
Stream Flow Monitoring Report IV – Salmon Creek

*Annex Creek/Salmon Creek Hydroelectric Project
(FERC Project No. 2307)*

Alaska Electric Light and Power Company

Juneau, Alaska

August 27, 2018

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1. INTRODUCTION AND PURPOSE

In October 2015, Alaska Electric Light & Power (AEL&P) requested an amendment to its license that would allow the operation of the stream gage to be performed by the licensee. By Order issued December 30, 2015, the Federal Energy Regulatory Commission (FERC) approved the amendment and stipulated that a new stream flow plan be developed after consultation with Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), and the United State Fish and Wildlife Service (USFWS). AEL&P prepared a plan in consultation with ADF&G, NMFS, and USFWS, as well as with the Alaska Department of Natural Resources (ADNR) Water Division and National Weather Service (NWS).

By Order issued August 9, 2016 the FERC approved the stream flow monitoring plan with a requirement to file an instream flow monitoring report biannually to the FERC, NMFS, USFWS and ADF&G. The report is to review operation of the gage, identify when supplemental water was released and include information on the operation of the supplemental water valve. The report is to be submitted for agency review, with a 30-day review and comment period, prior to filing with the FERC. Documentation of agency consultation should be included in the report.

The first report was submitted to FERC on April 19, 2017. The second report was filed with FERC on August 16, 2017 and the third on February 20, 2018. This is the fourth semi-annual report to be filed with FERC, it covers the period from January 1, 2018 through June 30, 2018. Pending agency approval, this is the final semi-annual report with the reporting requirement moved to an annual basis going forward.

1.1. Gage Operation

The stream gage started operation on April 27, 2016, taking level measurements on a 15 minute basis. This data is automatically distributed to www.aelp.com/About-Us/Salmon-Creek-Streamflow where it is available for public display. The page has multiple graph options for quick review of the data. Real-time flow data is supplied directly to the AELP Supervisory Control and Data Acquisition (SCADA) System where it is logged and monitored. Alarms are automatically generated for low flow conditions or for loss of communication with the sensor.

The communication path between the gage and the AEL&P SCADA system is through a cellular phone modem, which performed well during the period. This communication link is continuously monitored by the AELP SCADA system at the AELP dispatch center which is manned 24 hours per day. The operators are trained to respond to all alarms, either by taking direct action or calling a technical specialist who can resolve the specific problem. On May 11, 2018 there was a communication failure due to a loss of GCI communications, the supplemental valve was opened as a precaution until communications recovered.

Figures 1 and 2 below show the corrected discharge graphs for the first half of 2018. The corrections shown during the first quarter of 2018 are due to backwater from ice, which impacts the operation of the gage, typically resulting in false high readings. The dates of the manual discharge readings are identified in figures 1 and 2. A total of seven discharge measurements were conducted to calibrate discharges for the first half of 2018, including low-flow discharge measurements of 8.4 and 10.4 CFS.

Comments received from ADF&G on August 14, 2017 stated they would like to see discharge measurements taken when flows are less than 25 CFS to ensure the gage accuracy during periods of low flow. Since the primary function of this gage is to alert AELP to flows less than 9 CFS so that supplemental water can be added to the stream, this is a valid concern. The colder drier weather during the first half of 2018 allowed for AELP to collect several low-flow discharge measurements including measurements of 8.4 and 10.4 CFS. Three additional measurements of around 15 CFS were also taken during the first half of 2018. It should be noted, that low flow periods typically occur during the coldest winter periods and that AELP opens the supplemental valve when flows reach 9 CFS and leaves it open until ambient temperatures are above freezing and flow measurements are above 12 CFS.

A table of the Daily Mean Discharge for the months of October 2016 through June 2018 is included in Appendix B.

A copy of the rating curve for the gage is included in Appendix C.

Figure 1 – First Quarter 2018 Corrected Discharge

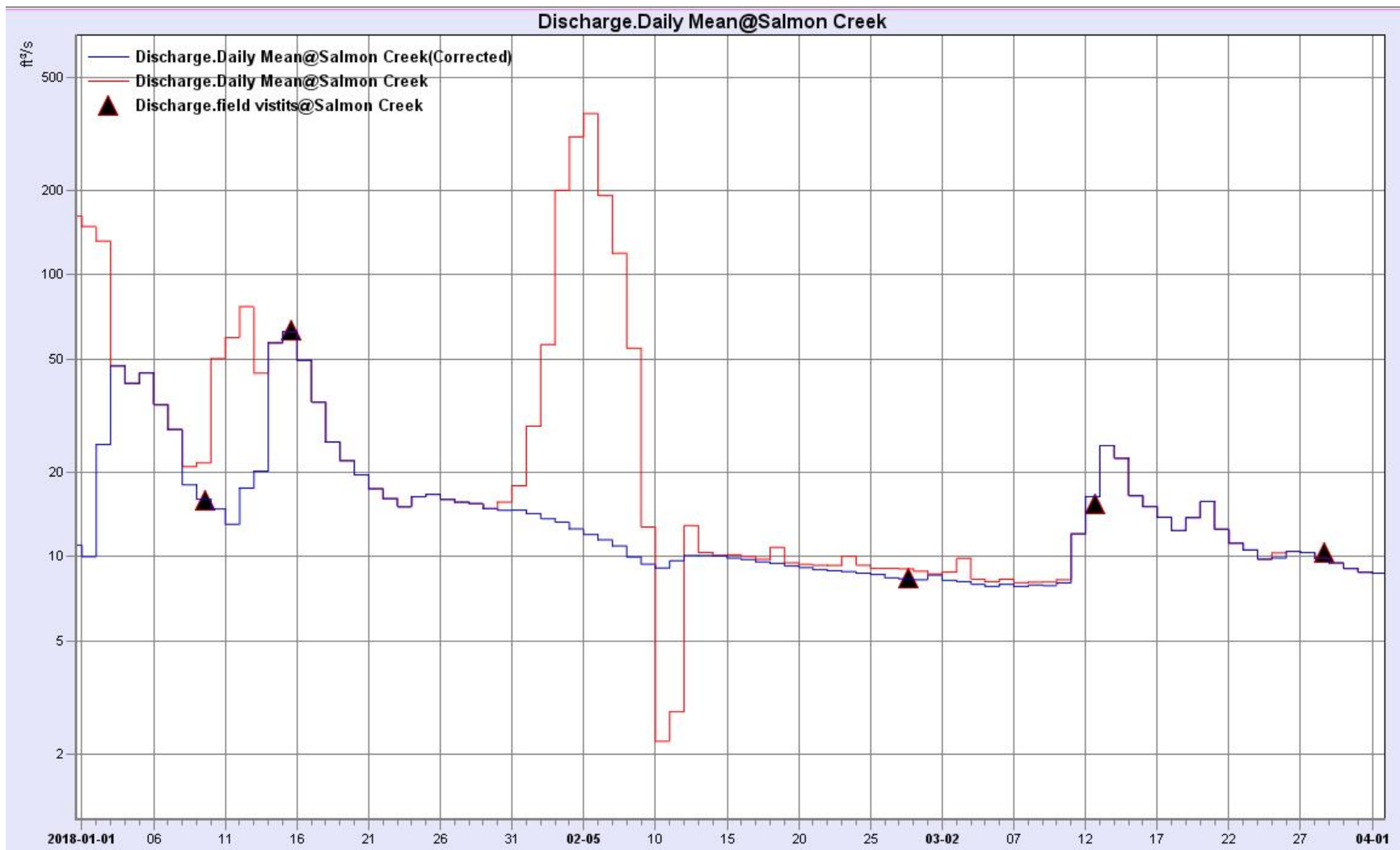
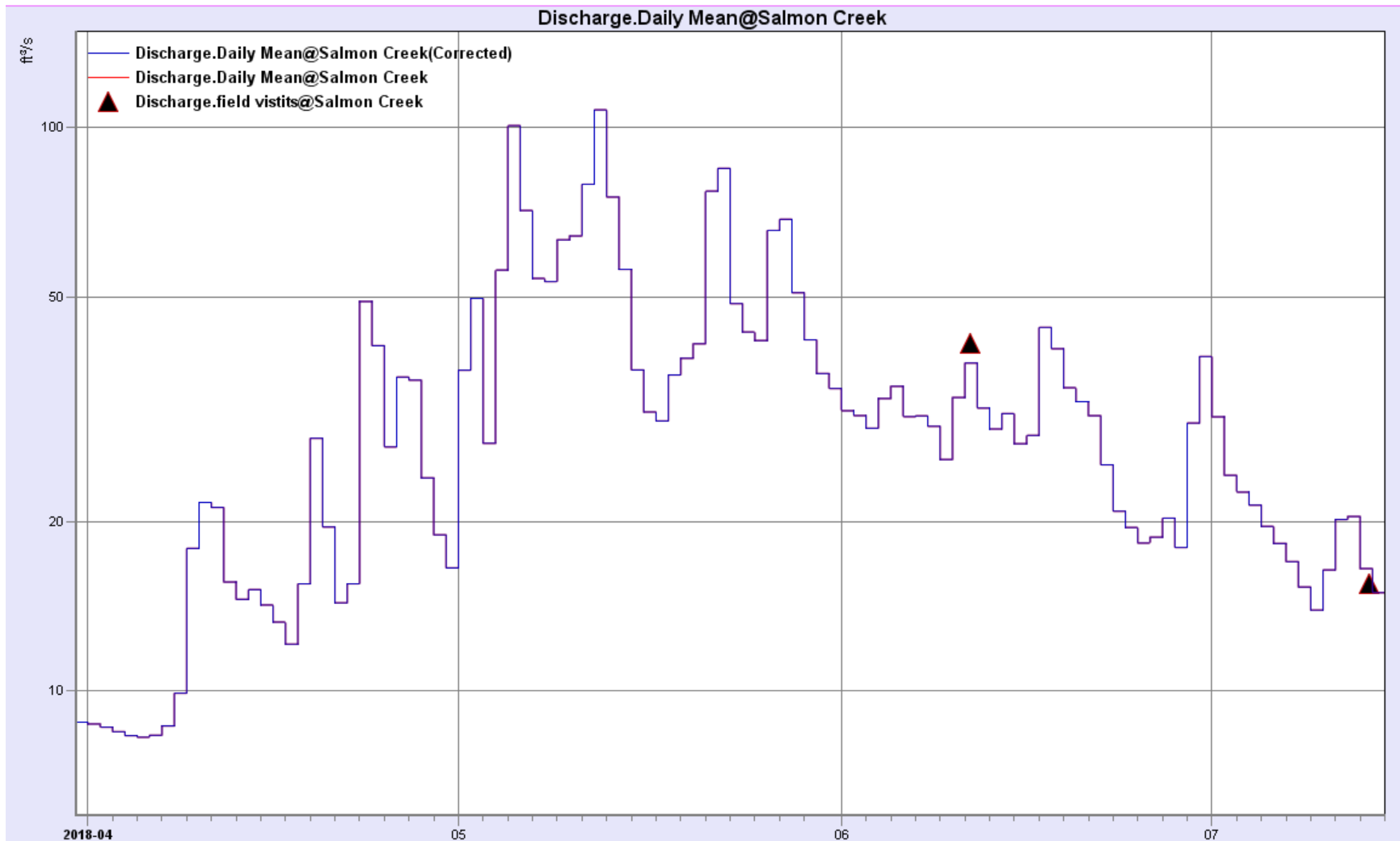


Figure 2 – Second Quarter 2018 Corrected Discharge



1.2. Supplemental Valve Operation

The supplemental water valve is a 6" valve tapped off of the penstock at the base of the dam. The valve discharges water directly into the natural drainage. Operation of the valve is performed remotely by the AEL&P System Operator who also has real-time indication of the streamflow. When the flow drops to 9CFS, an alarm is generated and the Operator opens the valve and logs the operation.

The valve is either open or closed, there are no intermediate positions. The Operator has feedback on the valve position, provided by limit switches which show the valve position as well as an analog signal which reflects valve position. In addition to valve position, there is a flowmeter on the outlet of the valve. The amount of flow through the valve when open varies with the reservoir elevation. At a higher elevation there is more flow and at a lower elevation the flow is less. The valve has been sized to ensure a minimum of 3CFS of flow at minimum reservoir elevation, so typically more CFS is discharged to the stream.

1.3. Supplemental Valve Release

Due to abnormally dry conditions throughout the region, the supplemental valve was opened for much of the spring. The table below shows operations of the supplemental valve. Station service at the valvehouse located at the base of the dam is provided by a small hydroelectric DC generator, this power is used for monitoring, valve operation and battery charging. The output of the turbine is discharged into the stream at the base of the dam. During the low flow periods this spring, the stream flow in Salmon Creek was stable due to the consistent releases through the supplemental valve and the hydroelectric turbine output.

Date	Time	Action	Release Flow (CFS)
1/9/18	16:05	OPEN	4.4
1/14/18	16:20	CLOSED	
1/24/18	05:45	OPEN	4.3
3/13/18	13:28	CLOSED	4
3/16/18	4:11	OPEN	3.9
4/10/18	17:02	CLOSED	3.5
4/13/18	7:15	OPEN	3.5
4/18/18	17:08	CLOSED	
5/11/18	5:05	OPEN(1)	3.6
5/11/18	8:00	CLOSED	3.5

(1) Valve opened due to communication failure to stream gage, not a low flow condition.

1.4. Agency Consultation

A copy of the draft report with a request for consultation was sent on July 25, 2018 by Christy Yearous with AEL&P to ADF&G, USFWS and NMFS by e-mail.

A copy of the request for consultation and comments received are in Appendix A.

On August 24, 2018 Kevin Keith with ADF&G requested that a copy of the rating curve be included with the report. In response to his request, Appendix C was added to the final draft.

APPENDIX A: AGENCY COMMENTS

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From: Keith, Kevin D (DFG) <kevin.keith@alaska.gov>
Sent: Friday, August 24, 2018 2:48 PM
To: Christy Yearous; 'steve_brockmann@fws.gov'; 'Sean Eagan - NOAA Federal'; 'susan.walker@noaa.gov'
Cc: 'Crane Johnson - NOAA Federal'; Klein, Joseph P (DFG)
Subject: ** EXTERNAL ** RE: P-2307 Salmon Creek Semi-Annual Streamflow Monitoring Report

Hello Christy,

Thank you for e-mailing a copy of the Salmon Creek Stream Flow Monitoring Report IV for our review. It appears that AEL&P is continuing to satisfactorily operate the streamgage.

ADF&G appreciates that 4 discharge measurements were taken at flows below 20 cfs during the 1st quarter of 2018. By regularly verifying that the stage-discharge relationship at low flows has not changed or by applying shifts to the rating curve when the stage-discharge relationship changes, AEL&P and the resource agencies can be confident in the streamgage's accuracy, and thus, its efficacy for identifying when supplemental water needs to be released. Along those lines, it would be helpful if these reports included the rating curve used to calculate Figures 1 and 2, as well as the discharge and stage at the time of the field visits. I believe this information was included as an appendix in the previous Stream Flow Monitoring Report filed with FERC.

ADF&G agrees with your proposal to move the due date for the annual monitoring report from September 1st to December 1st.

Please let me know if you have any questions.

Thanks,

Kevin

Kevin D. Keith
FERC Hydropower Coordinator
Instream Flow Program
Alaska Department of Fish & Game

907-267-2836

From: Christy Yearous [mailto:Christy.Yearous@aelp.com]
Sent: Wednesday, July 25, 2018 4:09 PM
To: Keith, Kevin D (DFG); 'steve_brockmann@fws.gov'; 'Sean Eagan - NOAA Federal'; 'susan.walker@noaa.gov'
Cc: 'Crane Johnson - NOAA Federal'
Subject: P-2307 Salmon Creek Semi-Annual Streamflow Monitoring Report

Per the Salmon Creek Streamflow Monitoring Plan, AEL&P is required to submit semi-annual reports for the AEL&P operated Salmon Creek stream gage. Attached is the DRAFT semi-annual report for January 1 through June 30, 2018. Please provide comments to me via e-mail by August 27, 2018. I will incorporate any comments received and submit the report to FERC after the comment period has ended.

This is the last semi-annual report required by the license order, unless we are notified otherwise by FERC this will now move to an annual reporting requirement. I believe that AEL&P has shown that we are capable of operating this gage in a reliable and responsible manner.

I would like to request that with this move to an annual reporting requirement, that the due date be changed from September 1, 2019 to December 1, 2019 and remain December 1st each year thereafter. This will allow us to analyze a complete water year and include that analysis in the annual report. For the last two years, this analysis has been included in the January semi-annual report draft distributed for agency review. If you agree to this change, please respond by e-mail so that I can show FERC that we have agency agreement with this request.

Please let me know if you have any questions or concerns. Thank all of you for working with us on this project.

Thank you,
Christy Yearous
AEL&P
463-6387

APPENDIX B: DAILY DISCHARGE TABLE OCTOBER 2016-JUNE 2018

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Salmon Creek

Identifier: Discharge.Daily Mean@Salmon Creek

Location: Salmon Creek Juneau

Units: ft³/s

Filter: None

Year: Oct. 2016 to Sept. 2017

Aggr: 39 Min: 8.2 Max: 560

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	25	11	19	12	13	12	34	34	64	63	21	150
2	22	12	67	12	12	12	21	37	62	92	19	96
3	20	24	98	12	11	12	16	39	57	110	18	59
4	19	33	38	11	11	11	13	32	46	70	17	120
5	17	59	25	11	12	11	17	27	45	52	16	76
6	16	31	20	11	13	11	17	25	59	47	15	56
7	15	27	19	9.9	12	11	14	25	68	40	14	75
8	14	51	17	9.5	11	10	13	34	78	36	13	80
9	13	64	15	9	10	10	19	69	67	54	12	140
10	13	76	14	8.6	11	10	16	42	48	46	12	120
11	12	120	13	8.3	19	9.8	16	46	39	49	12	72
12	12	95	14	8.8	31	9.6	18	55	37	46	14	57
13	12	65	16	16	53	9.4	22	50	36	69	16	46
14	11	63	15	43	74	9.2	20	49	33	82	33	39
15	11	43	14	45	77	9	18	43	35	54	30	34
16	12	33	13	130	43	8.7	18	44	51	57	69	31
17	17	27	15	55	27	8.6	17	48	77	46	130	32
18	37	23	17	29	21	8.4	16	49	49	37	110	27
19	32	20	19	34	17	8.3	13	81	45	33	73	23
20	31	18	20	22	15	8.3	12	81	53	29	73	21
21	23	16	24	17	14	8.2	13	300	43	27	110	20
22	26	16	15	15	13	8.2	18	150	42	37	150	27
23	25	16	12	14	12	8.3	22	94	37	39	75	31
24	19	15	11	15	11	8.2	25	73	42	30	51	68
25	16	14	10	23	11	8.2	32	59	40	27	68	50
26	15	14	12	22	12	8.2	30	58	37	35	95	74
27	14	14	13	27	13	8.6	41	52	41	76	70	150
28	13	13	15	33	13	12	62	47	36	48	55	130
29	12	27	11	25		16	38	61	34	35	43	60
30	12	30	13	18		13	29	64	50	29	42	41
31	11		12	15		42		62		24	100	
Aggr	18	36	21	23	21	11	22	62	48	49	51	67
Min	11	11	10	8.3	10	8.2	12	25	33	24	12	20
Max	37	120	98	130	77	42	62	300	78	110	150	150

Salmon Creek

Identifier: Discharge.Daily Mean@Salmon Creek
 Location: Salmon Creek Juneau
 Units: ft³/s
 Filter: None

Year: Oct. 2017 to July 2018

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	33	42	12	10	14	8.6	8.7	37	31	31	*	*
2	28	35	10	25	14	8.2	8.6	50	31	24	*	*
3	39	32	11	48	13	8.2	8.5	28	29	23	*	*
4	35	29	27	41	13	8	8.3	56	33	21	*	*
5	41	26	20	45	12	7.8	8.3	100	35	20	*	*
6	75	24	24	35	11	8	8.4	71	31	18	*	*
7	47	22	25	28	11	7.8	8.7	54	31	17	*	*
8	60	20	52	18	10	7.9	9.9	53	29	15	*	*
9	60	19	120	16	9.4	7.9	18	63	26	14	*	*
10	40	17	72	15	9.1	8.1	22	64	33	16	*	*
11	31	16	200	13	9.7	12	21	79	38	20	*	*
12	26	15	95	18	10	16	16	110	32	20	*	*
13	23	14	130	20	10	25	15	75	29	16	*	*
14	24	13	210	57	10	22	15	56	31	15	*	*
15	42	12	83	63	9.9	16	14	37	27	*	*	*
16	49	11	70	50	9.8	15	13	31	28	*	*	*
17	40	11	52	35	9.6	14	12	30	44	*	*	*
18	32	11	38	26	9.5	12	16	36	40	*	*	*
19	27	11	31	22	9.3	14	28	39	35	*	*	*
20	35	10	28	20	9.2	16	20	41	33	*	*	*
21	33	10	24	17	9	13	14	77	31	*	*	*
22	27	10	21	16	8.9	11	15	85	25	*	*	*
23	37	10	19	15	8.9	11	49	49	21	*	*	*
24	37	9.9	18	16	8.7	9.8	41	43	20	*	*	*
25	28	9.5	17	17	8.7	9.9	27	42	18	*	*	*
26	57	9.2	16	16	8.4	10	36	66	19	*	*	*
27	560	9.2	15	16	8.4	10	36	69	20	*	*	*
28	110	9.1	14	15	8.3	9.9	24	51	18	*	*	*
29	61	12	14	15		9.5	19	42	30	*	*	*
30	52	18	12	15		9.1	17	37	39	*	*	*
31	54		11	15		8.8		34		*	*	*
Aggr	59	17	48	25	10	11	19	55	30	*	*	*
Min	23	9.1	10	10	8.3	7.8	8.3	28	18	*	*	*
Max	560	42	210	63	14	25	49	110	44	*	*	*

APPENDIX C: STREAM RATING CURVE

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STATION NUMBER Salmon Creek Salmon Creek Juneau SOURCE AGENCY:
 LATITUDE 49.28 LONGITUDE -123.11
 Date Processed: 2018-07-27 10:44:09 UTC-09:00 By admin
 Rating for Discharge (ft³/s)
 Created by admin on 2018-01-11 07:26:59 [UTC], updated by admin on 2018-07-24 23:31:10 [UTC]
 Remarks:

Offset1: 0.73 offset2: 1.60
 Breakpoint1: 2.79

EXPANDED CAQRating TABLE

Stage (m)	Discharge (ft ³ /s)											DIFF IN Q PER .1 UNITS
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09		
1.30					3.000*	3.189	3.386	3.592	3.807	4.031	2.108	
1.40	4.265	4.509	4.763	5.027	5.302	5.587	5.884	6.192	6.512	6.843	2.922	
1.50	7.187	7.544	7.913	8.295	8.691	9.100	9.524	9.961	10.41	10.88	4.173	
1.60	11.36	11.86	12.37	12.90	13.45	14.01	14.59	15.19	15.80	16.44	5.730	
1.70	17.09	17.76	18.45	19.16	19.89	20.63	21.40	22.19	23.00	23.84	7.600	
1.80	24.69	25.57	26.47	27.39	28.34	29.31	30.30	31.32	32.36	33.43	9.830	
1.90	34.52	35.64	36.79	37.96	39.16	40.39	41.65	42.93	44.24	45.58	12.440	
2.00	46.96	48.36	49.79	51.25	52.75	54.28	55.83	57.42	59.05	60.71	15.440	
2.10	62.40	64.12	65.88	67.68	69.51	71.38	73.28	75.22	77.20	79.22	18.870	
2.20	81.27	83.36	85.50	87.67	89.88	92.13	94.43	96.76	99.14	101.6	22.730	
2.30	104.0	106.5	109.1	111.7	114.3	117.0	119.7	122.5	125.3	128.2	27.100	
2.40	131.1	134.1	137.1	140.2	143.3	146.5	149.7	153.0	156.3	159.7	32.000	
2.50	163.1	166.6	170.1	173.7	177.4	181.1	184.8	188.6	192.5	196.5	37.300	
2.60	200.4	204.5	208.6	212.8	217.0	221.3	225.7	230.1	234.6	239.1	43.300	
2.70	243.7	248.4	253.1	257.9	262.8	267.7	272.7	277.8	282.9	288.2*	54.700	
2.80	298.4	309.0	319.8	330.9	342.3	354.0	366.0	378.3	390.9	403.9	118.700	
2.90	417.1	430.7	444.7	458.9	473.5	488.5	503.8	519.5	535.5	552.0	151.700	
3.00	568.8	586.0	603.5	621.5	639.9	658.7	677.9	697.6	717.6	738.1	190.300	
3.10	759.1	780.5	802.3	824.7	847.5	870.7	894.5	918.7	943.4	968.7	235.300	
3.20	994.4	1021	1047	1075	1103	1131	1160	1190	1220	1250	287.600	
3.30	1282	1313	1346	1379	1412	1447	1482	1517	1553	1590	346.000	
3.40	1628	1666	1705	1744	1784	1825	1867	1909	1953	1996	413.000	
3.50	2041	2086	2132	2179	2227	2275	2324	2374	2425	2477	488.000	
3.60	2529	2583	2637	2692	2748	2805	2862	2921	2980	3041	573.000	
3.70	3102	3165	3228	3292	3357	3423	3490	3558	3628	3698	667.000	
3.80	3769											

"*" indicates a rating descriptor point

ID	Starting Date	Ending Date	Aging	Comments
C001	2018-02-05 12:00:00 [UTC-09:00]		0	