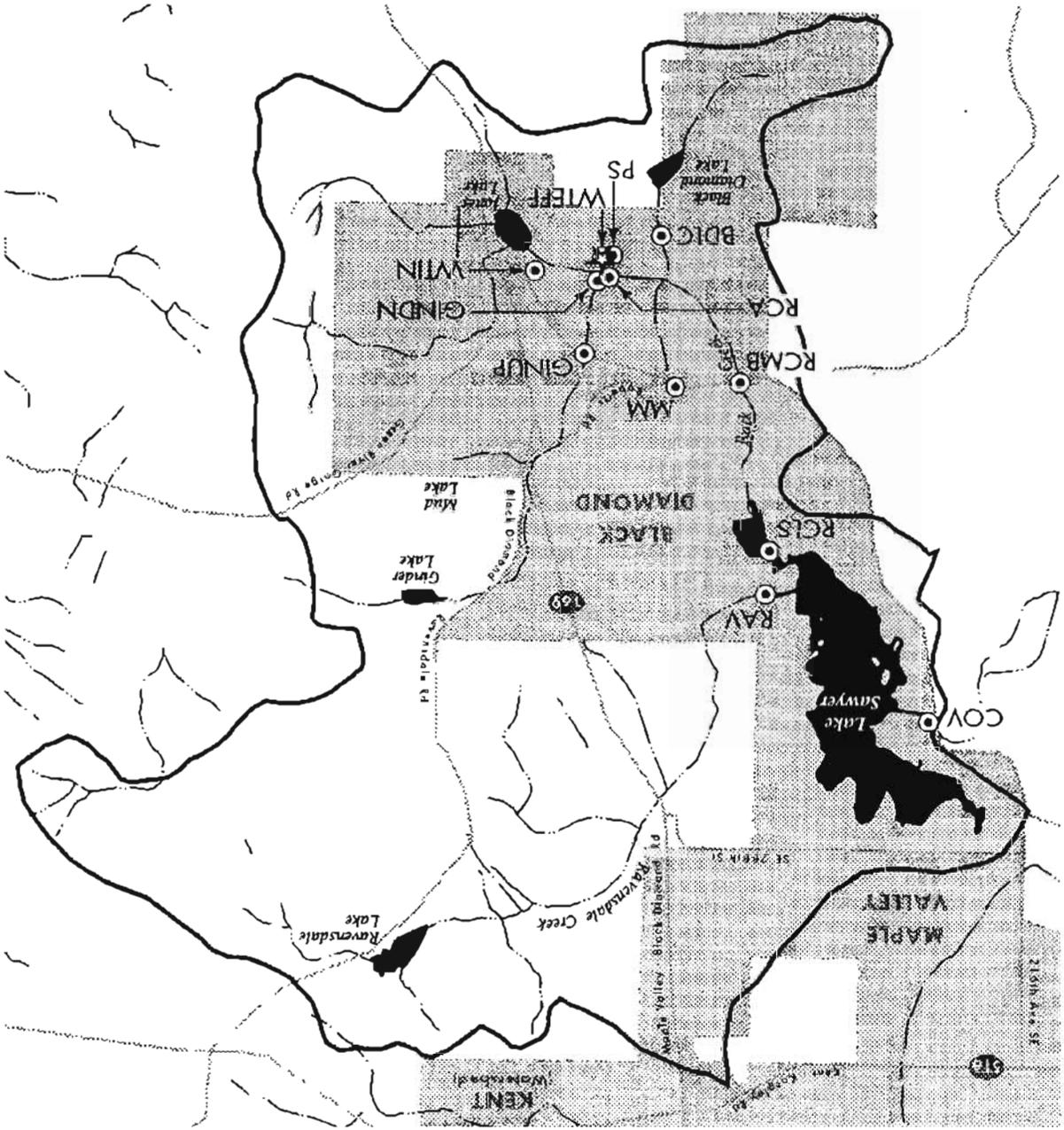


- ★ Wastewater Treatment Plant
- ⊙ LSIN9 Sampling Site & Number
- Watershed Boundary
- Stream
- Major Road
- Lake
- Incorporated Area

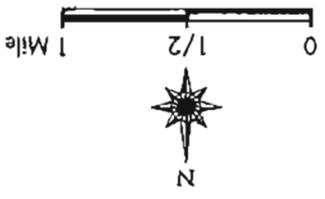


Creation and Production of this Map was a combined effort of the WLA Lakes Group and the WLA GIS & Visual Communications Unit 0005 Ltr SAWYER34 W/C

Sawyer Watershed Sampling Locations Department of Ecology Sites

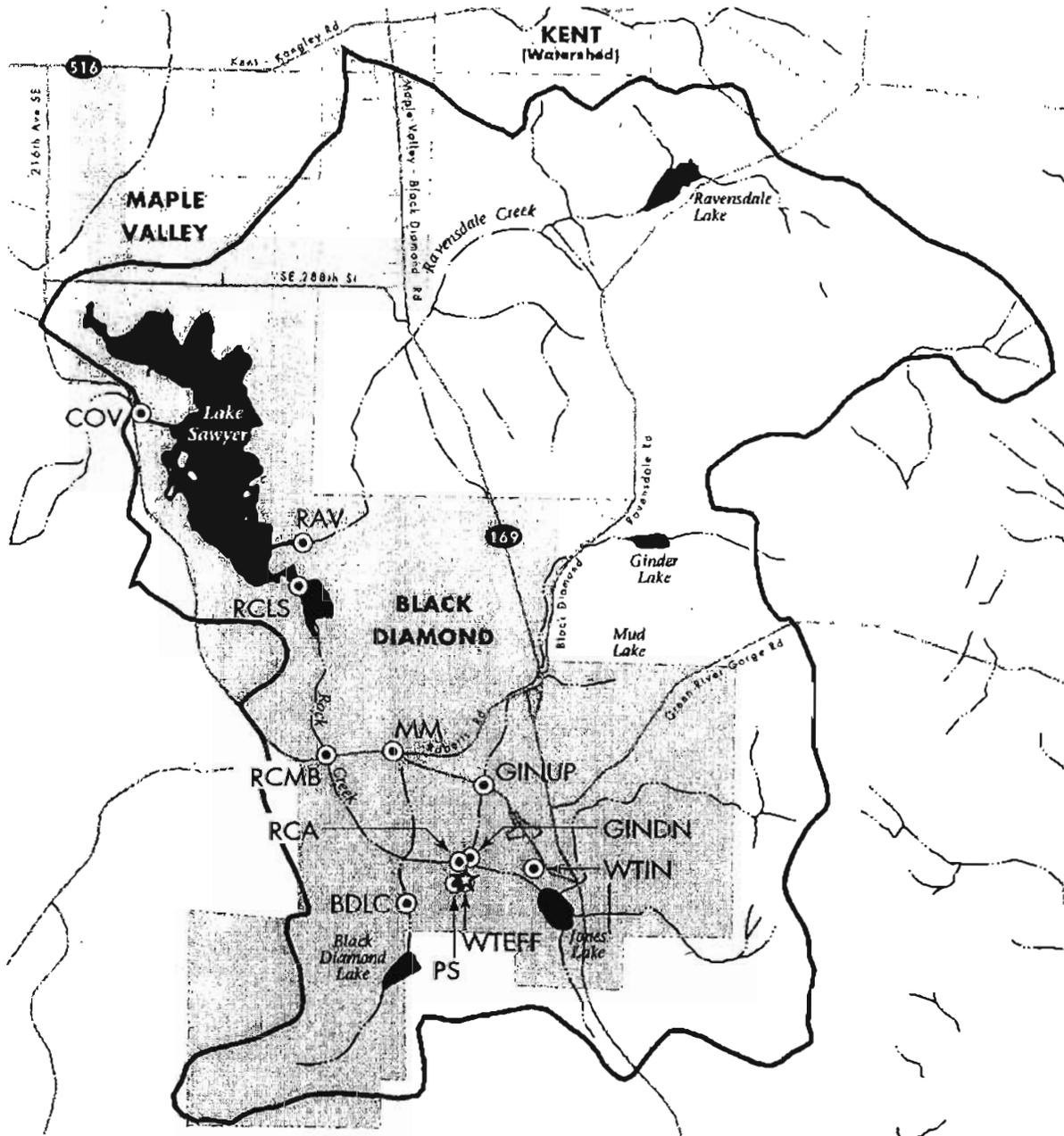


- ★ Wastewater Treatment Plant
- ⊙ PS Sampling Site & Name
- ~ Watershed Boundary
- ~ Stream
- ~ Major Road
- ~ Lake
- ▨ Incorporated Area

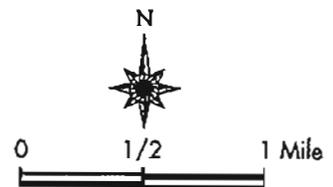


Sawyer Watershed Sampling Locations

Department of Ecology Sites



- ★ Wastewater Treatment Plant
- ⊙ PS Sampling Site & Name
- Watershed Boundary
- Stream
- Major Road
- Lake
- ▨ Incorporated Area



Creation and Production of this Map was a combined effort of the W.L.R. Lakes Group and the W.L.R. GIS & Visual Communications Unit
 0005 \info\SAWYER\Info\SAMPLING.WGC



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 684-2300

January 21, 1998

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager 
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CT, Black Diamond / Rock Creek
Samples L12512-1 - 13.

Attached is the comprehensive report for the water samples delivered to the laboratory on December 16, 1997. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

All products are analyzed in batches. For appropriate products, each analytical batch includes a calibration curve and one or more positive controls. All the analytical results are reported from batches where the calibration curve and positive controls were within control windows ($r = 0.995$ or greater, and $\pm 20\%$ of the true value respectively). Method blanks are expected to be less than method detection limits. Laboratory duplicates are expected to be within 25% relative percent difference, recovery of matrix spikes is expected to be within 70-130%.

There were no anomalies associated with the preparation and analysis of these samples.

The data has passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.



King County Environmental Lab Matrix Report

PROJECT: 421195CI

CONVENTIONALS-Liquid

Locator	Sample		Lab ID	Ortho Phosphorus mg/L	Total Phosphorus mg/L	Total Suspended Solids mg/L
	Depth					
LSIN1			L12512-1	0.107	2.1	
LSIN2			L12512-2	0.0429	3.6	
LSIN3			L12512-3	0.144	42.3	
LSIN5			L12512-4	0.0265	0.119	23.7
LSIN7			L12512-5		0.139	68.1
LSIN8			L12512-6		0.0859	20
LSGC4			L12512-7		0.209	65.2
LSRC9			L12512-8		0.037	1.4
LSGC11			L12512-9		0.193	54.8
LSLH13			L12512-10		0.474	107
LSJL3			L12512-11		0.142	23.4
LSINOUTDUP			L12512-12		0.0435	4.8
LSGL14			L12512-13	0.00773	0.0433	6

King County Environmental Lab Analytical Report

PROJECT: 421195CI

Locator: LSIN1
 Descrip: Rock Creek at Mout
 Sampled: Dec 16, 97
 Lab ID: L12512-1
 Matrix: STORM WTR
 % Solids:

Locator: LSIN2
 Descrip: Rock Creek at Morg
 Sampled: Dec 16, 97
 Lab ID: L12512-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Dec 16, 97
 Lab ID: L12512-3
 Matrix: STORM WTR
 % Solids:

Locator: LSIN5
 Descrip: Rock Creek at Chub
 Sampled: Dec 16, 97
 Lab ID: L12512-4
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
			- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis			
CONVENTIONALS																					
M.Code=Conventionala SM2340-D																					
Total Suspended Solids	2.1		0.5	1	mg/L	3.6		0.5	1	mg/L	42.3		0.5	1	mg/L	23.7		0.5	1	mg/L	
M.Code=Conventionala SM4500-P,B,E																					
Total Phosphorus	0.107		0.005	0.01	mg/L	0.0429		0.005	0.01	mg/L	0.144		0.005	0.01	mg/L	0.119		0.005	0.01	mg/L	
M.Code=Conventionala SM4500-P,F																					
Ortho Phosphorus																0.0265		0.002	0.005	mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421195CI

Locator: LSIN7
 Descrip: Mud Lk Outfall #2
 Sampled: Dec 16, 97
 Lab ID: L12512-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN8
 Descrip: Ginder Creek at SR
 Sampled: Dec 16, 97
 Lab ID: L12512-6
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Ginder Creek at Mo
 Sampled: Dec 16, 97
 Lab ID: L12512-7
 Matrix: STORM WTR
 % Solids:

Locator: LSRC9
 Descrip: Rock Creek Tributa
 Sampled: Dec 16, 97
 Lab ID: L12512-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					
CONVENTIONALS																					
<i>M.Code=Conventionalis SM2540-D</i>																					
Total Suspended Solids	56.1		0.5	1	mg/L	20		0.5	1	mg/L	65.2		0.5	1	mg/L	1.4		0.5	1	mg/L	
<i>M.Code=Conventionalis SM4500-P-B,E</i>																					
Total Phosphorus	0.139		0.005	0.01	mg/L	0.0859		0.005	0.01	mg/L	0.209		0.005	0.01	mg/L	0.037		0.005	0.01	mg/L	
<i>M.Code=Conventionalis SM4500-P-F</i>																					
Ortho Phosphorus																					

King County Environmental Lab Analytical Report

PROJECT: 421195CI

Locator: LSGC11
 Descrip: Ginder Cr at Rober
 Sampled: Dec 16, 97
 Lab ID: L12512-9
 Matrix: STORM WTR
 % Solids:

Locator: LSLH13
 Descrip: Lawson Culvert at
 Sampled: Dec 16, 97
 Lab ID: L12512-10
 Matrix: STORM WTR
 % Solids:

Locator: LSJL3
 Descrip: Jones Lk Outfall #
 Sampled: Dec 16, 97
 Lab ID: L12512-11
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrip: inflow/Outflow Dup
 Sampled: Dec 16, 97
 Lab ID: L12512-12
 Matrix: STORM WTR
 % Solids:

Parameters	Value																			
	Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units	
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis				
CONVENTIONALS																				
M.Code=Conventionals SM2540-D																				
Total Suspended Solids	54.6	0.5	1	mg/L		107	0.5	1	mg/L		23.4	0.5	1	mg/L		4.8	0.5	1	mg/L	
M.Code=Conventionals SM4500-P-B,E																				
Total Phosphorus	0.193	0.005	0.01	mg/L		0.474	0.005	0.01	mg/L		0.142	0.005	0.01	mg/L		0.0435	0.005	0.01	mg/L	
M.Code=Conventionals SM4500-P-F																				
Ortho Phosphorus																				

King County Environmental Lab Analytical Report

PROJECT: 421185CI

Locator: LSGL14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Dec 16, 97
 Lab ID: L12512-13
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units
------------	-------	------	-----	-----	-------

- Wet Weight Basis

CONVENTIONALS

M.Code=Conventional: SM2540-D					
Total Suspended Solids	6		0.5	1	mg/L
M.Code=Conventional: SM4500-P-B,E					
Total Phosphorus	0.0433		0.005	0.01	mg/L
M.Code=Conventional: SM4500-P-F					
Ortho Phosphorus	0.00773		0.002	0.005	mg/L

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix.

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and their codes are as follows.

Liquid

OTHER WTR	LA
INFLUENT	LB
EFFLUENT	LC
DIG SLUDGE	LD
IW WTR	LE
SEWER WTR	LF
STORM WTR	LG
DRINK WTR	LH
GRND WTR	LJ
FRESH WTR	LK
SALT WTR	LL
FILTER WTR	LM
BLANK WTR	LN
SEPTAGE	LP
TCLP LEACH	LQ
RECON WTR	LR
SEM EXTRACT	LS

SOLIDS

OTHR SOLID	SA
SOIL	SB
COMPOST	SC
SLUDGE	SD
FRSHWTRSED	SE
SALTWTRSED	SF
IW SLUDGE	SG

Matrices Cont.

IN-LINE SED	SH
SOLIDBLANK	SJ

TISSUES

OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH

AIR

AIR	AB
-----	----

%Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either Wet Weight Basis or Dry Weight Basis in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL	Less than method detection limit
<RDL	Less than reporting detection limit (practical quantitation limit, PQL)
RDL	Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count or biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
I#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1.
L	Recovery of matrix spike or SRM above acceptance range
LV	Larvae
NF	Not found
P	Present
PU	Pupae
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DIL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TIA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KCSWM - Black Diamond Project (December 16, 1998) QA/QC Data Summary

Parameter	Orthophosphate, mg/L	<MDL	Blank
Total Suspended Solids, mg/L	Total Phosphorus, mg/L	<MDL	Result
		<MDL	Blank

Laboratory Method Blank

Parameter	Orthophosphate, mg/L	98%	% Recovery
Total Suspended Solids, mg/L	Total Phosphorus, mg/L	0.0300	Det'd Value
		0.0295	True Value
		0.0312	Det'd Value
		104%	% Recovery
		NA	

Laboratory Positive Control (80-120%)

Parameter	Orthophosphate, mg/L	97%	% Recovery
Total Suspended Solids, mg/L	Total Phosphorus, mg/L	0.180	Det'd Value
		0.180	True Value
		0.174	Det'd Value
		97%	% Recovery
		98%	
		NA	

Laboratory Positive Control (80-120%)

Parameter	Orthophosphate, mg/L	0%	RdL % Diff.
Total Suspended Solids, mg/L	Total Phosphorus, mg/L	0.0187	Result 2
		0.0188	Result 1
		0.0433	Sample
		L12526-1	Sample
		L12512-13	Sample
		L12512-13	Sample
		0.100	Spike Amount
		0.118	Result 2
		0.141	% Recovery
		98%	
		NA	

Laboratory Duplicate Samples (25%RPD)

Parameter	Orthophosphate, mg/L	100%	% Recovery
Total Suspended Solids, mg/L	Total Phosphorus, mg/L	0.0433	Result 1
		0.100	Spike Amount
		0.118	Result 2
		0.141	% Recovery
		98%	
		NA	

Laboratory Spiked Samples (70 - 130%)



HW

King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 684-2300

December 15, 1997

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager *MS*
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CT, Black Diamond Storm
Samples L12258-1-13.

Attached is the comprehensive report for the water samples delivered to the laboratory on November 7, 1997. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

All products are analyzed in batches. For appropriate products, each analytical batch includes a calibration curve and one or more positive controls. All the analytical results are reported from batches where the calibration curve and positive controls were within control windows ($r = 0.995$ or greater, and $\pm 20\%$ of the true value respectively). Method blanks are expected to be less than method detection limits. Laboratory duplicates are expected to be within 25% relative percent difference, recovery of matrix spikes is expected to be within 70-130%.

The analysis of ORTHOP in samples L12258 -4 and -13 exceeded the recommended holding time by one day. The samples were received late Friday, November 7 and were unable to be analyzed until the following Monday. The values for both samples have been flagged with the "H" qualifier to indicate improper sample handling techniques.

The data has passed all other internal QA/QC checks for accuracy and completeness and may be used without qualification, except where noted above.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

Locator	Sample Depth	Lab ID	Conductivity umhos/cm	Dissolved Oxygen (Winkler) mg/L	Ortho Phosphorus mg/L	pH	Total Phosphorus mg/L	Total Suspended Solids mg/L
IN1		L12258-1	270	5.8		7.35	0.0455	0.75
IN2		L12258-2					0.0473	1.2
IN3		L12258-3					0.0888	11.5
IN5		L12258-4			0.0216		0.0423	1.5
IN7		L12258-5					0.0381	4.4
IN8		L12258-6					0.0373	4.2
GCA		L12258-7					0.0582	9.2
RC9		L12258-8					0.0485	1.4
GC11		L12258-9					0.0807	13.9
LH13		L12258-10					0.137	4.3
JL3		L12258-11					0.051	2.7
INOUTDUP		L12258-12						0.83
GL14		L12258-13			0.0085		0.0154	0.61

King County Environmental Lab Analytical Report

PROJECT: 421185CT

Locator: LSIN7
 Descrip: Mud Lk Outfall #2
 Sampled: Nov 07, 97
 Lab ID: L12258-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN8
 Descrip: Ginder Creek at SR
 Sampled: Nov 07, 97
 Lab ID: L12258-6
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Ginder Creek at Mo
 Sampled: Nov 07, 97
 Lab ID: L12258-7
 Matrix: STORM WTR
 % Solids:

Locator: LSRC9
 Descrip: Rock Creek Tributa
 Sampled: Nov 07, 97
 Lab ID: L12258-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
COMBINED LABS																					
M.Code=Conventionala SM2810-B																					
Conductivity																					
M.Code=Conventionala SM2840-D																					
Total Suspended Solids	4.4		0.5	1	mg/L	4.2		0.5	1	mg/L	9.2		0.5	1	mg/L	1.4		0.5	1	mg/L	
M.Code=Conventionala SM4600-H-B																					
H																					
M.Code=Conventionala SM4600-O-B																					
Dissolved Oxygen (Winkler)																					
M.Code=Conventionala SM4600-P-B,E																					
Total Phosphorus	0.0381		0.005	0.01	mg/L	0.0373		0.005	0.01	mg/L	0.0582		0.005	0.01	mg/L	0.0455		0.005	0.01	mg/L	
M.Code=Conventionala SM4600-P-F																					
Ortho Phosphorus																					

King County Environmental Lab Analytical Report

PROJECT: 421185CT

Locator: LSGL14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Nov 07, 97
 Lab ID: L12258-13
 Matrix: STORM WTR
 % Solids:

Parameters Value Qual MDL RDL Units
 - Wet Weight Basis

COMBINED LABS

M.Code=Conventionalis SM2510-B

Conductivity

M.Code=Conventionalis SM2540-D

Total Suspended Solids	0.61	<RDL	0.5	1	mg/L
------------------------	------	------	-----	---	------

M.Code=Conventionalis SM4500-H-B

DH

M.Code=Conventionalis SM4500-O-B

Dissolved Oxygen (Winkler)

M.Code=Conventionalis SM4500-P-B,E

Total Phosphorus	0.0154		0.005	0.01	mg/L
------------------	--------	--	-------	------	------

M.Code=Conventionalis SM4500-P-F

Ortho Phosphorus	0.0065	H	0.002	0.005	mg/L
------------------	--------	---	-------	-------	------

KCSWM - Black Diamond Project (November 7, 1997) QA/QC Data Summary

Laboratory Method Blank

Parameter	Conductivity umhos/cm	Orthophosphate mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Whitler Dissolved Oxygen mg/L
Result	NA	<MDL	NA	<MDL	<MDL	NA
Blank	NA	<MDL	NA	<MDL	<MDL	NA

Laboratory Positive Control (80-120%)

Parameter	Conductivity umhos/cm	Orthophosphate mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Whitler Dissolved Oxygen mg/L
True Value	718	0.0300	8.86	0.0300		
Det'd Value	734	0.0290	8.86	0.0307		
% Recovery	102%	97%	100%	102%	NA	NA

Laboratory Positive Control (80-120%)

Parameter	Conductivity umhos/cm	Orthophosphate mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Whitler Dissolved Oxygen mg/L
True Value	0.180			0.180		
Det'd Value	0.177			0.177		
% Recovery	NA	88%	NA	88%	NA	NA

Laboratory Duplicate Samples (25%RPD)

Parameter	Conductivity umhos/cm	Orthophosphate mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Whitler Dissolved Oxygen mg/L
Sample	L12258-1	L12258-13	L12258-1	L12258-13	L12258-3	
Result 1	270	0.0065	7.35	0.0184	11.5	
Result 2	267	0.0066	7.37	0.0180	12.5	
Rel. % Diff.	1%	-1%	0%	-4%	-8%	NA

Laboratory Spiked Samples (70 - 130%)

Parameter	Conductivity umhos/cm	Orthophosphate mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Whitler Dissolved Oxygen mg/L
Sample	L12258-13	L12258-13		L12258-13		
Result 1	0.007	0.100		0.0184		
Result 2	0.101	0.101		0.111		
% Recovery	NA	85%	NA	85%	NA	NA



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 684-2300

Are these yours?
Kerry Thrasher

December 15, 1997

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager *MS*
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CT, Black Diamond Storm
Samples L12272-1- 13.

Attached is the comprehensive report for the water samples delivered to the laboratory on November 12, 1997. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

All products are analyzed in batches. For appropriate products, each analytical batch includes a calibration curve and one or more positive controls. All the analytical results are reported from batches where the calibration curve and positive controls were within control windows ($r = 0.995$ or greater, and $\pm 20\%$ of the true value respectively). Method blanks are expected to be less than method detection limits. Laboratory duplicates are expected to be within 25% relative percent difference, recovery of matrix spikes is expected to be within 70-130%.

There were no anomalies associated with the preparation and analysis of these samples.

The data has passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

JECT: 421195CT

IBIHED LABS-Liquid

Locator	Sample		Conductivity umhos/cm	Dissolved Oxygen (Winkler) mg/L	Ortho Phosphorus mg/L	pH	Total Phosphorus mg/L	Total Suspended Solids mg/L
	Depth	Lab ID						
1		L12272-1				8.77	0.0459	0.8
2		L12272-2				7.01	0.0353	0.91
3		L12272-3				7.07	0.0268	2.4
5		L12272-4			0.0288	6.28	0.0513	1
7		L12272-5				7.76	0.0195	1.1
8		L12272-6				7.58	0.0168	1
14		L12272-7				7.39	0.0168	1.9
19		L12272-8				6.4	0.0313	0.8
11		L12272-9	485	11.1		7.7	0.0179	9.6
13		L12272-10				7.35	0.0088	0.81
3		L12272-11				6.58	0.0405	1.1
OUTDUP		L12272-12				6.37	0.0501	0.83
14		L12272-13			0.00507	7.72	0.0208	2

King County Environmental Lab Analytical Report

OBJECT: 421195CT

	Locator: LSIN7	Locator: LSIN8	Locator: LSGC4	Locator: LSRC8
	Descrpt: Mud Lk Outfall #2	Descrpt: Ginder Creek at SR	Descrpt: Ginder Creek at Mo	Descrpt: Rock Creek Tributa
	Sampled: Nov 12, 97	Sampled: Nov 12, 97	Sampled: Nov 12, 97	Sampled: Nov 12, 97
	Lab ID: L12272-5	Lab ID: L12272-8	Lab ID: L12272-7	Lab ID: L12272-8
	Matrix: STORM WTR	Matrix: STORM WTR	Matrix: STORM WTR	Matrix: STORM WTR
	% Solids:	% Solids:	% Solids:	% Solids:
ameters	Value Qual MDL RDL Units	Value Qual MDL RDL Units	Value Qual MDL RDL Units	Value Qual MDL RDL Units
	- Wet Weight Basis	- Wet Weight Basis	- Wet Weight Basis	- Wet Weight Basis
MBINED LABS				
M.C.Code=Conventional 5M2110-B				
ductivity				
M.C.Code=Conventional 5M2110-D				
al Suspended Solids	1.1 0.5 1 mg/L	1 RDL 0.5 1 mg/L	1.9 0.6 1 mg/L	0.8 <RDL 0.5 1 mg/L
M.C.Code=Conventional 5M4500-N-B				
pH	7.76	7.58	7.39	8.4
M.C.Code=Conventional 5M4500-O-B				
solved Oxygen (Winkler)				
M.C.Code=Conventional 5M4500-P-B,E				
al Phosphorus	0.0185 0.005 0.01 mg/L	0.0168 0.005 0.01 mg/L	0.0168 0.005 0.01 mg/L	0.0313 0.005 0.01 mg/L
M.C.Code=Conventional 5M4500-P-F				
no Phosphorus				

King County Environmental Lab Analytical Report

PROJECT: 421185CT

Locator: LSGL14
 Descrip: SE Glider Lk Rd, W
 Sampled: Nov 12, 87
 Lab ID: L12272-13
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units
- Wet Weight Basis					

COMBINED LABS

M.Code=Conventionalis SM2516-B

Conductivity

M.Code=Conventionalis SM2546-D

Total Suspended Solids	2		0.5	1	mg/L
------------------------	---	--	-----	---	------

M.Code=Conventionalis SM4800-H-B

	7.72				pH
--	------	--	--	--	----

M.Code=Conventionalis SM4800-O-B

Dissolved Oxygen (Winkler)

M.Code=Conventionalis SM4800-P-B,E

Total Phosphorus	0.0208		0.005	0.01	mg/L
------------------	--------	--	-------	------	------

M.Code=Conventionalis SM4800-P-F

Ortho Phosphorus	0.00507		0.002	0.005	mg/L
------------------	---------	--	-------	-------	------

KCSWM - Black Diamond Project (November 7, 1997) QA/QC Data Summary

Laboratory Method Blank

Parameter	Conductivity, umhos/cm	Orthophosphate, mg/L	pH	Total Phosphorus, mg/L	Suspended Solids, mg/L	Winkler Dissolved Oxygen, mg/L
Result	NA	<MDL	NA	<MDL	<MDL	NA
Blank						

Laboratory Positive Control (80-120%)

Parameter	Conductivity, umhos/cm	Orthophosphate, mg/L	pH	Total Phosphorus, mg/L	Suspended Solids, mg/L	Winkler Dissolved Oxygen, mg/L
True Value	718	0.0300	8.88	0.0300	NA	NA
Det'd Value	762	0.0283	8.84	0.0307	NA	NA
% Recovery	108%	88%	100%	102%	NA	NA

Laboratory Positive Control (80-120%)

Parameter	Conductivity, umhos/cm	Orthophosphate, mg/L	pH	Total Phosphorus, mg/L	Suspended Solids, mg/L	Winkler Dissolved Oxygen, mg/L
True Value	73.9	0.180		0.180	NA	NA
Det'd Value	77.1	0.180		0.177	NA	NA
% Recovery	104%	100%	NA	98%	NA	NA

Laboratory Duplicate Samples (25%RPD)

Parameter	Conductivity, umhos/cm	Orthophosphate, mg/L	pH	Total Phosphorus, mg/L	Suspended Solids, mg/L	Winkler Dissolved Oxygen, mg/L
Sample	L12102-7	L12102-7	L12272-13	L12272-13	L12272-4	L12272-4
Result 1	88.4	0.0242	7.72	0.0208	1.00	1.00
Result 2	98.9	0.0239	7.74	0.0202	7.02	7.02
Rel. % Diff.	0%	1%	0%	3%	-2%	NA

Laboratory Spiked Samples (70 - 130%)

Parameter	Conductivity, umhos/cm	Orthophosphate, mg/L	pH	Total Phosphorus, mg/L	Suspended Solids, mg/L	Winkler Dissolved Oxygen, mg/L
Sample	L12102-7	L12102-7	L12272-13	L12272-13		
Result 1		0.0242		0.0208		
Result 2		0.100		0.100		
% Recovery	NA	97%	NA	94%	NA	NA



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 884-2300

December 29, 1999

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager 
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CZ, Rock Creek WQ
Samples L16860-1 – 10.

Attached is the comprehensive report for the water samples delivered to the laboratory on November 29, 1999. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

Sample Information

The conventionals laboratory analyzed the samples for total phosphorus and total suspended solids.

Sample Containers, Preservation and Holding Times

All of the samples were received in acceptable containers and sufficient volume was provided to perform all of the analyses required for this project. The samples were preserved using established protocols and were analyzed within USEPA and King County Environmental Laboratory (KCEL) established holding times.

Analytical Methods

All analyses were performed within established KCEL SOPs.

Method QC

Instrument Calibration - Where applicable, instrument calibration was performed before each analytical batch and confirmed by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant KCEL control limits. A correlation coefficient of 0.995 or greater was achieved as stated in KCEL calibration requirements. All balances have been monitored monthly and calibrated yearly as recommended by the manufacturer. Ovens, incubators, and refrigerators are monitored daily, and temperatures are noted in the logbooks before and after analysis.

Method Blank - All of the method blank results associated with the analysis of each parameter were below the method detection limit.

Laboratory Control Samples - All of the laboratory control sample results were within the acceptable range established for each reported parameter.



Sample QC

Laboratory Duplicates – All of the laboratory duplicate results were within the acceptable range established for each reported parameter.

Matrix Spike – All of the matrix spike recovery results were within the acceptable range established for each reported parameter.

Summary

There were no anomalies associated with the preparation and analysis of these samples.

The data have passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

PROJECT: 421195CZ

COMBINED LABS-Liquid

Locator	Sample		Lab ID	Total Phosphorus		Total Suspended Solids
	Depth	mg/L		mg/L	mg/L	
LSIN8			L18860-1	0.0129	1.4	
LSOCA			L18860-2	0.0144	3.3	
LSIN1			L18860-3	0.0228	0.81	
LSIN2			L18860-4	0.0186	0.81	
LSGC11			L18860-5	0.0129	1.7	
LSIN3			L18860-6	0.0204	3.4	
LSGL14			L18860-7	0.0134	2.1	
LSOUT10			L18860-8	0.0148	0.89	
LSIN6			L18860-9	0.0066	2.7	
LSINOUTDUP			L18860-10	0.0206	0.71	

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSINB
 Descr: Ginder Creek at SR
 Sampled: Nov 29, 1999
 Lab ID: L16860-1
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descr: Ginder Creek at Mo
 Sampled: Nov 29, 1999
 Lab ID: L16860-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1
 Descr: Rock Creek at Mout
 Sampled: Nov 29, 1999
 Lab ID: L16860-3
 Matrix: STORM WTR
 % Solids:

Locator: LSIN2
 Descr: Rock Creek at Morg
 Sampled: Nov 29, 1999
 Lab ID: L16860-4
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis						- Wet Weight Basis
COMBINED LABS																					
M-CV 3M2646-D (03-01-008-001)																					
Total Suspended Solids	1.4		0.5	1	mg/L	3.3		0.5	1	mg/L	0.61	<RDL	0.5	1	mg/L	0.61	<RDL	0.5	1	mg/L	
M-CV 3M4690-P-B,Fmod(03-03-013-000)																					
Total Phosphorus	0.0129		0.005	0.01	mg/L	0.0144		0.005	0.01	mg/L	0.0226		0.005	0.01	mg/L	0.0196		0.005	0.01	mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421185CZ

Locator: LSGC11
 Descrip: Ginder Cr at Rober
 Sampled: Nov 29, 1999
 Lab ID: L16860-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Nov 29, 1999
 Lab ID: L16860-6
 Matrix: STORM WTR
 % Solids:

Locator: LSGL14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Nov 29, 1999
 Lab ID: L16860-7
 Matrix: STORM WTR
 % Solids:

Locator: LSOUT10
 Descrip: Lake Sawyer Outflo
 Sampled: Nov 29, 1999
 Lab ID: L16860-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value					Value					Value					Value				
	Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units	
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis				
COMBINED LABS																				
M-CV SM2540-D (03-01-005-001)																				
Total Suspended Solids	1.7	0.5	1	mg/L		3.4	0.5	1	mg/L		2.3	0.5	1	mg/L		0.89	<RDL	0.5	1 mg/L	
M-CV SM4500-P-B, Fmod(03-03-013-000)																				
Total Phosphorus	0.0129	0.005	0.01	mg/L		0.0204	0.005	0.01	mg/L		0.0134	0.005	0.01	mg/L		0.0148		0.005	0.01 mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSIN9
 Descrip: Ravensdale Creek I
 Sampled: Nov 29, 1999
 Lab ID: L16860-9
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrip: Inflow/Outflow Dup
 Sampled: Nov 29, 1999
 Lab ID: L16860-10
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
COMBINED LABS										
M-CV SM2840-D (03-01-009-001)										
Total Suspended Solids	2.7		0.5	1	mg/L	0.71	<RDL	0.5	1	mg/L
M-CV SM4600-P-S, Fmed(03-03-013-000)										
Total Phosphorus	0.0066	<RDL	0.005	0.01	mg/L	0.0206		0.005	0.01	mg/L

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix.

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and codes follow:
LIQUID

OTHER WTR	LA
EFFLUENT	LB
EFFLUENT	LC
DIG SLUDGE	LD
IW WTR	LE
SEWER WTR	LF
STORM WTR	LG
DRINK WTR	LH
GRND WTR	LJ
FRESH WTR	LK
SALT WTR	LL
FILTER WTR	LM
BLANK WTR	LN
SEPTAGE	LP
TCLP LEACH	LQ
RECON WTR	LR
SEM EXTRACT	LS
NON WATER	LT

SOLIDS

OTHR SOLID	SA
SOIL	SB
COMPOST	SC
SLUDGE	SD
FRSHWTRSED	SE
SALTWTRSED	SF
IW SLUDGE	SG
IN-LINE SED	SH
SOLIDBLANK	SJ

Matrices Cont.

SPMD	SK
TISSUES	
OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH
AIR	
AIR BLANK	AA
AIR	AB
LANDFILGAS	AC
SEWER AIR	AD

%Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either **Wet Weight Basis** or **Dry Weight Basis** in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: **organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.**

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL Less than method detection limit

<RDL Less than reporting detection limit (practical quantitation limit, PQL)

RDL Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count
or	biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
J#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1. Recovery of matrix spike or SRM above acceptance range
L	Larvac
LV	Larvac
NF	Not found
P	Present
PU	Pupac
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DIL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TIA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 12/22/1999 02:21
 Run ID: R42441 Workgroup: WG46158 (totp)

LD:WG46158-1 L16860-3 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0226		.0226				0		25

MS:WG46198-2 L16860-3 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0226	0.05	.0701	95		70-130			

LD:WG46158-3 L16948-1 Matrix: FRESH WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: 421195CY PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Nitrogen	.05	.1	mg/L	.909		.927				2		25

LD:WG46158-3 L16948-1 Matrix: FRESH WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CY PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0953		.0961				1		25

MS:WG46158-4 L16948-1 Matrix: FRESH WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: 421195CY PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Nitrogen	.05	.1	mg/L	.909	0.8	1.75	105		70-130			

MS:WG46158-4 L16948-1 Matrix: FRESH WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CY PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0953	0.05	.147	102		70-130			

LCS:WG46158-5 Matrix: BLANK WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Nitrogen	.05	.1	mg/L		0.895	.873	98		85-115			

LCS:WG46158-5 Matrix: BLANK WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.053	.0494	93		85-115			

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 12/22/1999 02:21
 Run ID: R42441 Workgroup: WG46158 (totp)

LCS:WG46158-6 Matrix: BLANK WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Nitrogen	.05	.1	mg/L		0.895	.879	98		85-115			

LCS:WG46158-6 Matrix: BLANK WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.053	.0499	94		85-115			

MB:WG46158-7 Matrix: BLANK WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Nitrogen	.05	.1	mg/L	<MDL	

MB:WG46158-7 Matrix: BLANK WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

MB:WG46158-8 Matrix: BLANK WTR Listtype: CVTOTN Method: SM4500-N-C (03-03-013-000) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Nitrogen	.05	.1	mg/L	<MDL	

MB:WG46158-8 Matrix: BLANK WTR Listtype: CVTOTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 12/22/1999 02:22
 Run ID: R42483 Workgroup: WG46153 (TSS Storms)

LD:WG46153-1 L16851-3 Matrix: FRESH WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	.5	1	mg/L	.59		.62						25

LD:WG46153-2 L16860-4 Matrix: STORM WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	.5	1	mg/L	.61		.62						25

MB:WG46153-3 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	.5	1	mg/L	<MDL	



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 884-2300

August 30, 1999

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager
WLRD, Environmental Laboratory 

SUBJECT: Attached Report for Project 421195CZ, Rock Creek WQ Monitoring
Samples L15998-1 – 10,

Attached is the comprehensive report for the water samples delivered to the laboratory on July 23, 1999. The samples were analyzed in the conventionals sections of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

Sample Information

The conventionals laboratory analyzed the samples for pH, total phosphorus, and total suspended solids.

Sample Containers, Preservation and Holding Times

All of the samples were received in acceptable containers and sufficient volume was provided to perform all of the analyses required for this project. The samples were preserved using established protocols and were analyzed within USEPA and King County Environmental Laboratory (KCEL) established holding times.

Analytical Methods

All analyses were performed within established KCEL SOPs.

Method QC

Instrument Calibration - Where applicable, instrument calibration was performed before each analytical batch and confirmed by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant KCEL control limits. A correlation coefficient of 0.995 or greater was achieved as stated in KCEL calibration requirements. All balances have been monitored monthly and calibrated yearly as recommended by the manufacturer. Ovens, incubators, and refrigerators are monitored daily, and temperatures are noted in the logbooks before and after analysis.

Method Blank – All of the method blank results associated with the analysis of each parameter were below the method detection limit.

Laboratory Control Samples – All of the laboratory control sample results were within the acceptable range established for each reported parameter.



Sample QC

Laboratory Duplicates – All of the laboratory duplicate results were within the acceptable range established for each reported parameter.

Matrix Spike – All of the matrix spike recovery results were within the acceptable range established for each reported parameter.

Summary

There were no anomalies associated with the preparation and analysis of these samples.

The data have passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

PROJECT: 421196CZ

COMBINED LABS-Liquid

Locator	Sample Depth	Lab ID	pH	Total Phosphorus mg/L	Total Suspended Solids mg/L
LSIN8		L15998-1		0.0182	2.9
LSGC4		L15998-2		0.0183	2.7
LSIN1		L15998-3	7.4	0.0432	0.7
LSIN2		L15998-4		0.0416	2.3
LSGC11		L15998-5		0.0207	2.6
LSIN3		L15998-6		0.0249	9
LSGL14		L15998-7		0.0102	1.1
LSOUT10		L15998-8		0.0112	3.9
LSIN9		L15998-9	7.61	0.0123	3.2
LSINOUTDUP		L15998-10		0.0402	2.4

Handwritten signature

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSIN8
 Descrip: Ginder Creek at SR
 Sampled: Jul 22, 1999
 Lab ID: L15998-1
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Ginder Creek at Mo
 Sampled: Jul 22, 1999
 Lab ID: L15998-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1
 Descrip: Rock Creek at Mout
 Sampled: Jul 22, 1999
 Lab ID: L15998-3
 Matrix: STORM WTR
 % Solids:

Locator: LSINZ
 Descrip: Rock Creek at Morg
 Sampled: Jul 22, 1999
 Lab ID: L15998-4
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
COMBINED LABS																					
M-CV 5M12540-D (03-01-009-001)	2.9		0.5	1	mg/L	2.7		0.5	1	mg/L	0.7	<RDL	0.5	1	mg/L	2.3		0.5	1	mg/L	
Total Suspended Solids																					
M-CV 5M4500-H-B (01-01-003-002)											7.4										
pH																					
M-CV 5M4500-P-B (Method 03-03-013-000)	0.0192		0.005	0.01	mg/L	0.0163		0.005	0.01	mg/L	0.0432		0.005	0.01	mg/L	0.0416		0.005	0.01	mg/L	
Total Phosphorus																					

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSGC11
 Descrip: Ginder Cr at Rober
 Sampled: Jul 22, 1999
 Lab ID: L15998-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Jul 22, 1999
 Lab ID: L15998-6
 Matrix: STORM WTR
 % Solids:

Locator: LSQL14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Jul 22, 1999
 Lab ID: L15998-7
 Matrix: STORM WTR
 % Solids:

Locator: LSOUT10
 Descrip: Lake Sawyer Outflo
 Sampled: Jul 22, 1999
 Lab ID: L15998-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis						- Wet Weight Basis
COMBINED LABS																					
M-CV 8M2848-D (03-01-008-001)																					
Total Suspended Solids	2.6		0.5	1	mg/L	9		0.5	1	mg/L	1.1		0.5	1	mg/L	3.9		0.5	1	mg/L	
M-CV 8M4896-H-B (03-01-003-002)																					
pH																					
M-CV 8M4800-P-B, Fmod(03-03-013-000)																					
Total Phosphorus	0.0207		0.005	0.01	mg/L	0.0348		0.005	0.01	mg/L	0.0102		0.005	0.01	mg/L	0.0112		0.005	0.01	mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421196CZ

Locator: LSIN9
 Descrip: Ravensdale Creek /
 Sampled: Jul 22, 1999
 Lab ID: L15998-9
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrip: Inflow/Outflow Dup
 Sampled: Jul 22, 1999
 Lab ID: L15998-10
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
	- Wet Weight Basis					- Wet Weight Basis				
COMBINED LABS										
M=CV SM2640-D (03-01-008-001)										
Total Suspended Solids	3.2		0.5		1 mg/L	2.4		0.5		1 mg/L
M=CV SM4500-H-B (03-01-003-002)										
pH	7.61				pH					
M=CV SM4500-P-B, Fmed(03-03-013-000)										
Total Phosphorus	0.0123		0.005	0.01	mg/L	0.0402		0.005	0.01	mg/L

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and codes follow:

Liquid

OTHER WTR	LA
INFLUENT	LB
EFFLUENT	LC
DIG SLUDGE	LD
IW WTR	LE
SEWER WTR	LF
STORM WTR	LG
DRINK WTR	LH
GRND WTR	LJ
FRESH WTR	LK
SALT WTR	LL
FILTER WTR	LM
BLANK WTR	LN
SEPTAGE	LP
TCLP LEACH	LQ
RECON WTR	LR
SEM EXTRACT	LS
NON WATER	LT

Solids

OTHR SOLID	SA
SOIL	SB
COMPOST	SC
SLUDGE	SD
FRSHWTRSED	SE
SALTWTRSED	SF
IW SLUDGE	SG
IN-LINE SED	SH
SOLIDBLANK	SJ

Matrices Cont.

SPMD	SK
TISSUES	
OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH
AIR	
AIR BLANK	AA
AIR	AB
LANDFILGAS	AC
SEWER AIR	AD

%Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either **Wet Weight Basis** or **Dry Weight Basis** in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: **organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.**

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL	Less than method detection limit
<RDL	Less than reporting detection limit (practical quantitation limit, PQL)
RDL	Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count
or	biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
J#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1.
L	Recovery of matrix spike or SRM above acceptance range
LV	Larvae
NF	Not found
P	Present
PU	Pupae
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DIL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TIA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 08/10/1999 03:59
 Run ID: R32889 Workgroup: WG43865 (ph)

LCS:WG43865-1 Matrix: BLANK WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	± Rec. Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	6.86		6.84	100	97-103			

LCS:WG43865-2 Matrix: BLANK WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	± Rec. Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	10.01		9.93	99	97-103			

LD:WG43865-3 LI5998-3 Matrix: STORM WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	± Rec. Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	7.4		7.42			.02		3

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 08/10/1999 03:56
 Run ID: R33031 Workgroup: WG43874 (totp)

LD:WG43874-1 LIS998-5 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0207		.021				1		25

MS:WG43874-2 LIS998-5 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0207	0.65	.0704	99		70-130			

LCS:WG43874-3 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.083	.0461	87		80-120			

MB:WG43874-4 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 08/10/1999 03:55
 Run ID: R33269 Workgroup: WG43982 (tss)

MS:WG43982-1 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421161 PKey: STD

Parameter	Mdl	Rdl	Units	MS Value	Qual
Total Suspended Solids	.5	1	mg/L	<MDL	

LD:WG43982-2 L15998-1 Matrix: STORM WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RSD/RSD	Qual	Limits
Total Suspended Solids	.5	1	mg/L	2.9		2.8				4		25

LD:WG43982-3 L16001-5 Matrix: IW WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421161 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RSD/RSD	Qual	Limits
Total Suspended Solids	.5	1	mg/L	96		102				6		25



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 884-2300

November 22, 1999

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager 
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CZ, Rock Creek
Samples L16486-1 – 10.

Attached is the comprehensive report for the water samples delivered to the laboratory on September 28, 1999. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

Sample Information

The conventionals laboratory analyzed the samples for conductivity, pH, total phosphorus, and total suspended solids.

Sample Containers, Preservation and Holding Times

All of the samples were received in acceptable containers and sufficient volume was provided to perform all of the analyses required for this project. The samples were preserved using established protocols and were analyzed within USEPA and King County Environmental Laboratory (KCEL) established holding times.

Analytical Methods

All analyses were performed within established KCEL SOPs.

Method QC

Instrument Calibration - Where applicable, instrument calibration was performed before each analytical batch and confirmed by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant KCEL control limits. A correlation coefficient of 0.995 or greater was achieved as stated in KCEL calibration requirements. All balances have been monitored monthly and calibrated yearly as recommended by the manufacturer. Ovens, incubators, and refrigerators are monitored daily, and temperatures are noted in the logbooks before and after analysis.

Method Blank – All of the method blank results associated with the analysis of each parameter were below the method detection limit.



Laboratory Control Samples – All of the laboratory control sample results were within the acceptable range established for each reported parameter.

Sample QC

Laboratory Duplicates – All of the laboratory duplicate results were within the acceptable range established for each reported parameter.

Matrix Spike – All of the matrix spike recovery results were within the acceptable range established for each reported parameter.

Summary

There were no anomalies associated with the preparation and analysis of these samples.

The data have passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

PROJECT: 421195CZ

COMBINED LABS-Liquid

Locator	Sample		Conductivity umhos/cm	pH	Total Phosphorus mg/L	Total Suspended Solids mg/L
	Depth	Lab ID				
LSIN8		L16486-1			0.0136	1.1
LSGC4		L16486-2			0.0115	1.8
LSIN1		L16486-3	466	7.58	0.0368	1
LSIN2		L16486-4	462	7.8	0.0424	3.8
LSGC11		L16486-5			0.0144	1.5
LSIN3		L16486-6			0.021	4.5
LSGL14		L16486-7			0.0082	0.9
LSOUT10		L16486-8	145	7.68	0.0151	
LSIN9		L16486-9	105	7.69	0.0072	0.82
LSINOUTDUP		L16486-10			0.0141	1.6

King County Environmental Lab Analytical Report

PROJECT: 421185CZ

Locator: LSIN8
 Descrip: Ginder Creek at SR
 Sampled: Sep 28, 1999
 Lab ID: L18486-1
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Ginder Creek at Mo
 Sampled: Sep 28, 1999
 Lab ID: L18486-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1
 Descrip: Rock Creek at Mout
 Sampled: Sep 28, 1999
 Lab ID: L18486-3
 Matrix: STORM WTR
 % Solids:

Locator: LSIN2
 Descrip: Rock Creek at Morg
 Sampled: Sep 28, 1999
 Lab ID: L18486-4
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
COMBINED LABS															
M-CV 814210-B (03-01-002-001)															
Conductivity	1.1		0.5	1	mg/L	1.8		0.5	1	mg/L	466		0.5	1	umhos/cm
M-CV 814234-D (03-01-002-001)															
Total Suspended Solids															
M-CV 814600-H-B (03-01-003-002)															
pH															
M-CV 814600-P-B (03-01-015-000)															
Total Phosphorus	0.0136		0.005	0.01	mg/L	0.0115		0.005	0.01	mg/L	0.0368		0.005	0.01	mg/L

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSGC11
 Descrip: Ginder Cr at Rober
 Sampled: Sep 28, 1999
 Lab ID: L16486-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Sep 28, 1999
 Lab ID: L16486-6
 Matrix: STORM WTR
 % Solids:

Locator: LSGL14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Sep 28, 1999
 Lab ID: L16486-7
 Matrix: STORM WTR
 % Solids:

Locator: LSOUT10
 Descrip: Lake Sawyer Outflo
 Sampled: Sep 28, 1999
 Lab ID: L16486-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value					Value					Value					Value				
	Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units		Qual	MDL	RDL	Units	
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis				
COMBINED LABS																				
M=CV 3M2616-B (03-01-002-001)																				
Conductivity																145	0.5	1	umhos/cm	
M=CV 3M2646-D (03-01-003-001)																				
Total Suspended Solids	1.5	0.5	1	mg/L	4.5	0.5	1	mg/L	0.9	<RDL	0.5	1	mg/L	<MDL	0.5	1	mg/L			
M=CV 3M4500-H-B (03-01-003-002)																				
pH																7.68			pH	
M=CV 3M4500-P-B, Fmod(03-03-013-000)																				
Total Phosphorus	0.0144	0.005	0.01	mg/L	0.021	0.005	0.01	mg/L	0.0092	<RDL	0.005	0.01	mg/L	0.0151	0.005	0.01	mg/L			

King County Environmental Lab Analytical Report

PROJECT: 421185CZ

Locator: LSIN9
 Descrip: Ravensdale Creek I
 Sampled: Sep 28, 1999
 Lab ID: L16486-9
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrip: Inflow/Outflow Dup
 Sampled: Sep 28, 1999
 Lab ID: L16486-10
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual MDL RDL			Units	Value	Qual MDL RDL			Units
		- Wet Weight Basis					- Wet Weight Basis			
COMBINED LABS										
M-CV 8M2810-B (03-01-002-001)										
Conductivity	105		0.5	1	umhos/cm					
M-CV 8M2840-D (03-01-009-001)										
Total Suspended Solids	0.82	<RDL	0.5	1	mg/L	1.8		0.5	1	mg/L
M-CV 8M4200-H-B (03-01-003-002)										
pH	7.69				pH					
M-CV 8M4800-P-B, Fmod(03-03-013-000)										
Total Phosphorus	0.0072	<RDL	0.005	0.01	mg/L	0.0141		0.005	0.01	mg/L

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix.

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and codes follow:

LIQUID		
OTHER WTR	LA	
INFLUENT	LB	
EFFLUENT	LC	
DIG SLUDGE	LD	
IW WTR	LE	
SEWER WTR	LF	
STORM WTR	LG	
DRINK WTR	LH	
GRND WTR	LJ	
FRESH WTR	LK	
SALT WTR	LL	
FILTER WTR	LM	
BLANK WTR	LN	
SEPTAGE	LP	
TCLP LEACH	LQ	
RECON WTR	LR	
SEM EXTRACT	LS	
NON WATER	LT	
SOLIDS		
OTHR SOLID	SA	
SOIL	SB	
COMPOST	SC	
SLUDGE	SD	
FRSHWTRSED	SE	
SALTWTRSED	SF	
IW SLUDGE	SG	
IN-LINE SED	SH	
SOLIDBLANK	SJ	

Matrices Cont.

SPMD	SK
TISSUES	
OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH
AIR	
AIR BLANK	AA
AIR	AB
LANDFILGAS	AC
SEWER AIR	AD

% Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either **Wet Weight Basis** or **Dry Weight Basis** in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: **organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.**

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL	Less than method detection limit
<RDL	Less than reporting detection limit (practical quantitation limit, PQL)
RDL	Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count
or	biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
J#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1.
L	Recovery of matrix spike or SRM above acceptance range
LV	Larvac
NF	Not found
P	Present
PU	Pupae
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DIL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TIA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 10/25/1999 04:25
 Run ID: R37450 Workgroup: WG45115 (conductivity)

LCS:WG45115-1 Matrix: BLANK WTR Listtype: CVCOND Method: SM2510-B (03-01-002-001) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec. Qual	Limits	RPD/RSD	Qual	Limits
Conductivity	5	1	umhos/cm		73.9	73.7	100	85-115			

ID:WG45115-2 LI6486-3 Matrix: STORM WTR Listtype: CVCOND Method: SM2510-B (03-01-002-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec. Qual	Limits	RPD/RSD	Qual	Limits
Conductivity	5	1	umhos/cm	466		467			0		25

LCS:WG45115-3 Matrix: BLANK WTR Listtype: CVCOND Method: SM2510-B (03-01-002-001) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec. Qual	Limits	RPD/RSD	Qual	Limits
Conductivity	5	1	umhos/cm		717.8	713	99	85-115			

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 10/25/1999 04:24
 Run ID: R37931 Workgroup: WG45116 (ph)

LCS:WG45116-1 Matrix: BLANK WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	6.86	6.85		100		98-102			

LD:WG45116-2 L16486-3 Matrix: STORM WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	7.58	7.58					0		2

LCS:WG45116-3 Matrix: BLANK WTR Listtype: CVPH Method: SM4500-H-B (03-01-003-002) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
pH			pH	10.01	9.96		100		98-102			

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 10/25/1999 04:25
 Run ID: R37449 Workgroup: WG45118 (TSS)

LD:WG45118-1 E16522-1 Matrix: FRESH WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421220 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L	112		117				4		25

LD:WG45118-2 E16486-3 Matrix: STORM WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L	1		<MDL						25

MB:WG45118-3 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	5	1	mg/L	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 10/25/1999 04:25
 Run ID: R37409 Workgroup: WG45111 (totp)

LD:WG45111-1 L16486-8 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0151		.0146				4		25

MS:WG45111-2 L16486-8 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0151	0.05	.0668	193		70-130			

LCS:WG45111-3 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.053	.0453	86		80-120			

MB:WG45111-4 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 684-2300

March 13, 2000

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager *MS*
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CZ, Rock Creek WQ
Samples L17314-1 – 11.

Attached is the comprehensive report for the water samples delivered to the laboratory on February 10, 2000. The samples were analyzed in the conventionals section of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

Sample Information

The conventionals laboratory analyzed the samples for total phosphorus and total suspended solids.

Sample Containers, Preservation and Holding Times

All of the samples were received in acceptable containers and sufficient volume was provided to perform all of the analyses required for this project. The samples were preserved using established protocols and were analyzed within USEPA and King County Environmental Laboratory (KCEL) established holding times.

Analytical Methods

All analyses were performed within established KCEL SOPs.

Method QC

Instrument Calibration - Where applicable, instrument calibration was performed before each analytical batch and confirmed by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant KCEL control limits. A correlation coefficient of 0.995 or greater was achieved as stated in KCEL calibration requirements. All balances have been monitored monthly and calibrated yearly as recommended by the manufacturer. Ovens, incubators, and refrigerators are monitored daily, and temperatures are noted in the logbooks before and after analysis.

Method Blank - All of the method blank results associated with the analysis of each parameter were below the method detection limit.

Laboratory Control Samples - All of the laboratory control sample results were within the acceptable range established for each reported parameter.



Sample QC

Laboratory Duplicates – All of the laboratory duplicate results were within the acceptable range established for each reported parameter.

Matrix Spike – All of the matrix spike recovery results were within the acceptable range established for each reported parameter.

Summary

There were no anomalies associated with the preparation and analysis of these samples.

The data have passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

PROJECT: 421195CZ

COMBINED LABS-Liquid

Locator	Sample Depth	Lab ID	Total Phosphorus mg/L	Total Suspended Solids mg/L
LSIN8		L17314-1	0.0124	1.4
LSGCA		L17314-2	0.0173	4.8
LSIN1		L17314-3	0.0256	1.8
LSIN2		L17314-4	0.0222	1.9
LSGC11		L17314-6	0.0121	1.7
LSIN3		L17314-6	0.0172	4.2
LSGL14		L17314-7	0.0116	1.4
LSOUT10		L17314-8	0.0155	0.73
LSIN8		L17314-9	0.0101	2.1
LSINOUTDUP		L17314-10	0.0125	1.9
LSIN1B		L17314-11	0.0252	1.2

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSIN8
 Descrip: Ginder Creek at SR
 Sampled: Feb 10, 2000
 Lab ID: L17314-1
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Ginder Creek at Mo
 Sampled: Feb 10, 2000
 Lab ID: L17314-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1
 Descrip: Rock Creek at Mout
 Sampled: Feb 10, 2000
 Lab ID: L17314-3
 Matrix: STORM WTR
 % Solids:

Locator: LSIN2
 Descrip: Rock Creek at Morg
 Sampled: Feb 10, 2000
 Lab ID: L17314-4
 Matrix: STORM WTR
 % Solids:

Parameters	Locator: LSIN8					Locator: LSGC4					Locator: LSIN1					Locator: LSIN2					
	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					
COMBINED LABS																					
M-CV 5M2540-D (03-01-009-001)																					
Total Suspended Solids	1.4		0.5		1 mg/L	4.9		0.5		1 mg/L	1.8		0.5		1 mg/L	1.9		0.5		1 mg/L	
M-CV 5M4500-P-B, Fmod(03-03-013-000)																					
Total Phosphorus	0.0124		0.005		0.01 mg/L	0.0173		0.005		0.01 mg/L	0.0256		0.005		0.01 mg/L	0.0222		0.005		0.01 mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSGC11
 Descrip: Glinder Cr at Rober
 Sampled: Feb 10, 2000
 Lab ID: L17314-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Feb 10, 2000
 Lab ID: L17314-6
 Matrix: STORM WTR
 % Solids:

Locator: LSGL14
 Descrip: SE Glinder Lk Rd, W
 Sampled: Feb 10, 2000
 Lab ID: L17314-7
 Matrix: STORM WTR
 % Solids:

Locator: LSOUT10
 Descrip: Lake Sawyer Outflo
 Sampled: Feb 10, 2000
 Lab ID: L17314-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
COMBINED LABS																					
M-CV 3M2640-D (03-01-008-001)																					
Total Suspended Solids	1.7		0.5		1 mg/L	4.2		0.5		1 mg/L	1.4		0.5		1 mg/L	0.73	<RDL	0.5		1 mg/L	
M-CV 3M4600-P-B.F.mod(03-03-013-000)																					
Total Phosphorus	0.0121		0.005		0.01 mg/L	0.0172		0.005		0.01 mg/L	0.0116		0.005		0.01 mg/L	0.0155		0.005		0.01 mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSIN9
 Descrpt: Ravensdale Creek I
 Sampled: Feb 10, 2000
 Lab ID: L17314-9
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrpt: Inflow/Outflow Dup
 Sampled: Feb 10, 2000
 Lab ID: L17314-10
 Matrix: STORM WTR
 % Solids:

Locator: LSIN18
 Descrpt: 2ND OUTLET FROM LA
 Sampled: Feb 10, 2000
 Lab ID: L17314-11
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis				
COMBINED LABS															
M-CV 8M2540-D (03-01-009-001)															
Total Suspended Solids	2.1		0.5		1 mg/L	1.9		0.5		1 mg/L	1.2		0.5		1 mg/L
M-CV 8M4600-P-B, Fmod (03-03-013-000)															
Total Phosphorus	0.0101		0.005	0.01	mg/L	0.0125		0.005	0.01	mg/L	0.0252		0.005	0.01	mg/L

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and codes follow:
LIQUID

OTHER WTR	LA
INFLUENT	LB
EFFLUENT	LC
DIG SLUDGE	LD
IW WTR	LE
SEWER WTR	LF
STORM WTR	LG
DRINK WTR	LH
GRND WTR	LJ
FRESH WTR	LK
SALT WTR	LL
FILTER WTR	LM
BLANK WTR	LN
SEPTAGE	LP
TCLP LEACH	LQ
RECON WTR	LR
SEM EXTRACT	LS
NON WATER	LT

SOLIDS

OTHR SOLID	SA
SOIL	SB
COMPOST	SC
SLUDGE	SD
FRSHWTRSED	SE
SALTWTRSED	SF
IW SLUDGE	SG
IN-LINE SED	SH
SOLIDBLANK	SJ

Matrices Cont.

SPMD	SK
TISSUES	
OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH
AIR	
AIR BLANK	AA
AIR	AB
LANDFILGAS	AC
SEWER AIR	AD

%Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either **Wet Weight Basis** or **Dry Weight Basis** in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: **organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.**

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL	Less than method detection limit
<RDL	Less than reporting detection limit (practical quantitation limit, PQL)
RDL	Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count
or	biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1.
L	Recovery of matrix spike or SRM above acceptance range
LV	Larvae
NF	Not found
P	Present
PU	Pupae
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DIL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TLA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 03/06/2000 09:17
 Run ID: R47140 Workgroup: WG47249 {}

MB:WG47249-1 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

LCS:WG47249-2 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.1	.0979	98		85-115			

LD:WG47249-3 LI7314-1 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0124		.0138				10		25

MS:WG47249-4 LI7314-1 Matrix: STORM WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0124	0.05	.0594	94		70-130			

MB:WG47249-5 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

LCS:WG47249-6 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B, Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.1	.0968	97		85-115			

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 03/06/2000 09:18
 Run ID: R46749 Workgroup: WG47235 (TSS)

LD:WQ47236-1 L17202-3 Matrix: FRESH WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L	1.2		1.4				15		25

LD:WQ47236-2 L17314-1 Matrix: STORM WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L	1.4		1.6				12		25

MB:WQ47236-3 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	5	1	mg/L	<MDL	

LD:WQ47236-4 L17335-1 Matrix: IW WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421161 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L	506		500				1		25

LCS:WQ47236-5 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L		101	91	90		80-120			

MB:WQ47236-6 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CS PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	5	1	mg/L	<MDL	



King County
Water and Land Resources Division
Environmental Laboratory
Department of Natural Resources
322 West Ewing Street
Seattle, WA 98119-1507
(206) 684-2300

April 25, 2000

TO: Kerry Thrasher, Administrative Specialist
WLRD, Regional Watershed Teams

FROM: Mary Silva, Laboratory Project Manager 
WLRD, Environmental Laboratory

SUBJECT: Attached Report for Project 421195CZ, Rock Creek WQ
Samples L17515-1 – 11.

Attached is the comprehensive report for the water samples delivered to the laboratory on March 24, 2000. The samples were analyzed in the conventionals sections of the laboratory. QA/QC data summaries are included for your information.

Conventionals:

Sample Information

The conventionals laboratory analyzed the samples for total phosphorus and total suspended solids.

Sample Containers, Preservation and Holding Times

All of the samples were received in acceptable containers and sufficient volume was provided to perform all of the analyses required for this project. The samples were preserved using established protocols and were analyzed within USEPA and King County Environmental Laboratory (KCEL) established holding times.

Analytical Methods

All analyses were performed within established KCEL SOPs.

Method QC

Instrument Calibration - Where applicable, instrument calibration was performed before each analytical batch and confirmed by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant KCEL control limits. A correlation coefficient of 0.995 or greater was achieved as stated in KCEL calibration requirements. All balances have been monitored monthly and calibrated yearly as recommended by the manufacturer. Ovens, incubators, and refrigerators are monitored daily, and temperatures are noted in the logbooks before and after analysis.

Method Blank – All of the method blank results associated with the analysis of each parameter were below the method detection limit.

Laboratory Control Samples – All of the laboratory control sample results were within the acceptable range established for each reported parameter.



Sample QC

Laboratory Duplicates – All of the laboratory duplicate results were within the acceptable range established for each reported parameter.

Matrix Spike – All of the matrix spike recovery results were within the acceptable range established for each reported parameter.

Summary

There were no anomalies associated with the preparation and analysis of these samples.

The data have passed all internal QA/QC checks for accuracy and completeness and may be used without qualification.

If you have any questions or need additional information, please call me at 684-2359.

King County Environmental Lab Matrix Report

PROJECT: 421195CZ

COMBINED LABS-Liquid

Locator	Sample		Lab ID	mg/L	mg/L	mg/L
	Depth					
LSIN8			L17515-1	0.0145	2	
LSGC4			L17515-2	0.0168	2.2	
LSIN1			L17515-3	0.0268	2.5	
LSIN2			L17515-4	0.032	4.8	
LSGC11			L17515-5	0.0136	2	
LSIN3			L17515-6	0.0209	3.3	
LSGL14			L17515-7	0.0134	2.4	
LSOUT10			L17515-8	0.0134	0.86	
LSIN8			L17515-9	0.012	2.2	
LSINOUTDUP			L17515-10	0.0137	1.3	
LSIN1B			L17515-11	0.0307	1.8	

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSIN8
 Descrip: Glinder Creek at SR
 Sampled: Mar 24, 2000
 Lab ID: L17515-1
 Matrix: STORM WTR
 % Solids:

Locator: LSGC4
 Descrip: Glinder Creek at Mo
 Sampled: Mar 24, 2000
 Lab ID: L17515-2
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1
 Descrip: Rock Creek at Mout
 Sampled: Mar 24, 2000
 Lab ID: L17515-3
 Matrix: STORM WTR
 % Solids:

Locator: LSIN2
 Descrip: Rock Creek at Morg
 Sampled: Mar 24, 2000
 Lab ID: L17515-4
 Matrix: STORM WTR
 % Solids:

Parameters	Value Qual MDL RDL Units					Value Qual MDL RDL Units					Value Qual MDL RDL Units					Value Qual MDL RDL Units				
	- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis					- Wet Weight Basis				
COMBINED LABS																				
M-CV 8M2543-D (03-01-009-001)																				
Total Suspended Solids	2		0.5	1	mg/L	2.2		0.5	1	mg/L	2.5		0.5	1	mg/L	4.6		1	2	mg/L
M-CV 8M4500-F-B, Fmod(03-03-013-000)																				
Total Phosphorus	0.0145		0.005	0.01	mg/L	0.0168		0.005	0.01	mg/L	0.0288		0.005	0.01	mg/L	0.032		0.005	0.01	mg/L

King County Environmental Lab Analytical Report

PROJECT: 421195CZ

Locator: LSGC11
 Descrip: Ginder Cr at Rober
 Sampled: Mar 24, 2000
 Lab ID: L17515-5
 Matrix: STORM WTR
 % Solids:

Locator: LSIN3
 Descrip: Rock Creek at Abra
 Sampled: Mar 24, 2000
 Lab ID: L17515-6
 Matrix: STORM WTR
 % Solids:

Locator: LSG14
 Descrip: SE Ginder Lk Rd, W
 Sampled: Mar 24, 2000
 Lab ID: L17515-7
 Matrix: STORM WTR
 % Solids:

Locator: LSOUT10
 Descrip: Lake Sawyer Outflo
 Sampled: Mar 24, 2000
 Lab ID: L17515-8
 Matrix: STORM WTR
 % Solids:

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
COMBINED LABS																					
M-CV 3M2560-D (63-61-009-001)																					
Total Suspended Solids	2		0.5		1 mg/L	3.3		0.5		1 mg/L	2.4		0.5		1 mg/L	0.89	<RDL	0.5		1 mg/L	
M-CV 3M4500-P-B, Fmod(63-61-013-000)																					
Total Phosphorus	0.0136		0.005		0.01 mg/L	0.0209		0.005		0.01 mg/L	0.0134		0.005		0.01 mg/L	0.0134		0.005		0.01 mg/L	

King County Environmental Lab Analytical Report

PROJECT: 421185CZ

Locator: LSIN9
 Descrp: Ravensdale Creek I
 Sampled: Mar 24, 2000
 Lab ID: L17515-9
 Matrix: STORM WTR
 % Solids:

Locator: LSINOUTDUP
 Descrp: Inflow/Outflow Dup
 Sampled: Mar 24, 2000
 Lab ID: L17515-10
 Matrix: STORM WTR
 % Solids:

Locator: LSIN1B
 Descrp: 2ND OUTLET FROM LA
 Sampled: Mar 24, 2000
 Lab ID: L17515-11
 Matrix: STORM WTR
 % Solids:

Parameters

	Value	Qual	MDL	RDL	Units		Value	Qual	MDL	RDL	Units		Value	Qual	MDL	RDL	Units	

COMBINED LABS

M-CV 3M2842-D (03-01-009-001)

Total Suspended Solids	2.2	0.5	1	mg/L		1.3	0.5	1	mg/L		1.8	0.5	1	mg/L
------------------------	-----	-----	---	------	--	-----	-----	---	------	--	-----	-----	---	------

M-CV 3M4800-F-B, Fmod (03-03-013-000)

Total Phosphorus	0.012	0.005	0.01	mg/L		0.0137	0.005	0.01	mg/L		0.0307	0.005	0.01	mg/L
------------------	-------	-------	------	------	--	--------	-------	------	------	--	--------	-------	------	------

DESCRIPTION OF COMPREHENSIVE REPORT CONTENTS

Locator

Each sampling site is assigned a unique locator code which defines a unique, specific, geographic reference for that sampling point.

Sample Date

The sample date is labeled Sampled. It is the record of the month, day, and year the sample was collected.

Lab ID

Each sample receives a unique Lab sample number, so that all samples can be referenced by their sample numbers.

Matrix

Matrix is the Lab's designation of the type of environment from which the sample was taken. There are four groups of matrices: liquids, solids, tissues, and air. The matrices and codes follow:

LIQUID		
OTHER WTR	LA	
INFLUENT	LB	
EFFLUENT	LC	
DIG SLUDGE	LD	
IW WTR	LE	
SEWER WTR	LF	
STORM WTR	LG	
DRINK WTR	LH	
GRND WTR	LJ	
FRESH WTR	LK	
SALT WTR	LL	
FILTER WTR	LM	
BLANK WTR	LN	
SEPTAGE	LP	
TCLP LEACH	LQ	
RECON WTR	LR	
SEM EXTRACT	LS	
NON WATER	LT	
SOLIDS		
OTHR SOLID	SA	
SOIL	SB	
COMPOST	SC	
SLUDGE	SD	
FRSHWTRSED	SE	
SALTWTRSED	SF	
IW SLUDGE	SG	
IN-LINE SED	SH	
SOLIDBLANK	SJ	

Matrices Cont.

SPMD	SK
TISSUES	
OTHR TISS	TA
ALGAE	TB
PLANT	TC
SHELLFISH	TD
FISH	TE
CRAYFISH W	TF
CRAYFISH E	TG
ORGANS	TH
AIR	
AIR BLANK	AA
AIR	AB
LANDFILGAS	AC
SEWER AIR	AD

%Solids

The percent of the non-liquid (by weight) portion of the sample. All data are calculated and stored on a wet weight basis. The % Solid value is used, if requested, to normalize and report data on a dry weight basis. Each sample will be flagged either **Wet Weight Basis** or **Dry Weight Basis** in the report. Note that the conversion to a dry weight basis is not applicable to all parameters, for example pH. Also, Particle Size Distribution is not based on moisture content.

Parameters

Parameters (analytes tested for) are reported in sub-groups corresponding to the laboratory that tested for them. The sub-groups are: organics, metals, conventionals, and micro (microbiology) field analysis, and Aquatic Toxicology.

Qualifiers currently used

Qualifiers give additional information about data points.

<MDL	Less than method detection limit
<RDL	Less than reporting detection limit (practical quantitation limit, PQL)
RDL	Equal to the Reporting Detection Limit

Qualifiers Cont.

AD	Adult
B	Blank
C	Confluent growth
D	Dominant
E	Estimated microbial count
or	biased analyte concentration
G	Matrix spike or SRM recovery below acceptance range
H	Sample handling criteria were not met, prior to analysis.
J#	Chemist's confidence of a Tentatively Identified Compound as indicated by the value of #. The value can vary from 1 to 4, the most confident being 1.
L	Recovery of matrix spike or SRM above acceptance range
LV	Larvae
NF	Not found
P	Present
PU	Pupae
R	Data may not be usable
S	Sub-dominant
TA	Text information available
TNTC	Too Numerous to Count
X	Matrix spike or surrogate recovery <10 %
>MR	Analyte concentration exceeds capacity to measure
>###	Population count exceeds capacity to measure

Other qualifiers used before 8/16/96

CS	Composite sample
DL	Diluted
IP	Incorrect preservation
IS	Incorrectly sampled
SL	Sample lost
TIA	Text information available
XCM	Exceeds capacity to measure (Instrument X limitation)
XHT	Exceeds holding time

Value

The value is the measurement of the parameter expressed in the appropriate units of measure. The

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 04/14/2000 11:02
 Run ID: R50276 Workgroup: WG48155 (1)

MB:WG48155-1 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421350A PKey: STD

Parameter	Mdl	Rdl	Units	MS Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

LCS:WG48155-2 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.1	.0996	100		85-115		

LD:WG48155-3 L17539-1 Matrix: FRESH WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421235 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0241		.0236			2		20

MS:WG48155-4 L17539-1 Matrix: FRESH WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421235 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0241	0.05	.0705	95		75-125		

MB:WG48155-5 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421350A PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Phosphorus	.005	.01	mg/L	<MDL	

LCS:WG48155-6 Matrix: BLANK WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L		0.1	.1	100		85-115		

LD:WG48155-7 L17542-5 Matrix: FRESH WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421235 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0186		.0171			9		20

MS:WG48155-8 L17542-5 Matrix: FRESH WTR Listtype: CVTQTP Method: SM4500-P-B.Fmod(03-03-013-000) Project: 421235 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	Rec. Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0186	0.05	.0662	95		75-125		

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 04/14/2000 11:02
 Run ID: R50276 Workgroup: WQ48155 ()

ID:WQ48155-9 L17252-4 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B,Procd(03-03-013-000) Project: 421350A PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0672		.062				8		20

MS:WQ48155-10 L17252-4 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B,Procd(03-03-013-000) Project: 421350A PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0672	0.05	.118	101		75-125			

ID:WQ48155-11 L17515-6 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B,Procd(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0134		.0139				4		20

MS:WQ48155-12 L17515-6 Matrix: STORM WTR Listtype: CVTOTP Method: SM4500-P-B,Procd(03-03-013-000) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	Limits	RPD/RSD	Qual	Limits
Total Phosphorus	.005	.01	mg/L	.0134	0.05	.0601	93		75-125			

KING COUNTY METRO ENVIRONMENTAL LABORATORY
 Lab QC Report - 04/14/2000 11:02
 Run ID: R49775 Workgroup: WG47983 (TSS)

LD:WG47983-1 L17589-3 Matrix: IW WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421161 PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	10	mg/L	1570		1590				1		25

LD:WG47983-2 L17515-4 Matrix: STORM WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LD Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	1	2	mg/L	4.6		5				7		25

LCS:WG47983-3 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: PKey: STD

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	LCS Value	% Rec	Qual	Limits	RPD/RSD	Qual	Limits
Total Suspended Solids	5	1	mg/L		45.2	41	51		80-120			

MB:WG47983-4 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	5	1	mg/L	<MDL	

MB:WG47983-5 Matrix: BLANK WTR Listtype: CVTSS Method: SM2540-D (03-01-009-001) Project: 421195CZ PKey: STD

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Suspended Solids	5	1	mg/L	<MDL	

APPENDIX L
Land Use Parameters for Modeling

Date: 10/9/97
TO: Persons Concerned about the 1/97 Draft Lake Sawyer Management Plan (LSMP)
FROM: David Hartley (KC-WLRD)
CC:

RE: Ramifications of the Use of Provisional Future Land Use Information to Model P Loading to Lake Sawyer as Reported in the 1/97 Draft Lake Sawyer Management Plan

Concerns have been raised that the future land use assumptions of the 1/97 draft LSMP are somewhat inconsistent with more recent future land use predictions based on the final Black Diamond Annexation agreement. In principle, this inconsistency may affect the recommendations made in the draft plan because they rely in part on estimation of future phosphorus loading (P) to Lake Sawyer. These loadings are dominated by contributions from the tributary watershed which are estimated from projected land uses. The purposes of this memo are to present differences between provisional future land use data used to model P loadings as reported in the 1/97 draft LSMP and the final future land use reflected in the annexation agreement, analyze the impact of the different versions on future P loading from the lake's watershed, and make recommendations regarding the need for additional technical work on LSMP based on changed future land uses.

Comparison of Land Uses

Table 1. Compares the provisional future land uses utilized for modeling in the 1/97 LSMP to final uses as reflected in the annexation agreement for each of the 3 subbasins that contribute runoff to the lake. In terms of land use categories, there appear to be significant differences between the two future projections in each of the subbasins. In Ravensdale Creek subbasin, the annexation agreement suggests 25% less forest cover, a lot less commercial area (47% less), and a big increase in residential low-density at the expense of residential medium-density. In Rock Creek subbasin, the most significant changes are substantially increased quarry/mining and high-density residential acreages, and much reduced medium-density residential acreages. In the Lake Sawyer subbasin, changes include additional low-density acreage and reduced medium-density acreages.

TABLE 1. FUTURE LAND USE COMPARISON

SUBBASIN	LAND USE CATEGORY	PROV. FUTURE	FINAL FUTURE	%DIFF
RAVENS	FOREST	878	659	-25%
RAVENS	GRASS	121	123	1%
RAVENS	COM/IND	257	136	-47%
RAVENS	MUL. FAM.	31	35	16%
RAVENS	OPEN WAT	21	21	0%
RAVENS	QUARRY	191	191	0%
RAVENS	SING. HI	158	192	21%
RAVENS	SING. LO	633	1036	64%
RAVENS	SING. MED	109	0	-100%
RAVENS	WETLAND	132	140	6%
ROCK	FOREST	1331	1103	-17%
ROCK	GRASS	233	132	-43%
ROCK	COM/IND	498	493	-1%
ROCK	MUL. FAM.	52	21	-61%
ROCK	OPEN WAT	63	63	0%
ROCK	QUARRY	80	387	383%
ROCK	SING. HI	423	1237	193%
ROCK	SING. LO	391	338	-14%
ROCK	SING. MED	926	70	-92%
ROCK	WETLAND	260	415	60%
SAWYER	FOREST	52	34	-35%
SAWYER	GRASS	51	53	5%
SAWYER	COM/IND	8	10	29%
SAWYER	MUL. FAM.	42	42	0%
SAWYER	OPEN WAT	293	293	0%
SAWYER	QUARRY	0	0	0%
SAWYER	SING. HI	679	679	0%
SAWYER	SING. LO	59	155	162%
SAWYER	SING. MED	122	37	-70%
SAWYER	WETLAND	19	22	14%

Comparison of Hydrologic/Water Quality Land Classes

While Table 1 shows that there are fairly significant land use differences between the two future scenarios, these differences may or may not result in significant P loading differences since P loadings are determined from characteristic concentrations that have been identified for only five land cover categories in the Lake Sawyer watershed. Thus, the 10 land use classes shown in Table 1 must be reduced to 5 hydrologic classes shown in Table 2. The following conversion factors were used to “map” land use classes to hydrologic classes:

<u>Land Use</u>	<u>Hydrologic/WQ Class</u>
Forest (F)	100% Forest
Grass (G)	100% Grass
Commercial (C)	85% Impervious, 15% Grass
Multi Fam (MF)	48% Impervious, 52% Grass
Open Water (OW)	100% Open Water
Quarry (Q)	100% Grass
Single High (SH)	25% Impervious, 75% Grass
Single Med (SM)	10% Impervious, 90% Grass
Single Med (SM)	4% Impervious, 96% Grass
Wetland (WL)	100% Saturated

As shown in Table 2., the most up-to-date land use shows less forest, more grass, and less impervious area in the Ravensdale Subbasin; less forest, more wetland, and more impervious in the Rock Creek subbasin; and relatively small changes in the Lake Sawyer Subbasin.

TABLE 2. H2O/WQ MODEL CLASS COMPARISON			
HYD/WQ MODEL	PROV. FUTURE (ACRES)	FINAL FUTURE (ACRES)	%DIFF
RAVENSDALE CK SUBBASIN			
FOREST	878	659	-25%
GRASS	1192	1489	25%
WETLAND	132	140	6%
IMPERVIOUS	309	224	-28%
OPEN WATER	21	21	0%
RAVENS. TOTAL	2532	2532	0%
ROCK CK SUBBASIN			
FOREST	1331	1103	-17%
GRASS	1941	1919	-1%
WETLAND	260	415	60%
IMPERVIOUS	662	758	14%
OPEN WATER	63	63	0%
ROCK CK TOTAL	4257	4257	0%
LK SAWYER SUBBASIN			
FOREST	52	34	-35%
GRASS	749	768	2%
WETLAND	19	22	14%
IMPERVIOUS	211	208	-1%
OPEN WATER	293	293	0%
SAWYER TOTAL	1324	1324	0%

Comparison of P Loadings- <1% Difference Watershed-wide

The amount of P delivered to Lake Sawyer is based on characteristic concentrations and total runoff from each of the 5 hydrologic classes. The average loadings in kilograms/acre/year for each class are shown in the second column of Table 3. As shown, forest delivers the smallest amount per acre followed by grass, wetland, open water and finally, the big contributor, impervious surface. The third and fourth columns compare average annual loadings in each subbasin from each hydrologic cover type for both of the future scenarios. As shown, although there are some substantial differences in land use and even hydrologic class, some of these differences tend to cancel each other out within a subbasin. The largest difference in total subbasin load is in Ravensdale Creek where total annual load is reduced by 15%, while in Rock Creek there is a 10% increase, and in Lake Sawyer a smaller 1% decrease. Further, when total loads to the Lake from all subbasins are computed, the difference between the two future land use scenarios is reduced further to less than 1%.

This result suggests that in spite of some apparently significant land use changes, the estimate of net loading to Lake Sawyer does not change sufficiently to warrant a re-modeling in-lake nutrient dynamics.

TABLE 3. COMPARISON OF P LOADING DIFFERENCES				
	P LOAD	PROV.	FINAL	
	FACTOR	FUTURE	FUTURE	%DIFF
	(KG/AC/YR)	(KG/YR)	(KG/YR)	
RAVENSDALE CK SUBBASIN				
FOREST	0.07	62	47	-25%
GRASS	0.08	98	123	25%
WETLAND	0.11	15	15	6%
IMPERVIOUS	0.96	296	214	-28%
OPEN WATER	0.14	3	3	0%
RAVENS. TOTAL		474	402	-15%
ROCK CK SUBBASIN				
FOREST	0.07	95	78	-17%
GRASS	0.08	160	158	-1%
WETLAND	0.11	29	46	60%
IMPERVIOUS	0.96	634	726	14%
OPEN WATER	0.14	9	9	0%
ROCK CK TOTAL		927	1017	10%
LK SAWYER SUBBASIN				
FOREST	0.07	4	2	-35%
GRASS	0.08	62	63	2%
WETLAND	0.11	2	2	14%
IMPERVIOUS	0.96	202	199	-1%
OPEN WATER	0.14	42	42	0%
SAWYER TOTAL		311	309	-1%
TOTAL WATERSHED		1712	1729	1%

A Note About Sensitivity to Uncertain Assumptions

From the preceding discussion it is apparent that because of its potency as a P source, differences in impervious area are likely to dominate the differences in P loading associated with different watershed land use scenarios. Therefore, results are quite sensitive to assumptions about the impervious area content of different land use classes. This is borne out by the results shown in Tables 2 and 3. Even though impervious area is only 15% of the total watershed area represented by the final version of future land use, it accounts for 66% of the total annual P load to Lake Sawyer.

Assumptions regarding imperviousness are fairly well established for most of the land uses in the watershed; however, quarries represent an exception to this general rule. As discussed above, future "quarry" areas were classed as 100% "grass" consistent with their treatment in the current land use modeling. From the perspective of phosphorus loading, this interpretation of quarries represents a fairly optimistic view of runoff quality from these areas within the watershed. It implies that surface discharge is minimal from quarry areas or that it is well treated and relatively clean of sediments, turbidity and associated P.

If a more pessimistic view of quarries is taken, total P-load predicted by different land use scenarios (whether current or future) can change, both absolutely and relative to each other if they differ significantly in their acreages of quarries. For example if quarries were classed as 50% impervious and 50% grass instead of 100% grass, total annual P-load for either future scenario rises significantly, but more so for the final version because it includes 307 more acres of quarry. The result is that the total annual P-load difference between the two future scenarios rises from 1% to 8% and the predicted future load for the final land use scenario rises by 253 kg or 15%.

Summary and Conclusions

The provisional future land use utilized to model watershed hydrology and phosphorus loading in the 1/97 draft LSMP was significantly different from the final adopted future land use. (Even though the final, future land use was accurately represented in Table 2-1 of the draft plan). In spite of the difference between the provisional and final land use, differences in total future watershed loading to Lake Sawyer were negligible under the assumptions used- notably the classification of quarries as similar to grass for water quality modeling purposes.

Although total future watershed loading to the lake is not affected, the distribution of the loads between the two major subbasins, Rock and Ravensdale, was changed with Ravensdale's load decreasing by 15% and Rock's load increasing by 10% in the final, future version as compared with the provisional one. Clearly, any additional analysis of watershed treatments for the control of P-loads should use the most up-to-date land use information.

The existence of significant current, and additional future acreages of quarries pose somewhat of a water quality "wild card" for the Lake Sawyer watershed. The 1/97 draft plan does not address the

specific runoff and water quality characteristics of quarry areas and makes fairly optimistic assumptions regarding P-loading from these areas. Given the significant land disturbance associated with all surface mining, there is at least the potential for sediment- and P-laden runoff to enter creeks and contribute high P concentrations to Lake Sawyer. These considerations suggest both the need for additional assessment of the runoff and pollutant loading characteristics of quarries in the Lake Sawyer watershed and in King County in general.

In the mean time, given the sensitivity of Lake Sawyer to P-loadings, no effort should be spared to contain and treat runoff from quarries and other disturbed areas within the lake's watershed.

Memorandum

To: Lake Sawyer File
From: Jeff Burkey
Date: 5/12/00
Re: Process used to update Lake Sawyer WAQCEM spreadsheet

Existing Land Use

Land use for the Lake Sawyer WAQCEM model was updated using a combination of available resources. First was to use the Existing Land Use GIS coverage (which I believe may have been 1995 land use) and update it by intersecting a parcel coverage. This allows the individual modifications of land use by parcel. Next was to compare the existing coverage with the 1998 ortho photographs. In the original existing land use (1995ish), there were substantial clear-cut delineations. For the most part there has been a reversal of land cover. The forested areas then are now clear-cut and the clear-cut are now forested. I did not investigate to any great degree, the age of the now reforested areas. Except there were a couple blocks of reforestation where the age was known. Given this fact and comparing the likeness of other reforested areas, most of the reforested areas were considered hydrologically mature (in non-snow zone climate). This is based on the assumption that 15 year-old trees¹ react hydrologically like a forest. If snow is a significant consideration, the age of the forest then needs to be older to fill in the canopy cover. Further refinement of existing land use was done by the City Manager of Black Diamond.

Future Land Use

Future land use was compiled from multiple sources. The current future land use GIS coverage (which is based on multiple sources), most recent King County and Black Diamond Comprehensive plans, King County parcel database, Black Diamond Storm Water Plan, and City Engineer for Black Diamond.

Assumptions regarding the future land use are: some quarries were considered to be fully active, forest reserve delineation's were assumed to be fully reforested (this may not be 100% correct, but its plausible), any zoned areas were assumed to be utilized to the fullest potential.

Catchments Used

Lake Sawyer catchments were modified to incorporate the Black Diamond Storm Water Drain Plan. By intersecting the existing catchments and the storm water drainage basins, a unique set of catchments were developed. All catchments were used in the model, C9 on up. The re-delineation of the catchments that intersect with the Black Diamond drainage basins were separated out, no double counting of land area was done. Catchments were hand digitized into GIS database.

¹ Brief literature search (I can't remember my reference, I'll dig it up later) and email conversation with Dr. Charles Rhett Jackson, P.E. Ph.D., Professor, University of Georgia, Athens.

Jurisdictions Used

Incorporated in the model were four jurisdictions: King County, Black Diamond, Maple Valley, Kent, and the Potential annexations of Black Diamond. Kent and Maple Valley were combined in the spreadsheet model for simplicity. By separating out the potential Annexation areas (PA), the user of the spreadsheet could manipulate the model's land use assumptions.

The boundaries of the jurisdictions were obtained from the King County GIS database, and the Black Diamond Comprehensive plan maps and hand digitized in by me. So the accuracy of the jurisdictions boundaries may be slightly off when comparing to a registered coverage.

Importing into WAQCEM

In order to import into the spreadsheet raw data page, it was necessary to aggregate some of the land use types together. The following table lists these assumptions:

Existing Land Use Types	Assumed WAQCEM Type
Forest	Forest
Low Density Forest	Forest
Wetland	Forest
Grass	Agriculture
Quarry	Agriculture
Low density Grass	SFR
Medium Density Residential	SFR
High Density Residential	SFR
Multifamily	MF
Industrial	COM

Future Land Use Types	Assumed WAQCEM Types
Forest	Forest
Wetland	Forest
Grass	Agriculture
Quarry	Agriculture
Medium Density residential	SFR
High density residential	SFR

Multifamily	MF
Low Density (mostly hobby farms)	Rural
Industrial	Com

APPENDIX M
Ecology Equivalency Review Matrix

King County Surface Water Design Manual
Washington State Department Of Ecology (WSDOE) Equivalency Review Matrix

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used: - define non-regulatory methods	Equivalency determination
THRESHOLDS AND DEFINITIONS				
<p>New Development - Small Parcel Threshold: All Single Family Residences (SFRs), less than 5,000 ft² or greater of added impervious surface, OR land disturbing activities less than one acre.</p>	<p>KCC 9.04.030 (Drainage review threshold) Surface Water Design Manual (SWDM) Chap. 1 (adopted by public rule PUT 9.04) KCC 16.82.050 (Grading Code threshold) KCC 9.12.025 (Water Quality BMPs threshold) KCC 9.04.130 (Hazard threshold)</p>	<p>KCC 16.82.100A (ESC requirement)</p>	<p>DDES SFR Permit Requirements and Site Review Procedures</p>	<p>The drainage review threshold effectively captures 1) any land disturbing activity over one acre that adds less than 5,000 ft² of impervious surface that would have any effects on surface water drainage, 2) any SFR that adds greater than 5,000 ft² of impervious surface, or 3) all permitted projects containing or adjacent to sensitive areas. Those projects not captured by this threshold are still captured by the Water Pollution Code and/or Grading Code thresholds requiring Erosion and Sediment Control (ESC) Best Management Practices (BMPs). In addition, any project creating an erosion or drainage problem is required to address its cause. Although a complex approach, the result is equivalent.</p>
<p>New Development - Large Parcel Threshold: 1). 5,000 ft² or greater of added impervious surface AND/OR land disturbing activities greater than one acre meets minimum requirements #1 through #11; 2). 5,000 ft² or greater of added impervious surface AND land disturbing activities less than one acre meets minimum requirements #2 through #11 (and subject to small parcel requirements).</p>	<p>KCC 9.04.030 (threshold) SWDM Chap. 1</p>			<p>All projects requiring permits that create 5,000 ft² of impervious surface are required to meet drainage requirements. Any project that collects from or alters a drainage system of 12 inches in diameter or greater is also captured. This second threshold effectively captures any land disturbing activity over one acre that adds less than 5,000 ft² of impervious surface if they have any impact to surface water drainage. If a project has to collect water into a drainage system then they will be captured. This approach results in an equivalent proportion of projects captured by the thresholds.</p>

State Requirements for which Substantially Equivalent County Requirements are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
<p>Redevelopment</p> <p>1). 5,000 ft² or greater of redevelopment meets minimum requirements #1 through #11 for portion of site being redeveloped AND source control applied to remainder of site;</p> <p>2). If sites that meet 1) above AND are either a) greater than one acre in size with 50% or more impervious surface, or b) discharge to documented water quality problem, THEN develop a schedule to apply minimum requirements to maximum extent practicable for the entire site.</p>		<p>KCC 9.04.030 SWDM Chap. 1 (Two redevelopment thresholds)</p>	<p>NPDES permit compliance</p>	<p>Redevelopment is captured under two thresholds. The first captures sites with high use traffic conditions that produce heavy oil accumulations when they add more than \$100,000 of improvements. These sites are required to provide source controls and oil control BMPs for the entire site. The second captures sites that add more than \$500,000 in improvements and replaces 5,000 ft² of impervious surface with pollutant generating surfaces. All requirements except flow control are applied to the redeveloped portion of the site (source controls and oil control BMPs apply to the entire site if needed). The project cost levels are used to apply the drainage improvements when they would be cost effective without being so burdensome as to stop the proposed project. In this manner, more redevelopment will be cost effective, resulting in more actual recapture of untreated surfaces. In addition, this approach targets the largest pollutant loading sites and results in greater pollutant load reductions. Combined with the County's required NPDES program for retrofit of existing development in the highest priority areas, this approach should result in greater water quality benefits and is therefore equivalent.</p>
<p>New Development Definition</p>	<p>KCC 9.04.020.F SWDM Definitions Sec. (Development definition)</p>			<p>All the activities listed in the WSDOE definition are covered under the activities requiring the permits listed in King County's definition. Application by permit type provides an equivalent coverage of activities.</p>

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - not applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
Redevelopment Definition	KCC 9.04.020 SWDM Definitions Sec. (Redevelopment project and high use site definitions)	As discussed under thresholds, projects are captured by nesting permits. The definitions captures an equivalent proportion of development scenarios.	DDES Site Review Procedures	Defined as the site conditions that existed on May 1, 1979 or the site conditions at the time of an approved, permitted drainage system. While fully forested conditions are not required, most new development projects had forested conditions in 1979. Together with the higher removal efficiencies of our water quality facility designs (see Minimum Requirement #4 below), all King County water bodies, including water quality sensitive areas, will receive equivalent or better water quality protection.
Land Disturbing Activities Definition:	KCC 9.04.020.F KCC 16.82.020, D & M SWDM Definitions Sec. (Clearing and grading definitions)	Existing Conditions Definition:	SWDM Definitions Sec. (Existing Site Condition Definition)	Existing Conditions Definition:
MINIMUM REQUIREMENTS - SMALL PARCELS				
Small Parcel Requirement #1: Construction access routes.	KCC 9.12.025.C (BMP requirements) KCC 16.82.100.G (Access)	KCC 16.82.100.A (RSC BMPs requirement)	SFR RSC Fact Sheet (revised) Building permit review and inspection Grading permit review and inspection	Those sites captured by full or small site drainage review meet requirement (See ESC Requirement #10 below). Those projects captured by grading permit meet requirement. Remaining sites are required to meet these requirements under the grading code or the water pollution code which is implemented through the building permit review process. Equivalent approach.

Small parcels include all SFRs, sites which add <5,000 ft² impervious surface, or sites with <1 acre of land disturbing activity.

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
Small Parcel Requirement #2: Stabilization of denuded areas.	KCC 9.12.025.C (BMP requirements) KCC 16.82.100.B (control of disturbed areas)	KCC 16.82.100.A (ESC BMPs requirement)	SFR ESC Fact Sheet (revised) Building permit review and inspection Grading permit review and inspection	Those sites captured by full or small site drainage review meet requirement (See ESC Requirement #1 below). Those projects captured by grading permit meet requirement. Remaining sites are required to meet these requirements under the grading code or the water pollution code which is implemented through the building permit review process. Equivalent approach.
Small Parcel Requirement #3: Protection of adjacent properties.	KCC 9.12.025.C (BMP requirements) KCC 16.82.100.E & K (protection of adjacent property)	KCC 16.82.100.A (ESC BMPs requirement)	SFR ESC Fact Sheet (revised) Building permit review and inspection Grading permit review and inspection	Those sites captured by full or small site drainage review meet requirement (See ESC Requirement #3 below). Those projects captured by grading permit meet requirement. Remaining sites are required to meet these requirements under the grading code or the water pollution code which is implemented through the building permit review process. Equivalent approach.
Small Parcel Requirement #4: Maintenance.	KCC 9.12.025.C (Maintenance of BMPs) KCC 9.04.090 (Maintenance) KCC 16.82.100.B (Maintenance of ESC)	KCC 16.82.100.A (ESC BMPs requirement)	SFR ESC Fact Sheet (revised) Building permit review and inspection Grading permit review and inspection	Those sites captured by full or small site drainage review meet requirement (See ESC Requirement #14 below). Those projects captured by grading permit meet requirement. Remaining sites are required to meet these requirements under the grading code or the water pollution code which is implemented through the building permit review process. Equivalent approach.
Small Parcel Requirement #5: Other BMPs can be required to mitigate if needed.	KCC 9.12.035 (require additional BMPs) KCC 9.04.050 & SWDM CR #5 (require additional BMPs)	KCC 16.82.100.A (ESC BMPs requirement)	Building permit inspection Grading permit inspection	Both ESC and source control BMP requirements require additional controls if needed. Equivalent approach.
MINIMUM REQUIREMENTS – MINIMUM REQUIREMENT #1: EROSION AND SEDIMENT CONTROL				
Erosion and Sediment Control Requirement #1. Stabilization and Sediment Trapping	KCC 9.04.050 SWDM Core Requirement (CR) #5.2; 5.5 & 5.8. (Cover measures, sediment retention, wet season construction)			Same requirements as WSDOE except that the two day cover requirement only runs from Oct. 1 to Mar 31. The additional ESC requirements applied near sensitive areas will result in an equivalent level of protection.

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
Erosion and Sediment Control Requirement #2. Delineate Clearing and Easement Limits	KCC 9.04.050 SWDM CR #5 (Clearing limits)			Similar requirements - equivalent.
Erosion and Sediment Control Requirement #3. Protection of Adjacent Properties	KCC 9.04.050 SWDM CR #5 (Perimeter protection)			Similar requirements - equivalent.
Erosion and Sediment Control Requirement #4. Timing and Stabilization of Sediment Trapping Measures	KCC 9.04.090 (Timing) KCC 9.04.050 SWDM CR #5 (Cover measures, sediment retention, surface water control)			Sediment trapping facilities must be in place prior to construction but other structures such as conveyance and interception berms can be built as construction proceeds (must be in place concurrently). Essentially same requirements - will provide equivalent protection.
Erosion and Sediment Control Requirement #5. Cut and Fill Slopes	KCC 9.04.050 SWDM CR #5 (Cover measures) KCC 16.82.100 (Cut & fill requirements)			Any cuts or fills that move over 100 yd ³ of material are required to meet grading code design conditions that ensure stability and minimize erosion. Maximum distances between interception dikes and required use of erosion control blankets are used for ESC. Equivalent level of protection.
Erosion and Sediment Control Requirement #6. Controlling Offsite Erosion	KCC 9.04.050 SWDM CR #2 (Offsite analysis)			Requires detailed analysis as part of permit application that identifies any downstream impacts including erosion problems. Equivalent level of protection.
Erosion and Sediment Control Requirement #7. Stabilization of Temporary Conveyance Channels and Outlets	KCC 9.04.050 SWDM CR #5 & 4 SWDM Sec. 5.4.6 (Stormwater control, conveyance)			All temporary channels are required to be built to the conveyance standards of permanent systems. Approach affords greater protection.
Erosion and Sediment Control Requirement #8. Storm Drain Inlet Protection	KCC 9.04.050 SWDM CR #5 (Sediment retention, final stabilization)			Onsite systems can be used during construction. Any inlets up to 500 feet downstream must be protected. All permanent systems and any downstream inlets that required protection are cleaned after final site stabilization. Equivalent level of protection.
Erosion and Sediment Control Requirement #9. Underground Utility Construction	KCC 9.04.050 SWDM Sec. 5.6 (Utility ESC)	SWDM Sec 5.6 (Dewatering requirement)		Specific section on roads and utilities acknowledging their specific problems for ESC and requiring additional measures. Equivalent level of protection.
Erosion and Sediment Control Requirement #10. Construction Access Route	KCC 9.04.050 SWDM CR #5 (Traffic area stabilization)			Similar requirements - equivalent.

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
Erosion and Sediment Control Requirement #11. Removal of Temporary BMPs	KCC 9.04.050 SWDM CR #5 (final stabilization)			Similar requirements - equivalent.
Erosion and Sediment Control Requirement #12. Dewatering Construction Sites	KCC 9.04.050 SWDM CR #5 (Construction within sensitive areas)	SWDM Sec 5.6 (Dewatering requirement)		Requires specific dewatering treatment near sensitive areas. Sections added for utilities and to clarify that construction site dewatering must run through sediment trap. Equivalent level of protection.
Erosion and Sediment Control Requirement #13. Control of Pollutants Other than Sediment on Construction Sites	KCC 9.12.025 Stormwater Pollution Control Manual (Source control BMPs)			BMPs required at construction sites. WSDOE has already determined that this manual is equivalent.
Erosion and Sediment Control Requirement #14. Maintenance	KCC 9.04.090 (Maintenance) KCC 9.04.050 SWDM CR #5 (Maintenance)			Similar requirements - equivalent.
Erosion and Sediment Control Requirement #15. Financial Liability	KCC 9.04.100 KCC 9.04.050 SWDM CR #5 (Bonding) KCC 16.82.080 (Grading bonding)			Similar requirements - equivalent.
MINIMUM REQUIREMENTS - LARGE DEVELOPMENT				
Minimum Requirement #2: Preservation of Natural Drainage Systems.	KCC 9.04.050 SWDM CR #1 & 4 (Discharge at natural location, conveyance) KCC 21A.24 (Sensitive Areas Ordinance)			All defined streams must be maintained, vegetative channels required where feasible, and discharge at the natural location required. Similar requirements - equivalent.
Minimum Requirement #3: Source Control of Pollution.	KCC 9.12.025 Stormwater Pollution Control Manual (Source control BMPs)	KCC 9.04.050 SWDM Special Requirement (SR) #4 (Source controls)		Applicable source controls required for all new and redevelopment. Similar requirements - equivalent.

State Requirement for which Substantiality Equivalent County Requirement are Needed	Minimum Requirement #4: Runoff treatment BMPs	Minimum Requirement #5: Streambank Erosion Control	Existing regulation applies - list applicable regulation	KCC 9.04.050 SWDM CR #8 (Treatment goals and target receiving waters)	KCC 9.04.050 SWDM CR #3 (Method revision and target resource areas and problems for stricter controls)	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	New method is used to predict runoff and release rates. In urban areas where there are no significant salmon resources, the standard matches peaks between the 2-year and 10 year runoff events. Analysis shows the release rates are close to those required by WSDOE. In addition, these standards are applied all development that increases runoff by 0.5 cfs, not just those discharging to streams. Additional controls are required if downstream analyses shows erosion problems. In rural areas and significant salmon resource areas, the standard is to match duration of flows between the 50% of the 2 year peak flow and the 50 year peak flow. This level of protection exceeds the WSDOE standard. In rural areas and in many urban areas, the level of protection meets equivalency.
Equivalency determination	Threshold for water quality BMPs is 5,000 ft ² of pollutant generating impervious. Some smaller projects required by WSDOE to treat runoff are not captured. These facilities are not cost effective when applied to such small areas. However, revisions increase volume treated for all the projects captured to equal to or greater than that required by WSDOE. The level of treatment also targets high traffic areas (a major pollution source) and pollutants of concern for different receiving bodies. Overall, projects to provide greater protection to receiving waters.							

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies - list applicable regulation	Revised or new regulation required - list regulation & note change required	Other implementation method used - define non-regulatory methods	Equivalency determination
Minimum Requirement #6: Wetlands.	KCC 21A.24.330.H (discharges to wetlands) KCC 21A.24.340 (mitigation requirements)			Discharges to wetlands are required to maintain water quality, rates of flow and existing plant composition. Wetland buffers may only be used if no feasible alternative exists and buffer functions are not adversely affected. Any wetland mitigation is regulated exactly like a wetland. Constructed wetlands are allowed but must be built like any other treatment facility. Isolated class 3 wetlands which are grazed wet meadows are allowed to be used for detention (but not treatment) of stormwater unless located in a designated resource area. Cumulative level of protection to wetlands is equivalent.
Minimum Requirement #7: Water Quality Sensitive Areas.	KCC 9.08.020 & KCC 20.14 (Basin Plans) KCC 9.08.120 (Lake Management Plans)	KCC 9.04.050 SWDM CR #8 (Different treatment goals for sensitive bodies) SWDM SP #1 (specific lake management plan requirements)	305j reporting NPDES permit requirements	Different treatment goals are used for different receiving bodies. Many of these areas and the water quality requirements to protect them were identified through basin plans. In addition, lake management plans are used to develop specific requirements to address lake eutrophication problems. Equivalent approach.
Minimum Requirement #8: Off-site Analysis.	KCC 9.04.050 SWDM CR #2 (Offsite analysis)	KCC 9.04.050 SWDM CR #3 & #8 (Targeted controls for problems, spill control requirement)		Requires analysis 1/4 mile downstream to identify existing or potential problems (1 mile for complaints). Mitigation requires additional controls to not increase problem. Also, some downstream problems require application of specific requirements. Spill control is a requirement of all sites. Equivalent approach.
Minimum Requirement #9: Basin Planning.	KCC 9.08.020 & KCC 20.14 (Basin Plans) KCC 9.04.050 SWDM SP #1 (Apply basin plan area-specific requirements)			County develops basin plans that are used to set specific levels of protection for portions of those basins. Will continue with comprehensive watershed management in cooperation with local governments. Equivalent approach.
Minimum Requirement #10: Operation and Maintenance.	KCC 9.04.090 - 120. (Maintenance) KCC 9.04.050 SWDM CR #6 SWDM App. A (Maintenance Schedule)			Responsibilities for operation and maintenance of stormwater facilities are defined; a maintenance plan consistent with the maintenance schedules for each facility type is required. Equivalent approach.

State Requirement for which Substantially Equivalent County Requirement are Needed	Existing regulation applies. List applicable regulation	Revised or new regulation required. list regulation & note change required	Other implementation method used. Define non-regulatory methods	Equivalency determination
Minimum Requirement #11: Financial Liability.	KCC 9.04.100 (Bonds) KCC 9.04.050 SWDM CR #7			Drainage facilities restoration and site stabilization bonds and defect and maintenance bonds are required for each project. Equivalent approach.
EXCEPTIONS				
Exception Process	KCC 9.04.050 (Variances) SWDM Sec. 1.4			Variance process that requires equivalent results meeting similar objectives. If reasonable use is denied, can use the best practicable alternative. Since state law does not allow denial of reasonable use, the approach is equivalent.

APPENDIX N
Conceptual Stormwater Plan for Rock
Creek/Ginder Creek Drainage Area

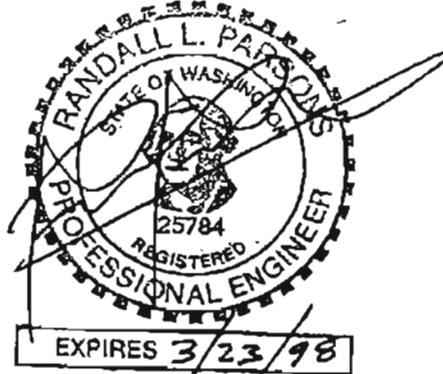
Conceptual Stormwater Plan for Rock Creek/Ginder Creek Drainage Area

Lake Sawyer Drainage Basin Water Quality/Quantity Drainage Improvements

Report Prepared by:
Ken Nilsen, P.E., Project Manager
Terry Hsu, P.E., Project Engineer

December 1997

Approved by:
Randall Parsons, P.E., Manager
Watershed Management CIP Unit



King County
Wastewater Treatment Division
Watershed Management CIP Unit
700 Fifth Avenue, Suite 2200
Seattle, Washington 98104-5022



KING COUNTY
Department of Natural Resources

TABLE OF CONTENTS

	<u>Page</u>
Background.....	1
Problem	1
Scope of Work.....	1
Assumptions	1
Findings.....	2
General.....	2
Master Utility Plan.....	3
General Concerns/Questions/Constraints	3
Subbasin 1.....	4
Subbasin 2.....	5
Subbasin 3.....	6
Project Costs.....	7
Recommendation.....	10
APPENDIX A: Vicinity Maps	
APPENDIX B: Background Information	
APPENDIX C: Drainage Basin	
APPENDIX D: KCRS Flow Analysis	
Predeveloped Conditions	
Existing Conditions	
Future Conditions	
APPENDIX E: KCRS Pond Sizing	
Summary Sheet	
Future Land Use	
Existing Land Use	
Water Quality Component of Pond	
APPENDIX F: Conceptual Layout	
APPENDIX G: Cost Estimates	

Background

Lake Sawyer, a 280-acre lake, is located 2 miles northwest of Black Diamond, in southeast King County (see vicinity map in Appendix A). The lake is an extremely valuable recreational and natural resource for King County and the community. In January 1997, the King County Department of Natural Resources completed the *Draft Lake Sawyer Management Plan (DLSMP)*. The purpose of this plan was to develop stormwater management strategies for Black Diamond to provide flow control and benefit the overall quality of Lake Sawyer.

Problem

Water quality sampling of Lake Sawyer, conducted as part of the DLSMP, showed that the lake was experiencing high levels of phosphorus. This phosphorus loading of the lake was expected to worsen as the area developed. The Lake Sawyer Technical Advisory Committee when reviewing the draft plan recommended controls for phosphorus removal from existing and future development. The *King County Surface Water Design Manual* recommends wetponds to remove phosphorus from the surface water runoff. The goal of these wetponds is to remove, on average, 50 percent of the annual total phosphorus.

Scope of Work

On September 24, 1997, Watershed Management CIP Unit staff took a tour of the City of Black Diamond, with City staff, to review the existing drainage system and review the areas of existing flooding and water quality problems. The objective of this study was to develop a conceptual layout of potential combined surface water control and water quality wetponds. These ponds would be designed to meet the Lake Protection Standard from the proposed February 1996 draft update of the *King County Surface Water Design Manual*. In addition, a conceptual layout was to be developed for the drainage system needed to convey the storm and surface water runoff to these ponds, including a preliminary cost estimate to design, permit, and construct these facilities.

Assumptions

In order to scope these potential improvements, a number of assumptions were made. These assumptions are as follows:

- The ponds designed to the Lake Protection Standard will remove 50 percent of the total phosphorus. The phosphorus is from the stormwater runoff and not the adjacent wetlands (further testing of the phosphorus will be needed to verify this assumption).
- The City can be divided into three drainage basins. The basin areas were calculated based on a USGS topographic map.

- The ponds were sized using the King County Runoff Time Series (KCRTS) hydrologic model. The runoff was based on the maximum development that the *1996 Black Diamond Comprehensive Plan* would allow. This assumes that a portion of the areas that have currently been clear-cut will revert back to an open-space land designation, which will be predominantly a forested condition.
- The land use/land cover and geology areas were derived from King County Geographical Information System (GIS) information.
- The wetpond portions of the ponds were sized assuming 8 feet of dead storage.
- Land values are based on current King County assessed values.
- The pipe sizes are based on peak KCRTS values for the 100-year design storm; final pipe sizing will require a detailed hydraulic analysis during the design phase.
- Only the surface water from the area of Black Diamond north of Rock Creek and east of Ginder Creek was included in this study.
- Fifty percent of the new pipes are within paved areas and 50 percent are in gravel shoulders.
- Seventy-five percent of the pond volumes will need to be excavated. The remaining 25 percent will be in an existing depression.

Findings

General

During the field visit, it was observed that the geology in the area north of Rock Creek and east of Ginder Creek was predominately hardpan near the surface. This hardpan acts as an impermeable surface, generating large amounts of surface water runoff. Runoff from this area goes through a series of culverts, open ditches, and a limited number of detention ponds that are obviously undersized (most likely designed to 1979 King County Detention Standards). Most of the City's surface water runoff travels through open ditches and does not include any quantity or quality control features.

The drainage area in question is approximately 1,300 acres in size. This drainage basin was broken into three subbasins (see basin map in Appendix C). The first basin is approximately 300 acres, the second is approximately 800 acres, and the third is approximately 165 acres. These subbasins were modeled by using the KCRTS model to size the ponds to the King County Design Manual Standard. The results of this modeling are shown in the summary section for each subbasin.

Since the City's drainage system is predominately open-ditch, a major component of this work would be to construct a network of storm drainage pipes to carry the storm and surface water runoff to the ponds. Up to 25,000 feet of storm drainage pipe, ranging from 18 to 36 inches in diameter, would need to be installed within the City in

order to convey all runoff in a pipe system. The exact size and length of these pipes will need to be determined during the design phase. Most of these pipes would be constructed under existing roadway and/or shoulders (see the conceptual layout of ponds and pipes in Appendix F). A limited number of pipes would need to be constructed in easements across private property.

Master Utility Plan

As the area of Black Diamond develops, it could begin to feel the strain on its existing utilities, mainly the storm drainage, water, and sanitary sewer/septic systems. In order for the City to meet the demands that development places on these utilities, with the least amount of disruption, it is recommended that the City coordinate the construction of any future water, sanitary sewer, and storm drainage systems in a Master Utility Plan for the City. This Master Utility Plan would identify areas of the City that need utility improvements and their relative priority. This plan would thereby create a mechanism by which the City could coordinate and construct the needed utility improvements in a way that would solve the highest priority problems first, while minimizing construction impacts and reducing the construction costs.

General Concerns/Questions/Constraints

As we began to conceptually lay out potential pond(s) and pipe locations, there were a number of concerns, questions, and/or constraints that were identified, which will need to be addressed during the planning and/or feasibility-concept alternatives analysis phases of this project, before a final recommendation can be made. The following is a summary of these issues:

- How deep can the live storage be and still allow drainage of the live storage to the downstream drainage system and/or creek? If there were not sufficient drop in topography, the surface area of the ponds would have to be enlarged significantly to achieve the required pond volume. This increased pond surface area would require additional land acquisition, thereby increasing the project cost.
- Is sufficient land available to construct these ponds?
- Would it be more effective to remove the phosphorus in order to construct a few large ponds or a series of smaller ponds? In order to maximize the phosphorus removal from the ponds, it is important that the sediment be removed from the pond approximately every three years, so that it does not become re-suspended in the water. The larger the pond, the more difficult it will be from a maintenance standpoint to drain the pond and remove the sediment. If there is not sufficient grade to drain not only the live storage but also the 8-foot-deep wetpond, this water will have to be pumped out of the pond. This process could take several days.
- Ponds of the size proposed could have significant safety requirements if the proposed live storage were contained above the existing ground level. This type of

construction would have to meet Washington State Department of Ecology Dam Safety requirements.

- In terms of water quality, would open ditches be better than closed pipes for conveying surface water (that is, nutrient uptake from plants in the ditch)?
- How much phosphorus is actually being released from the wetland adjacent to Rock Creek and the failed wastewater treatment plant?
- Would it be better to size the ponds for existing development, allowing enough room for enlargement/expansion as the area develops? Would developers pay for future expansion?
- As part of their natural biological/chemical process, are the upstream bogs contributing a large amount of phosphorus to Rock Creek and Ginder Creek?
- What are the potential conflicts with underground utilities during the construction of the new storm drainage system?
- Will the State of Washington allow an open-cut trench for pipe installation across State Route 169?

Subbasin 1

This subbasin is predominately single-family residential construction, with a majority of the basin developed. The basin contains several newer developments, including Lawson Hill Estates and the Catholic Church. The detention ponds from this area are not designed to treat the surface water runoff for phosphorus removal, and appear to be undersized to adequately reduce the peak flow. The results of KCRTS hydrologic modeling are shown below:

Subbasin Size: 306 acres

Storm Flow Rates:

FREQUENCY	PREDEVELOPED	EXISTING	FUTURE
100-Year	35 cfs	86 cfs	93 cfs
25-Year	28	49	55
2-Year	13	24	34
1-Year	4	14	21

Pond Sizing:

Basin 1 (future developed conditions)
 77 acre-feet storage volume (detention)
 22 acre-feet dead storage (water quality)
 99 acre-feet total pond size
 Basin 1 (existing conditions)
 65 acre-feet storage volume (detention)

22 acre-feet dead storage (water quality)
87 acre-feet total pond size

Concerns for Subbasin 1:

- It needs to be determined if there is sufficient drop in the topography to allow for the proposed 10 feet of live storage, as proposed in the conceptual layout of the pond. If not, the pond will have to be significantly enlarged.
- There are limited undeveloped tracts of land available to construct a pond.
- It is assumed that the existing 18-inch pipes within Lawson Hill Estates are adequate to convey future flows.
- It needs to be determined if it is better to make one large pond for both existing and future development, or construct at least two ponds that could be phased as development occurs. From the topography and current land use, it may make more sense to construct one pond with room for future expansion.

Subbasin 2

This subbasin is predominately undeveloped. However, approximately 100 acres of the basin have been clear-cut, which produces large volumes of surface water runoff. This basin does not appear to have any existing detention ponds. Based on the soil conditions and the runoff generated from a clearcut area, there is no significant difference between the existing and future predicted flows. This is because of the large amount of runoff generated from a clearcut area. The results of KCRTS hydrologic modeling are shown below:

Subbasin Size: 797 acres

Storm Flow Rates:

FREQUENCY	PREDEVELOPED	EXISTING	FUTURE
100-Year	88 cfs	184 cfs	180 cfs
25-Year	68	97	103
2-Year	31	49	59
1-Year	9	28	33

Pond Sizing:

Basin 2 (future conditions)
156 acre-feet storage volume (detention)
36 acre-feet dead storage (water quality)
192 acre-feet total pond size

Basin 2 (existing conditions)
154 acre-feet storage volume (detention)

36 acre-feet dead storage (water quality)
 190 acre-feet total pond size

Concerns for Subbasin 2:

- It needs to be determined if there is sufficient drop in the topography to allow for the proposed 15 feet of live storage, as proposed in the conceptual layout of the pond. If not, the pond will have to be significantly enlarged.
- For a preliminary review of the subbasin, it appears that it may be better to construct a number of ponds, rather than one large pond, for a number of reasons. These reasons include: (1) the availability of a single parcel of land large enough to construct one pond; (2) the maintenance problems associated with one large pond (as previously discussed); (3) the distribution of costs by phasing design and construction as the area develops; and (4) the topography of the area.
- Due to possible wetlands in the proposed pond location, east of Lake Jones, there may be permitting constraints.

Subbasin 3

This subbasin is predominately developed. It contains the City's primary business and commercial district. There appears to be no existing detention ponds in this area. The results of KCRTS hydrologic modeling are shown below:

Subbasin Size: 166 acres

Storm Flow Rates:

FREQUENCY	PREDEVELOPED	EXISTING	FUTURE
100-Year	23 cfs	50 cfs	55 cfs
25-Year	17	29	32
2-Year	9	15	17
1-Year	3	9	11

Pond Sizing:

Basin 3 (future conditions)
 30 acre-feet storage volume (detention)
 10 acre-feet dead storage (water quality)
 40 acre-feet total pond size

Basin 3 (existing conditions)
 23 acre-feet storage volume (detention)
 10 acre-feet dead storage (water quality)
 33 acre-feet total pond size

Concerns for Subbasin 3:

- It needs to be determined if there is sufficient drop in the topography to allow for the proposed 10 feet of live storage, as proposed in the conceptual layout of the pond. If not, the pond will have to be significantly enlarged.
- For a preliminary review of the subbasin, it appears that it may be better to construct two ponds to allow drainage from all areas of the subbasin.
- An investigation should be made to determine if it is possible to use all or a portion of the existing wastewater treatment plant for the pond construction.

Project Costs

The construction cost estimates for this work are based on a review of actual costs for past King County construction projects. The design and construction management and inspection costs, calculated as a percentage of the construction cost, are based on cost curves from past King County projects and compare those items to the construction costs. Note that these project costs do not include any additional costs for studies on the potential effectiveness and performance of water quality ponds in removing phosphorus, master planning, and environmental impact statement or monitoring programs.

To familiarize the reader with the engineering components used in this analysis for estimating total project costs, the major components are defined below. The components are typical of King County's engineering estimating processes, but could change depending on how the City of Black Diamond chooses to implement this plan.

Feasibility/Concept Alternative

Includes review of various alternatives, conceptual design of the recommended alternative, and the State Environmental Policy Act (SEPA). (SEPA assumes a Mitigated Determination of Non-Significance and not an Environmental Impact Statement.)

Land Acquisition

The total cost to acquire the land in fee title or easement (based on King County Assessed value), including appraisals, title reports, and staff time to negotiate the acquisition.

Final Design and Permitting

The total costs needed to prepare construction plans and specifications, conduct public meetings, design survey, secure all permits, prepare any special studies needed for design or permit approval, and advertise and award the construction contract.

Construction

Includes all associated construction costs (including sales tax) and contingencies.

Construction Management and Inspection

Includes all costs to manage the construction, including inspection, billing, dispute resolution, construction survey, material testing, etc.

These costs do not include the costs to prepare a Master Utility Plan. The expected cost to prepare a Master Utility Plan is estimated in the range of \$350,000 to \$500,000. Even though these costs would represent an additional upfront expenditure, it is anticipated that savings in the design and construction phase would exceed this amount.

According to a cost analysis comparing the total project costs for the existing land use to the future land use, it was determined that there would be an increase in costs of approximately 10 percent for Subbasins 1 and 3. These basins are predominately developed and not expected to change dramatically. For Subbasin 2, even though it has a large amount of undeveloped area, the total project cost would increase only slightly, due to zoning restrictions within the undeveloped portion of the subbasin.

A cost analysis was done for four scenarios: (1) current land use, with new pipes to convey all surface water to the proposed ponds; (2) future land use, with new pipes to convey all surface water to the proposed ponds; (3) current land use, with limited pipes to the proposed ponds; and (4) future land use, with limited pipes to the proposed ponds. In the limited pipe scenario, the existing pipes and open ditches would be used to convey the storm flow. Cost estimates for all of these are included in Appendix G of this report. However, in order to provide a comparison of the high and low range of project costs, only the existing land use, with pipes at the pond inlet and outlet, and future land use, with all new pipes, are included in the body of this report.

Subbasin 1

Construction of One Pond in Subbasin 1 for Existing Development with Limited Pipe Infrastructure (New pipes only constructed at the inlet and outlet to the pond — existing pipes and ditches used to convey the runoff)

Feasibility/Concept Alternatives	\$ 161,200
Land Acquisition	312,000
Final Design and Permitting	161,200
Construction	1,612,170
Construction Management and Inspection	<u>205,500</u>
Total Project Cost	\$2,452,070

Construction of One Pond in Subbasin 1 for Future Development with Complete Pipe Infrastructure (as shown in the conceptual layout in Appendix F)

Feasibility/Concept Alternatives	\$ 265,800
Land Acquisition	337,000
Final Design and Permitting	265,600
Construction	2,855,900
Construction Management and Inspection	<u>325,700</u>
Total Project Cost	\$3,849,800

Subbasin 2

Construction of One Pond in Subbasin 2 for Existing Development with Limited Pipe Infrastructure (New pipes only constructed at the inlet and outlet to the pond — existing pipes and ditches used to convey the runoff)

Feasibility/Concept Alternatives	\$ 324,500
Land Acquisition	162,000
Final Design and Permitting	324,500
Construction	3,244,700
Construction Management and Inspection	<u>393,500</u>
Total Project Cost	\$4,449,200

Construction of Two Ponds in Subbasin 2 for Future Development and Complete Pipe Infrastructure (as shown in the conceptual layout in Appendix F)

Feasibility/Concept Alternatives	\$ 440,500
Land Acquisition	212,000
Final Design and Permitting	440,500
Construction	4,404,850
Construction Management and Inspection	<u>527,000</u>
Total Project Cost	\$6,024,850

Subbasin 3

Construction of Two Ponds in Subbasin 3 for Existing Development with Limited Pipe Infrastructure (New pipes only constructed at the inlet and outlet to the pond — existing pipes and ditches used to convey the runoff)

Feasibility/Concept Alternatives	\$ 82,300
Land Acquisition	72,000
Final Design and Permitting	82,300
Construction	823,350
Construction Management and Inspection	<u>114,775</u>
Total Project Cost	\$1,174,725

Construction of Two Ponds in Subbasin 3 for Future Development and Complete Pipe Infrastructure (as shown in the conceptual layout in Appendix F)

Feasibility/Concept Alternatives	\$ 178,325
Land Acquisition	87,000
Final Design and Permitting	178,325
Construction	1,783,200
Construction Management and Inspection	<u>225,250</u>
Total Project Cost	\$2,452,100

Total Project Cost

Construction Ponds for Existing Development with Limited Pipe Infrastructure
(New pipes only constructed at the inlet and outlet to the pond — existing pipes and ditches used to convey the runoff)

Feasibility/Concept Alternatives	\$ 568,000
Land Acquisition	546,000
Final Design and Permitting	568,000
Construction	5,680,220
Construction Management and Inspection	<u>713,775</u>
Total Project Cost	\$8,075,995

Construction of Ponds for Future Development and Complete Pipe Infrastructure
(as shown in the conceptual layout in Appendix F)

Feasibility/Concept Alternatives	\$ 884,425
Land Acquisition	636,000
Final Design and Permitting	884,425
Construction	8,843,950
Construction Management and Inspection	<u>1,077,950</u>
Total Project Cost	\$12,326,750

Recommendation

Based on our field visit, review of existing data, and initial modeling, we found nothing from an engineering standpoint that would prohibit the construction of these ponds and the associated infrastructure. However, there are a number of significant issues that will need to be resolved in the planning and concept alternative phases prior to proceeding with the detail design. The main issues are as follows:

1. How can this work be coordinated with other utility work in order to reduce costs and minimize construction impacts?
2. Is there sufficient land available to construct the proposed ponds?
3. How deep can you feasibly construct these ponds?
4. Should construction be phased and, if so, what areas have the highest priority?