Division of Geological & Geophysical Surveys

Public-data File 92-11

MISCELLANEOUS WATER QUALITY AND STREAM FLOW DATA FROM THE GOLD CREEK DRAINAGE BASIN, JUNEAU, ALASKA

by

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Division of Water

Released by

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological &
Geophysical Surveys

in cooperation with
Division of Water

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INTRODUCTION

The Alaska Department of Natural Resources collected miscellaneous geochemical and stream flow data intermittently in the Gold Creek drainage basin between 1989 and 1991. The data presented in this report are not otherwise contained in accessible databases. The Gold Creek watershed is located east of downtown Juneau, has an area of approximately 10 square miles, and discharges into Gastineau Channel. Field notes are located in the Juneau Office of the Division of Water.

METHODS

Alkalinity and pH determinations were done in the field at the time of sampling if possible. Alkalinity was done at the end of the day in the office if outside air temperature prevented proper titration.

Water samples were collected in a one liter Nalgene bottle. The collection bottle was rinsed with deionized water before each sample collection, and then rinsed three times with sample water. From the sample collection bottle, a 125 ml subsample was filtered (.45um Millipore Type HA) and fixed with five to eight drops of ultra-pure nitric acid for cation determination. A second 125 ml subsample was filtered and collected for anion determination. All samples were kept at approximately 4 degrees Celsius in a cooler.

All samples were sealed with tape and mailed first class to DNR's Water Quality laboratory in Fairbanks following the chain of custody procedures described by Munter and others (1990). A separate cover letter listing all samples, with dates and times of collection, was sent at the same time to ensure all samples arrived.

Stream flows were measured with a pygmy meter and top setting wading rod using the midsection method (Rantz and others, 1982). Locations were selected where the stream has relatively straight reaches, with laminar flow, and without turbulent or choppy water. A cross-section was selected that was free from obstructions such as logs, weeds, and large boulders. Standard procedures were followed as outlined in Lyons (1988), and Rantz and others, (1982).

RESULTS

Data are listed in Tables-1 through 3 for clarity and convenience. Original laboratory reports are contained in Appendix A. Original discharge data sheets are contained in Appendix B.

Table-1 contains major ion results for three separate sampling rounds. February 7th and 8th, 1990 samples were collected during a winter low flow period with a Gold Creek average daily flow of 11 and 9.9 cfs, respectively. September 26th, 1990 samples were collected with a Gold Creek average daily flow of 99 cfs. February 15th, 1991 samples were collected after a pump test of the City and Borough of Juneau's well field.

Table-2 contains stable isotope results collected May 14th and 15th, 1991. Samples were analyzed by the Stable Isotope Laboratory at Southern Methodist University in Dallas, Texas.

Table-3 contains stream discharge measurements. The December 7th, 1990 flow was measured at the same time as the USGS and Echo Bay Mines personnel to verify methods and results. The December 19th, 1990 measurements were to document the recharge in the upper reach in Last

Chance Basin. The November 4th, 1991 measurements were to verify the amount of discharge in Gold Creek from Silverbow Basin, Granite Creek, and the Nowell placer drainage tunnel.

ACKNOWLEDGMENTS

Roman Motyka of DGGS and John Dunker of DOW provided help in the field, Scott Ray and Jim Vohden of DOW at the Fairbanks laboratory analyzed the samples, and Jim Munter of DOW provided technical review and comment on the results.

Table-1
DNR SAMPLING RESULTS
for
Gold Creek Drainage Basin

All units mg/l except pH
See Figure-1 for location of sample sites

7 February 1990
Gold Creek flow: 11 cfs

Location	Ca	Mg	Na	K	HCO_3	SO_4	Cl	pH
Spring near PW-1	27.9	3.16	0.94	0.78	76.5	13.8	1.5	7.23
USGS gage	27.0	8.98	1.36	1.50	42.6	57.3	1.7	7.79
Tunnel	114	79.0	8.80	5.17	136	489	1.3	8.51
PW-3	21.8	5.63	0.84	1.08	40.2	31.9	1.7	7.09

8 February 1990
Gold Creek flow: 9.9 cfs

Ebner Falls	10.6	1.75	0.57	0.84	25.6	9.60	2.1	7.89
Spring Line	21.9	6.43	0.93	1.16	44.0	34.5	2.1	7.65

26 September 1990
Gold Creek flow: 99 cfs

Location	Ca	Mg	Na	K	HCO_3	SO_4	Cl	pH
Mt. Juneau Talus Slope flow	10.6	2.84	0.77	0.28	34.0	4.07	0.37	6.23
USGS gage	16.6	4.62	0.84	0.98	34.0	31.3	0.34	7.87
Tunnel	89.4	34.5	3.12	4.13	121	214	0.10	7.87
PW-3	16.2	3.55	1.01	0.89	39.1	20.9	0.37	7.49
Gold Ck above tunnel	7.76	1.01	0.55	0.62	21.6	4.09	0.28	6.18
Spring Line	14.7	2.77	0.81	0.87	36.7	13.7	0.34	7.44

15 February 1991
Gold Creek flow: 85 cfs

Location	Ca	Mg	Na	K	HCO_3	SO_4	Cl	pH
Seep near chlorination bldg	25.5	4.09	1.3	1.04	61.0	22.3	0.79	6.75
USGS gage	14.5	2.90	1.0	0.84	31.7	20.4	0.83	7.98
Ditch across from PW-4	23.5	12.2	1.2	1.10	48.8	37.6	0.74	6.60
Spring Line	23.2	4.52	1.1	0.97	43.9	33.3	0.72	7.23

Table-2
DNR SAMPLING RESULTS
for
Stable Isotopes[1]
from the
Gold Creek Drainage Basin

See Figure-1 for location of sample sites

Location	Sample Date	$^{18}O/^{16}O$ (PDB-CO_2)	D/H (SMOW)
Mt. Juneau Talus Slope flow	5/14/90	-13.78	-101.8
Mt. Juneau Talus Slope flow	5/14/90	-13.75	-102.8
USGS gage	5/14/90	-14.62	-104.4
Tunnel	5/14/90	-13.93	-100.2
PW-3	5/15/90	-13.52	-98.1
Gold Ck above tunnel	5/14/90	-14.61	-102.3
Spring Line	5/14/90	-13.95	-100.1

[1]Analyzed by: Stable Isotope Laboratory, Institute for the Study of Earth and Man, Southern Methodist University, Dallas, Texas.

Table-3
DNR Instantaneous
Stream Discharge Measurements

See Figure-1 for location of sample sites

Date	Time	Location	Flow	Remarks
12/7/90	0945	Gold Creek, Bridge at Salmon Bake	29.8	
12/19/90	1200	Gold Creek, ore cart half way between tunnel and Salmon Bake bridge	13.3	
12/19/90	1400	Gold Creek, Bridge at Salmon Bake	7.33	
11/4/91	0942	Gold Creek, 250m above bridge over Granite Creek	1.08	Gold Creek flow out of Silverbow Basin
11/4/91	1033	Gold Creek, 250m below bridge over Granite Creek	10.9	Combined Gold Creek flow out of Silverbow Basin and Granite Creek flow
11/4/91	1130	Flow from Nowell placer drainage tunnel	8.31	Flow out of Silverbow basin that is within 400 feet of glory holes
11/4/91	1230	Gold Creek, 100m above metal trail bridges	23.3	Gold Creek flow increase from talus slope base flow

REFERENCES CITED

Lyons, S., 1988, Stream Discharge Measurement Handbook, U.S. Department of the Interior, Fish and Wildlife Service, Region 7, 15 p.

Munter, J.A., Maurer, M.A., and Moorman, M., 1990, Evaluation of the hydrology and geology of the Moonlight Springs area, Nome, Alaska: quality assurance project plan: Alaska Division of Geological and Geophysical Surveys Public-Data File 90-8, 23 p.

Rantz S.E. and others, 1982, Measurement and Computation of Streamflow: Volume 1: U.S. Geological Survey Water-Supply Paper 2175, Chapter 5, 284 p.

APPENDIX A

LABORATORY REPORTS

Feb 7, 1990

Site Name	T	pH	Na	K	Ca	Mg	Li	Cations	HCO3	SO4	F	Cl	Anions	Bal %	SiO2	H2S	TDS
RM89TAT-hot	68	8.41	110.00	4.15	17.8	0.64	0.59	5.92	188.0	18.8	22.00	23.30	5.33	10.5	30.0	3.74	373.6
PW-1		7.23	0.94	0.78	27.9	3.16	0.00	1.71	76.5	13.8	0.05	1.50	1.59	7.7	2.0		87.8
USGS -stat		7.79	1.36	1.50	27.0	8.98	0.00	2.18	42.6	57.3	0.03	1.70	1.94	11.8	3.0		121.9
AJ Mine		8.51	8.80	5.17	114.0	79.00	0.00	12.70	136.2	489.0	0.07	1.30	12.45	2.0	3.0		767.4
PW-3		7.09	0.84	1.08	21.8	5.63	0.00	1.61	40.2	31.9	0.02	1.70	1.37	16.2	2.0		84.8
Ebner Falls		7.97	0.57	0.84	10.6	1.75	0.00	0.72	25.6	9.6	0.02	2.10	0.68	5.7	2.2		40.3
Spring Line		7.65	0.93	1.16	21.9	6.43	0.00	1.69	44.0	34.5	0.02	2.10	1.50	12.0	3.3		92.0
RM89TAT-cold			2.25	0.17	1.7	1.25	0.00	0.29		4.2	0.21	4.20	0.22	28.6	6.9		20.9

26 Sept Sampled

Data for Rick Noll

ALL VALUES IN MG/L

SAMPLE ID	FLUORIDE	CHLORIDE	NITRATE	PHOSPHATE	SULFATE	pH
Mt. Juneau	0.09	0.37	0.15	<0.01	4.07	6.73
Gold Creek	0.06	0.28	0.19	<0.01	4.09	6.18
Spring line	0.11	0.34	0.13	<0.01	13.7	7.44
AJ Tunnel	0.57	0.10	0.11	<0.01	214	7.87
PW-3	0.12	0.37	0.17	<0.01	20.9	7.49
USGS	0.14	0.34	0.19	<0.01	31.3	7.87

ALL VALUES IN MILLIEQUIVALENTS

SAMPLE ID	FLUORIDE	CHLORIDE	NITRATE	PHOSPHATE	SULFATE
Mt. Juneau	4.74	10.45	10.71	0.00	84.79
Gold Creek	3.16	7.91	13.57	0.00	85.21
Speing Lime	5.79	9.60	9.29	0.00	285.42
AJ Tunnel	30.00	2.82	7.86	0.00	4458.33
PW3	6.32	10.45	12.14	0.00	435.42
USGS	7.37	9.60	13.57	0.00	652.08

CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	ALKALINITY
10.6	2.84	0.77	0.28	34.0
7.76	1.01	0.55	0.62	21.6
14.7	2.77	0.81	0.87	36.7
89.4	34.5	3.12	4.13	121
16.2	3.55	1.01	0.89	39.1
16.6	4.62	0.84	0.98	34.0

CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	ALKALINITY	SUM(ANIONS)
528.94	233.74	33.49	7.16	680.00	790.69
387.23	83.13	23.92	15.86	432.00	541.85
733.53	227.98	35.23	22.25	734.00	1044.10
4461.08	2839.51	135.71	105.63	2420.00	6919.02
808.38	292.18	43.93	22.76	782.00	1246.33
828.34	380.25	36.54	25.06	680.00	1362.63

SUM(CATIONS)	DIFFERENCE	% Diff
803.34	-12.65	-1.58668318
510.13	31.71	6.029373096
1019.00	25.10	2.432901768
7541.92	-622.91	-8.61502203
1167.26	79.07	6.551968577
1270.19	92.44	7.021819182

State of Alaska
Division of Geological and Geophysical Surveys
Water Quality Laboratory
209 O'Neill University of Alaska Fairbanks Fairbanks, Alaska 99775 (907)474-7713

Client: DGGS / Juneau

Submitted By: Rick Noll

Date Submitted: February, 1991

Sample	Fluoride	Chloride	Nitrate	Phosphate	Sulfate
SP1	0.28	0.79	0.28	<DL	22.3
USGS	0.10	0.83	0.42	<DL	20.4
Ditch Flow	0.15	0.74	0.34	<DL	37.6
Spring Line	0.14	0.72	0.31	<DL	33.3
Units	mg/l	mg/l	mg NO_3*N/l	mg PO_4*P/l	mg/l
EPA Method	300.0	300.0	300.0	300.0	300.0
Detection Limit	0.01	0.01	0.02	0.1	0.01
RPD	1.9	2.2	4.0	*	1.0
% Recovery	99	92	90	96	94

* Relative Percent Difference (RPD) cannot be calculated when values are below detection limit.

Approved By _____ Date 28FEB91

Jim Vohden, Chemist

State of Alaska
Division of Geological and Geophysical Surveys
Water Quality Laboratory
209 O'Neill University of Alaska Fairbanks Fairbanks, Alaska 99775 (907)474-7713

Client: DGGS / Juneau

Submitted By: Rick Noll

Date Submitted: February, 1991

Sample	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese
SP1	25.5	4.09	1.3	1.04	0.22	0.05
USGS	14.5	2.90	1.0	0.84	0.11	<DL
Ditch Flow	23.5	12.2	1.2	1.10	0.12	<DL
Spring Line	23.2	4.52	1.1	0.97	0.12	<DL
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
EPA Method	AES 0029	AES 0029	273.1	258.1	AES 0029	AES 0029
Detection Limit	0.01	0.01	0.1	0.01	0.03	0.01
RPD	9.4	1.2	0.2	1.8	3.8	5.1
% Recovery	104	103	96	99	103	91

Approved By _____ Date 28FEB91

Jim Vohden, Chemist

State of Alaska; Noll
6 samples received 6/23/90
Analyses by: SMU/ISEM Stable Isotope Laboratory

Sample	18O/16O(PDB-CO2)		D/H(SMOW)	
Spring Line	-13.95		-100.1	
PW3	-13.52		-98.1	
GC-1	-14.61		-102.3	
Tunnel	-13.93		-100.2	
Mt. Juneau	-13.78	-13.75	-101.8	-102.8
USGS Station	-14.62		-104.4	

APPENDIX B

DISCHARGE DATA SHEETS

State of Alaska Gold Creek ~~Salmon River~~ Bridge
Dept. of Natural Resources
Div. of Geological & Geophysical Surveys

Page 1 of 2
7 Dec 90

Meas. No. .....

WATER RESOURCE INVESTIGATIONS

Comp. by .....

DISCHARGE MEASUREMENT NOTES

Checked by .....

Sta. No. .....

Gold Creek Bridge at Salmon Bake

Date 7 Dec 1990 Party Thomas (USGS) Berg, Trim, Atkins (EBE), Nolt, Dunker

Width 25' Area 27.14 Vel. ..... G. H. ..... Disch. 29.76

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS (upstream)				
Time		Recorder	Inside	Outside
09.45			4.40	4.72
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter Pygme

Date rated 1-4-79 ..... for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 44 sec. after 38

Meas. plots .... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side

bridge 50 feet, mile, above, below

gage, and .....

Check-bar, found .....

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section Good x Section some large boulders upstream

Flow 29.76 Weather overcast

Other ..... Air .....°F@ .....

Gage ..... Water .....°F@ .....

..... Record removed ..... Intake flushed U .....

Observer .....

.....

Control .....

.....

Remarks Measured with USGS & EBE to test meters
USGS - 31.84 CFS, DGGS - 29.76 CFS, EBE - 23.9 CFS
AT LOWER BRIDGE USGS HAD 35.5 CFS

G. H. of zero flow ..... ft.

Rite in the Rain WEATHERPROOF S-768 U.S. GAUGING CORP. TACOMA, WASH. U.S.A.

River at—

Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
RB 33.4	.45									
32.5	.7	.56		5	43	.140			.392	.055
32.0	.9	.61		25	47	.546			.549	.300
30.7	1.05	.66		25	46	.557			.693	.386
29.9	.85	1.4		25	46	.557			1.190	.663
29.0	.95	.9		35	41	.990			.855	.752
28.0	1	1.31		50	43	1.16			1.31	1.520
27.0	1	1.4		40	43	.936			1.4	1.31
26.0	1	1.6	.8	50	41	1.22	1.124		1.6	1.798
"		"	3.2	45	44	1.028			—	—
25.0	1	1.6	3.2	60	44	1.36	1.275		1.6	2.04
"		"	.8	50	42	1.19			—	—
24.0	1	1.60	.8	40	45	.895	1.138		1.6	1.821
"		"	3.2	80	54	1.47			—	—
23.0	1	1.42		50	42	1.19			1.42	1.69
22.0	1	1.62	2.8	60	42	1.42	1.049		1.62	1.699
"		"	.8	30	45	.678			—	—
21.0	1	1.62	.8	40	41	.980	1.27		1.62	2.057
"		"		80	51	1.56			—	—
20.0	1	1.74	.85	25	42	.608	1.14		1.74	1.984
"		"		60	42	1.42			—	—
19.0	1	1.52	.75	50	43	.948	1.254		1.52	1.906
"		"		80	51	1.56			—	—
18.0	1	1.08		60	43	1.39			1.08	1.501
17.0	1	1.26		80	54	1.47			1.26	1.852
16.0	1	1.24		60	43	1.39			1.24	1.724
15.0	1	1.06		60	40	1.49			1.06	1.579
14.0	1	.84		50	40	1.25			.84	1.05
13.0	1	.89		50	40	1.25			.89	1.113
12.0	1	.80		40	45	.895			.80	.716
11.0	1	.50		20	48	.433			.50	.217
10.0	1	.36		3	50	.085			.36	.031

.0 .10 .20 .30 .40 .50 .60 .70 .75

State of Alaska
Dept. of Natural Resources
Div. of Geological & Geophysical Surveys

2 of 2

Meas. No. .....

WATER RESOURCE INVESTIGATIONS

Comp. by .....

DISCHARGE MEASUREMENT NOTES

Checked by .....

Sta. No. .....

Gold Creek Bridge at Salmon Bake

Date 7 Dec 1970 Party same as sheet 1

Width ..... Area ..... Vel. ..... G. H. ..... Disch. .....

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter .....

Date rated ..... for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. ..... after .....

Meas. plots .... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found ..... changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section .....

Flow ..... Weather .....

Other ..... Air .....°F@ .....

Gage ..... Water .....°F@ .....

..... Record removed ..... Intake flushed U L .....

Observer .....

.....

Control .....

.....

Remarks .....

.....

.....

G. H. of zero flow ..... ft.

S-768

River at—

Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
9.0	.5			0	0	—				—
LEW	11:35am									

.0 .10 .20 .30 .40 .50 .60 .70 .75

Gold Creek Between Snowslide Gulch & Salmon Bay
A DEC 90

State of Alaska
Dept. of Natural Resources
Div. of Geological & Geophysical Surveys

Meas. No. .....

WATER RESOURCE INVESTIGATIONS

Comp. by RN

DISCHARGE MEASUREMENT NOTES

Checked by RJM

Sta. No. LCR-1

90 ft u/s from wing dam, Yukon River

Date 12/19, 19 90 Party [illegible]

Width 12.4 Area 14.38 Vel. .92 G. H. ..... Disch. 13.30 cfs

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter Price AA

Date rated 1-15-79 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 49.0 sec after 32

Meas. plots ..... % diff. from rating .....

(Wading), cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found .....

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), (good (5%), fair (8%)), poor (over 8%), based on following conditions: Cross section .....

Flow Slightly Turbulent Weather Cold & Clear

Other ..... Air 18.8 °F@ Noon

Gage ..... Water 37 °F@ 11:45

..... Record removed ..... Intake flushed U

Observer .....

Control .....

Remarks .....

G. H. of zero flow ..... ft.

S—768

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle coefficient	Dist. from initial point (ft)	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
R'l	10.0"	1	1.01'		0						
	11	1	.7		3	46	0.09			0.7	0.06
	13	1	0.88		40	54	0.75			0.88	0.66
	14	1	1.0		60	44	1.36			1.0	1.36
	15	1	1.31		40	42	0.957			1.31	1.25
	16	1	1.32		50	47	1.07			1.32	1.41
	17	1	1.28		60	40	1.49			1.28	1.91
	18	1	1.05		60	42	1.42			1.05	1.49
	19	1	1.00		80	45	1.76			1.0	1.76
	20	1	0.92		60	44	1.36			0.92	1.25
	21	1	0.78		25	42	.608			0.78	0.47
	22	1	0.74		20	41	.503			0.74	0.37
	23	1	0.80		25	47	.546			0.80	0.44
	24	1	0.85		20	44	.470			0.85	0.40
⊙	25	1	0.75		15	47	.338			0.75	0.25
	26	1	1.00		10	54	.207			1.00	0.21
	27										
	[illegible]										
											13.30

.80 .88 .90 .92 .94 .95 .97 .98 .99 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

Gold Creek Salmon Bake Bridge
19 DEC 90

State of Alaska
Dept. of Natural Resources
Div. of Geological & Geophysical Surveys

Meas. No. .....

WATER RESOURCE INVESTIGATIONS

Comp. by .....

DISCHARGE MEASUREMENT NOTES

Checked by .....

Sta. No. 48

Salmon Bake [illegible]

Date 12/19, 19 90 Party [illegible] & RJM

Width 21.0 Area 20.80 Vel. .35 G. H. ..... Disch. 733 cfs

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter Pygmy

Date rated 1-4-89 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. FROZEN after FROZEN
SPIN BACK AT OFFICE = 46 SEC

Meas. plots ..... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found 4.3 ft.

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section meter was frozen at start

Flow ..... Weather Cold & Clear

Other ..... Air 1 °F @ 2:30 PM

Gage ..... Water 33 °F @ .....

..... Record removed ..... Intake flushed .....

Observer .....

Control .....

Remarks .....

G. H. of zero flow ..... ft.

Rite in the Rain WATERPROOF S-768 U.S. DEPTS. COMM. PACOMA, WASH. U.S.A.

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	left edge										
	9.0										
	10.0	1	0.63		3	56	.078			0.63	0.05
	11.0	1	0.73		10	44	.248			0.73	0.18
	12.0	1	0.70		10	53	.210			0.70	0.15
	13.0	1	0.80		10	49	.225			0.80	0.18
	14.0	1	0.87		10	48	.230			0.87	0.20
	15.0	1	1.02		20	52	.402			1.02	0.41
	16.0	1	1.01		20	54	.388			1.01	0.39
	17.0	1	1.09		15	62	.263			1.09	0.29
	18.0	1	1.22		20	42	.492			1.22	0.60
	19.0	1	1.35		20	46	.451			1.35	0.61
	20.0	1	1.35		20	46	.451			1.35	0.61
	21.0	1	1.37		25	50	.515			1.37	0.71
	22.0	1	1.33		15	44	.359			1.33	0.48
	23.0	1	1.24		20	45	.461			1.24	0.57
	24.0	1	1.30		25	48	.535			1.30	0.70
	25.0	1	1.19		15	41	.387			1.19	0.46
	26.0	1	1.12		15	49	.325			1.12	0.36
	27.0	1	1.10		10	48	.230			1.10	0.25
	28.0	1	1.10		0					~~1.10~~	
	29.0		est				0.1			1.38	0.14
	Rt edge										
											7.33

.0 .10 .20 .30 .40 .50 .60 .70 .75

Meas. No. 1

Comp. by RICK

Checked by .....

DISCHARGE MEASUREMENT NOTES

Sta. No. SC-1

250 M ABOVE BRIDGE OVER GRANITE CK
SILVER BOW BASIN DRAINAGE

Date 4 NOV 19 91 Party ROMAN NOTTICK/RICK NOW

Width 4.5 Area 2.00 Vel. .57 G. H. NONE Disch. 1.08 CFS

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
0942	STATION 1			
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter PYGMY

Date rated 4-4-79 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 56 SEC after 36

Meas. plots ..... % diff. from rating .....

Wading, cable, ice, boat. upstr., downstr., side

bridge 250 + MD feet, mile, above, below

gage, and .....

Check-bar. found .....

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section LOW FLOW, NO TURB

Flow ..... Weather OVERCAST RAIN/SNOW

Other ..... Air 28-38 °F @ 942

Gage ..... Water .....°F @ .....

..... Record removed ..... Intake flushed U .....

Observer .....

.....

Control .....

.....

Remarks .....

.....

.....

G. H. of zero flow ..... ft.

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
RB	0.75	RIGHT	BANK								
	9.0	.65	NO	FLOW							
	8.5	.5	.5		7	57		.146		.25	.04
	8.0	.5	.7		15	52		.308		.35	.11
	7.5	.5	.6		40	52		.778		.30	.23
	7.0	.5	.6		40	51		.743		.30	.24
	6.5	.5	.55		25	46		.557		.28	.16
	6.0	.5	.6		25	45		.569		.30	.17
	5.5	.38	.5		30	46		.664		.19	.13
LB	5.25	.13	.25					.5E		.03	.02
										2.05	1.08

Meas. No. 2

Comp. by R. Holly

Checked by .....

DISCHARGE MEASUREMENT NOTES

Sta. No. GC-2

250 m BELOW GRANITE CREEK BRIDGE COMBINED FLOW

Date 4 Nov 1991 Party R. MOTYKA & R. HOLLY

Width 16.70 Area 2.715 Vel. .40 G. H. NONE Disch. 1.094

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
0942	STATION 1			
1033	STATION 2			
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter PYGMY

Date rated 4-4-79 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 38 SEC. after 31

Meas. plots .... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found ..... changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section SLOW DEEP POOL, LAMINAR FLOW, FEW LARGE ROCKS

Flow ..... Weather OVERCAST - RAIN/SNOW

Other ..... Air .....°F@ .....

Gage ..... Water .....°F@ .....

..... Record removed ..... Intake flushed U .....

Observer .....

.....

Control .....

.....

Remarks .....

.....

.....

G. H. of zero flow ..... ft.

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
RB	26.0	.5					0				0
	25.0	1	2.0		NO FLOW		0			2.0	0
	24.0	1	2.0		NO FLOW		0			2.0	0
	23.0	1	2.0		15	51	.314			2.0	.628
	22.0	1	2.1		30	46	.664			2.1	1.39
	21.0	1	2.1		25	46	.557			2.1	1.17
	20.0	1	2.3		20	40	.575			2.3	1.18
	19.0	1	2.1		20	45	.402			2.1	.844
	18.0	1	1.9		25	45	.569			1.9	1.08
	17.0	1	1.75		15	45	.352			1.75	.616
	16.0	1	1.6		15	42	.375			1.6	.600
	15.0	1	[illegible]		20	45	.515			1.55	.798
	14.0	1	[illegible]		25	45	.564			1.4	.797
	13.0	1	[illegible]		20	42	.442			1.35	.577
⊙	12.0	1	1.15		10	45	.243			1.15	.280
	11.0	1	1.1		15	42	.375			1.1	.412
	10.0	.95	1.2		20	42	.476			1.02	.512
LB	9.0	.35			EST.		.20			.21	.042
										27.63	[illegible]

Meas. No. 3

Comp. by R. Nolt

Checked by .....

DISCHARGE MEASUREMENT NOTES

Sta. No. VC 3

SILVER BOW BASIN TUNNEL DRAINAGE - BELOW TRAIL BRIDGE

Date 4 Nov, 1971 Party R. MOTYKA & R. NOLT

Width 13.1 Area 8.65 Vel. .96 G. H. NONE Disch. 8.31

Method ..... No. secs. ..... G. H. change ..... m ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
0942	STATION #1			
1033	STATION #2			
1130	STATION #3			
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter PYGMY

Date rated 4-4-74 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 0.31, @ 2.2 after ?

Meas. plots .... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found .....

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), (fair (8%)), poor (over 8%), based on following conditions: Cross section FAST SHALLOW FLOW SOME TURBULENCE

Flow ..... Weather OVERCAST & COOLING

Other ..... Air .....°F@ .....

Gage ..... Water .....°F@ .....

..... Record removed ..... Intake flushed .....

Observer .....

.....

Control .....

.....

Remarks SMALL BRAID OFF MAIN LK ENTER JUST ABOVE MEASUREMENT. THIS FLOW ENTERS BETWEEN 2 ROCKS FORMING A UNIFORM DEPTH. ONE FLOW MEASUREMENT WAS TAKEN TO SUBTRACT FROM THE TOTAL FLOW.

~~G. H. of zero flow~~

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
RB	5.5	.5					.10			.088	.009
	6.5	1	.35		15	52	.308			.35	.108
	7.5	1	.40		15	44	.359			.40	.144
	8.5	1	.45		25	41	.622			.45	.280
	9.5	1	.55		30	40	.759			.55	.418
	10.5	1	.70		50	41	1.23			.70	.854
	11.5	1	.90		60	45	1.33			.90	1.20
	12.5	1	.95		70	41	1.68			.95	1.60
	13.5	1	.95		80	45	1.76			.95	1.67
	14.5	1	1.0		40	48	.876			1.0	.876
	15.5	1	.85		40	43	.936			.85	.796
	16.5	1	.80		10	50	.221			.80	.177
	17.5	1.05	.50		25	51	.505			.525	.265
LB	18.6	.55					.20			.137	.027
⊙										8.65	8.42
		MAIN BRAID FROM GOLD CK									
		1.3	.20		20	46	.451			.26	.117
											8.31

Meas. No. 4

Comp. by R. Nolle

Checked by

DISCHARGE MEASUREMENT NOTES

Sta. No. GC-4

GOLD CK ABOVE METAL TRAIL BRIDGES ≈ 100 m

Date 4 NOV 1991 Party R. MOTYKA & R. NOLLE

Width 29.0 Area 21.40 Vel. .51 G. H. NONE Disch. 23.34

Method ..... No. secs. ..... G. H. change ..... in ..... hrs. Susp. .....

Method coef. ..... Hor. angle coef. ..... Susp. coef. ..... Meter No. .....

GAGE READINGS				
Time		Recorder	Inside	Outside
0947	STATION	#1		
1033	STATION	#2		
1130	STATION	#3		
1230	STATION	#4		
Weighted M. G. H.				
G. H. correction				
Correct M. G. H.				

Type of meter PRICE

Date rated 4-4-79 for rod, other.

Meter ..... ft. above bottom of weight.

Spin before meas. 34 after 32

Meas. plots .... % diff. from rating .....

Wading, cable, ice, boat, upstr., downstr., side bridge ..... feet, mile, above, below gage, and .....

Check-bar, found .....

changed to ..... at .....

Correct .....

Levels obtained .....

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section SLIGHTLY TURBID, SHALLOW SECTION

Flow ..... Weather .....

Other ..... Air .....°F@ .....

Gage ..... Water .....°F@ .....

..... Record removed ..... Intake flushed U .....

Observer .....

.....

Control .....

.....

Remarks .....

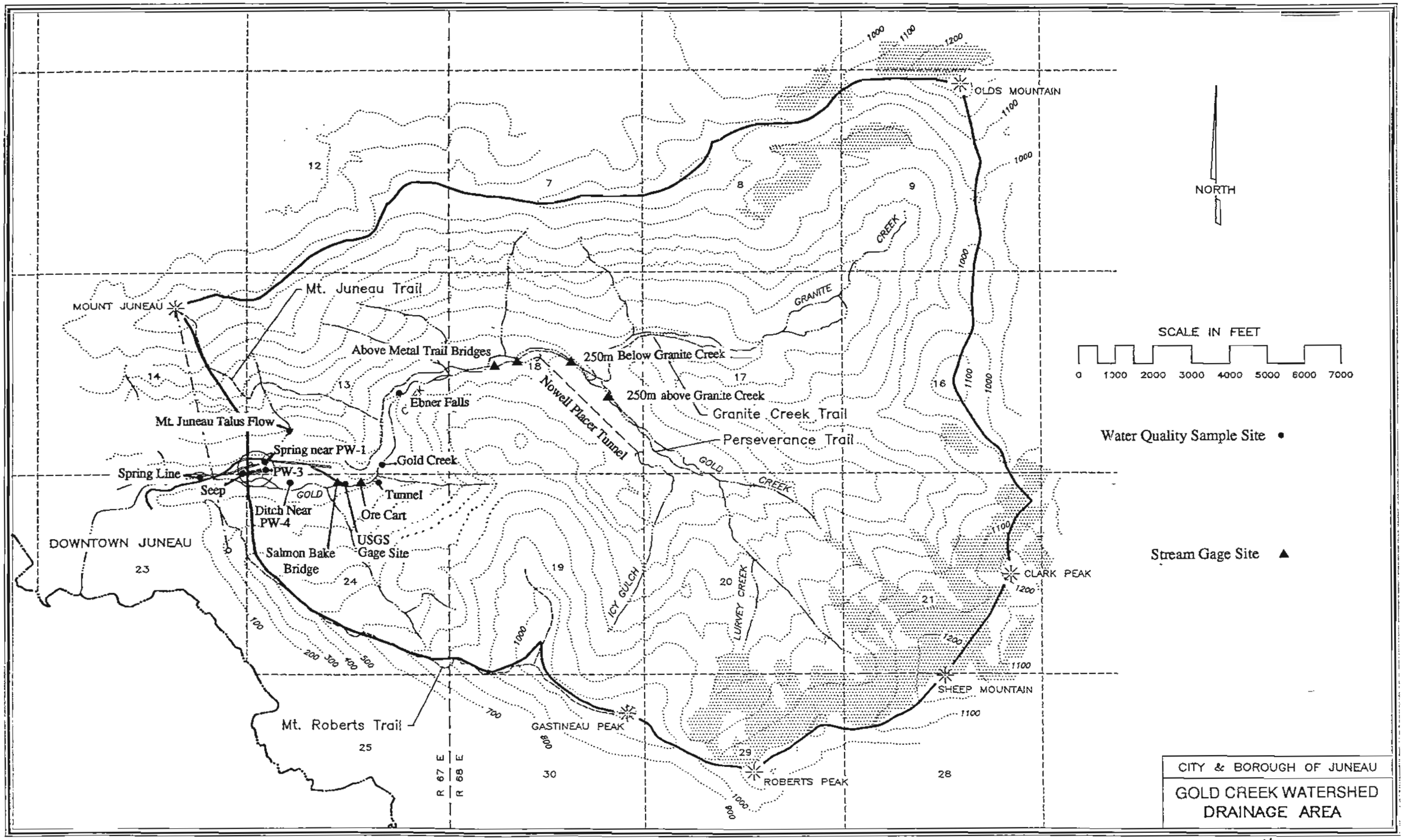
.....

.....

G. H. of zero flow ..... ft

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
RB	4.0	.5					.10			.15	.015
	5.0	1	.6		15	54	.298			.6	.179
	6.0	1	.4		15	48	.332			.4	.133
	7.0	1	.5		5	54	.116			.5	.058
	8.0	1	.4		25	43	.594			.4	.238
	9.0	1	1.15		15	41	.384			1.15	.442
	10.0	1	1.3		60	47	1.27			1.3	1.65
	11.0	1	1.6		60	46	1.30			1.6	2.08
	12.0	1	1.5		50	41	1.25			1.5	1.88
	13.0	1	1.4		30	46	.664			1.4	.930
	14.0	1	1.3		50	49	1.02			1.3	1.33
	15.0	1	1.1		80	45	1.76			1.1	1.94
	16.0	1	.6		70	42	1.65			.6	.990
	17.0	1	.6		70	42	1.65			.6	.990
⊙	18.0	1	.75		50	42	1.19			.75	.892
	19.0	1	1.3		30	46	.664			1.3	.863
	20.0	1	1.3		40	41	.940			1.3	1.27
	21.0	1	1.35		60	46	1.30			1.35	1.76
	22.0	1	1.1		40	40	1.00			1.1	1.10
	23.0	1	1.4		20	42	.492			1.4	.689
	24.0	1	1.2		40	51	.793			1.2	.952
	25.0	1	1.1		20	47	.442			1.1	.486
	26.0	1	1.3		5	68	.098			1.3	.127
	27.0	1	1.35		5	47	.130			1.35	.176
	28.0	1	1.45		3	44	.097			1.45	.135
	29.0	1	1.3		10	64	.179			1.3	.233
	30.0	1	1.0		40	50	.808			1.0	.808
	31.0	1	1.0		40	47	.858			1.0	.858
	32.0	1	.2		25	42	.608			.2	.122
LB	33.0	.5					.20			.05	.010
										25.40	23.04



PDF 92-11

FIGURE-1 SITE LOCATION MAP
After: CBJ Draft Well-Head Protection Plan, 1992