ERRATA NOTES – added November 7, 2013

PLEASE NOTE THAT THESE DATA TABLES ARE CONSIDERED UNRELIABLE.

At some point after the initial publication release, the data tables for this report were informally retracted and removed from the DGGS library and public sales. Written documentation describing why the tables were removed was either not provided or not preserved. This was standard operating procedure for the publication series (Public Data File) and the era in which this dataset was originally published. Subsequent personal communication between current DNR staff members and the authors indicates that the tables were pulled from circulation because the measurements were collected using equipment that was later found to have a faulty sensor.

In conjunction with recent division-wide historic data rescue efforts we have located and scanned the original data tables. We are providing these tables to allow users to view original information that may have been cited in subsequent studies. However, we remind users that information released in Public Data File reports was not technically reviewed prior to release and that DNR staff believe this particular dataset was retracted shortly after publication to prevent propagation of possibly erroneous information.

Public-data File 90-14

SUMMARY OF STREAMFLOW DATA FOR THE LITTLE SALMON RIVER AND WALKER LAKE CREEK, SKAGWAY B-3 AND B-4 QUADRANGLES, ALASKA: DRAFT REPORT

by

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INTRODUCTION

The community of Klukwan and the Alaska Energy Authority (AEA) are evaluating the Little Salmon River, and its Walker Lake tributary, as a potential hydroelectric power source for the residents of the Klukwan area. In 1985, AEA contracted the Water Resources Section (WRS) of the Alaska Division of Geological and Geophysical Surveys (DGGS) to collect and summarize streamflow data for the Little Salmon River and the Walker Lake outlet tributary, hereafter called Walker Lake Creek.

Two stream gaging sites were established for this study. The first site, Walker Lake Creek, is located 8.5 mi west of Klukwan and 0.25 mi downstream of the lake outlet at 1150 ft elevation. The second site, the Little Salmon River, is located 6.5 mi west of Klukwan where the stream flows out of the mountains and onto the Tsirku River floodplain at 390 ft elevation. This report presents a summary and discussion of the streamflow data collected at both sites from September 1985 to September 1988.

BACKGROUND

Drainage basin areas for both gaging sites, as well as the entire Little Salmon River, were calculated using USGS 1 in. to 1 mi topographic maps. The areas and the percentage of basin are as follows:

	Drainage basin area (sq mi)	Proportion of main basin (%)
Little Salmon River	16.0	100
Little Salmon River gaging site	11.4	71
Walker Lake Creek gaging site	3.75	23
Little Salmon River gaging site (exc. Walker Lake Creek basin)	7.65	48

The main stem of Little Salmon River (to the gaging site) is approximately 5 mi long, with a rocky, steep gradient of 370 ft/mi. Walker Lake Creek flows approximately 1 mi to its confluence with Little Salmon River, and has a channel gradient of 160 ft/mi; most of the elevation drop occurs at a falls immediately upstream of the confluence. No glaciers or permanent snowfields exist in the drainage basin, but it is common for snowmelt to continue into the early summer months.

Most of the Little Salmon River basin is densely wooded or covered with brush. A thick vegetation mat overlies a thin soil layer and bedrock is near the surface. Little Salmon River flows through a bedrock channel to the gaging site, at which point the bedrock gives way to alluvial deposits as the stream flows across the Tsirku River fan.

Walker Lake Creek's flow fluctuation is mitigated by Walker Lake, and the small stream flows clear most of the time. The Little Salmon River, however, is a dynamic stream with a widely fluctuating flow and sediment load. During dry spells or sub-freezing temperatures, Little Salmon River flows very clear and little sediment moves. Conversely, during breakup or heavy rains, bedload sediment movement increases dramatically, resulting in new sand and gravel deposits up to 3 ft thick in the vicinity of the gage site.

CLIMATE

The Klukwan area experiences a transitional climate, with moderate temperatures that are colder in the winter and warmer in the summer than Haines. Precipitation varies dramatically over short distances in the mountainous coastal areas of southeast Alaska, because of orographic lifting

and the effects of nearby marine waters. Mean annual precipitation at Haines is 53 in. (Selkregg, 1974), compared to 21 in. at Klukwan (Patric and Black, 1968). Both of these sites are at an elevation of approximately 100 ft. Because most of the Little Salmon River basin is above 100 ft, a more representative precipitation data site would be 10 mi north of Klukwan, at Linger Longer where the elevation is 700. Table 1 summarizes climatic data for Linger Longer (Selkregg, 1974).

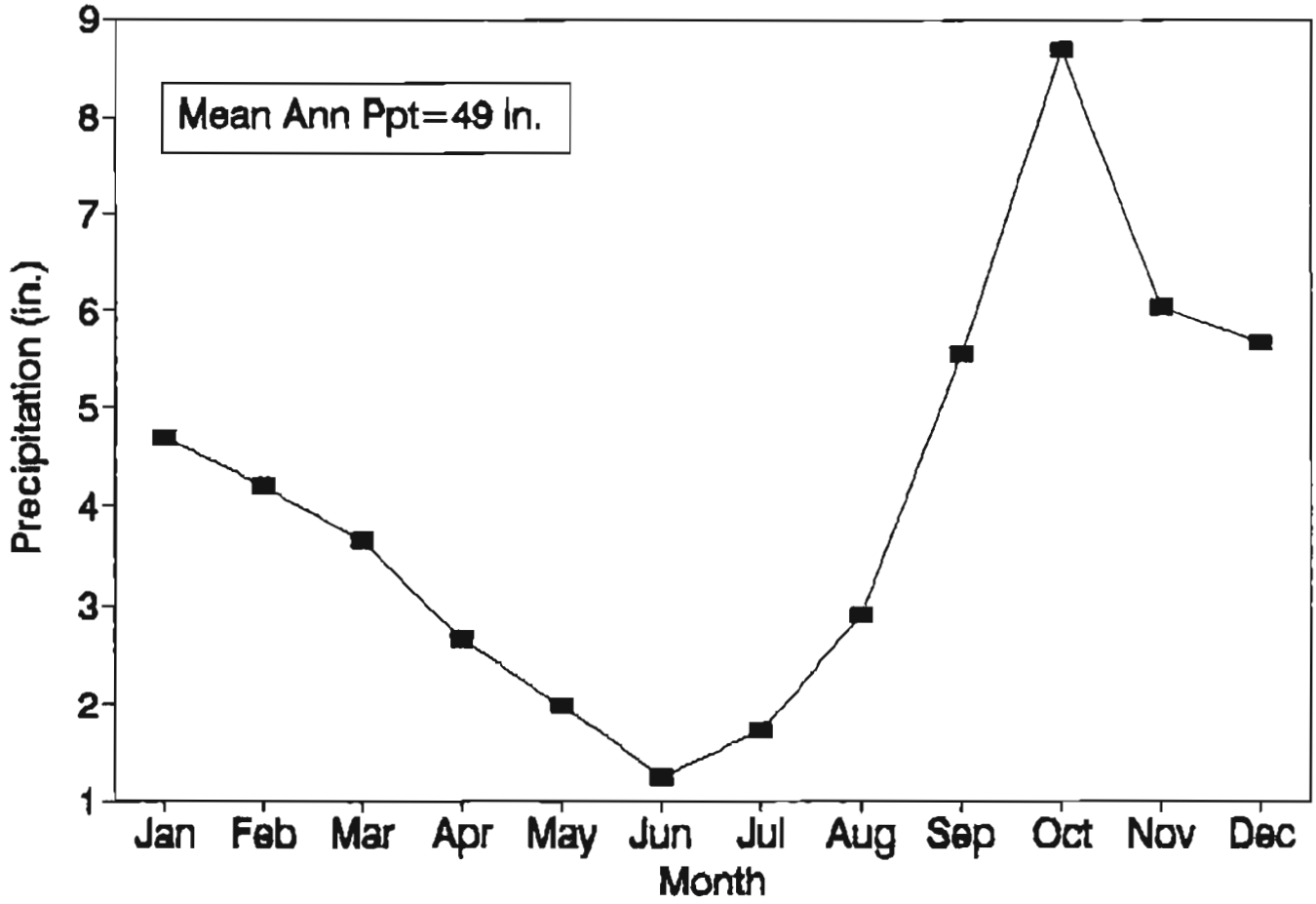
Table 1. Linger Longer (near Klukwan) Climate Summary

Temperature (°F)		Precipitation (in.)	
Summer temperature	42-69	Average annual	36.6
Winter temperature	8-31	Maximum month (OCT)	N/A
Mean annual temperature	37.7	Minimum month (JUN)	N/A
		Average annual snowfall	175

Current weather records are incomplete for Haines, the only active recording station near Klukwan (fig. 1). For the three year, stream gaging period-of-record, 1987 was the only year with a complete weather record at Haines, when a near-normal 56 in. of precipitation was recorded. Using other southeast Alaska weather stations as a guide for the other two years of record, it appears that 1986 also had normal precipitation, while 1988 experienced 10-20 percent greater precipitation. In general, precipitation at the study area for the 3 years of record was probably near normal.

The fall months of September through November are the wettest in southeast Alaska, and May through July are the driest months. The Klukwan area is no exception, but heavy rains can occur at almost any time of year. Snowpack in the Little Salmon River basin is deep and persistent. Local residents claim that it is common for snow depths to range from 6-12 ft around Walker Lake, and for the snow, along with accompanying snowmelt to persist into late June.

FIGURE 1. Haines Mean Monthly Precip. 1957-1984



SCOPE OF WORK AND METHODS OF INVESTIGATION

Stream stage was recorded using battery-operated Datapod DP212 (Little Salmon River) and DP320 (Walker Lake Creek) data recorders coupled to submersible pressure transducers that sense the depth of water above the transducer unit at predetermined times or predetermined changes in stage. The stage data is stored on EPROM data storage modules that are retrieved from the field and taken back to the office for computer analyses using SAS system statistical software. The attached printout gives Daily, Monthly, Quarterly, and Annual Streamflow Summaries; Power and Energy Estimate Summaries; and Flow-Duration Tables.

The streamflow summaries, hydrographs, and flow-duration data were calculated using sums and daily averages that were derived from the transducer data. Power and energy figures were calculated using a head of 700 ft and a system efficiency of 85 percent.

Flow-duration data are presented in tables for both arithmetic and logarithmic discharge class intervals; the duration data are further divided into period-of-record and annual duration summaries. Finally, the printout gives daily and monthly instantaneous power tables and graphs derived from maximum or peak flow events. The period of record for Walker Lake Creek is September 20, 1985 to September 20, 1988, while the Little Salmon River was gaged only during the summer months (because of freeze-up) from 1986 to 1988.

STREAMFLOW SUMMARY

Walker Lake Creek flows year round, while winter flows in the Little Salmon River can be so low as to be unmeasurable. The average discharge for the

period of record at Walker Lake Creek was 12.9 cubic feet per second (cfs), with a maximum recorded flow of 139 cfs and a minimum flow of 1.3 cfs. Figure 2 shows a plot of mean monthly discharge for Walker Lake Creek. At Little Salmon River, the average summer discharge was 56.2 cfs, with a maximum flow of 268 cfs and a minimum flow of 1.5 cfs. This latter minimum flow is questionable, especially for a summer low; however, inspection of the data did not warrant outright elimination of the figure, because the instrument appeared to be operating normally at the time.

Flow duration data for Walker Lake Creek show that the stream flows from 1.5 to 5.0 cfs half the time, with a 95 percent exceedance level of 1.0 cfs. As for the Little Salmon River during the summer months, the stream flows from 10 to 40 cfs nearly half the time, with a 95 percent exceedance level of 6.0 cfs. Approximately 22 percent of the summer months for Little Salmon River, the discharge is 100 to 200 cfs.

Miscellaneous measurements compiled by Bugliosi (1988) indicate that the Little Salmon River at the gaging site is a losing stream; in other words a stream that loses water to the ground-water system instead of receiving inflow from ground water. Consequently, streamflow measurements at the gaging site will not reflect the total discharge from the drainage basin above, because some percentage of the flow will have already seeped into the alluvial gravel. The amount of water lost to the gravel would not be significant during the summer months of higher flows, but could possibly make up a significant portion of the lowest winter flows. During one seepage measurement conducted in April 1982 (Bugliosi, 1988), a reach of the Little Salmon River just downstream of the gaging site lost 20 cfs of flow over a quarter mile reach of

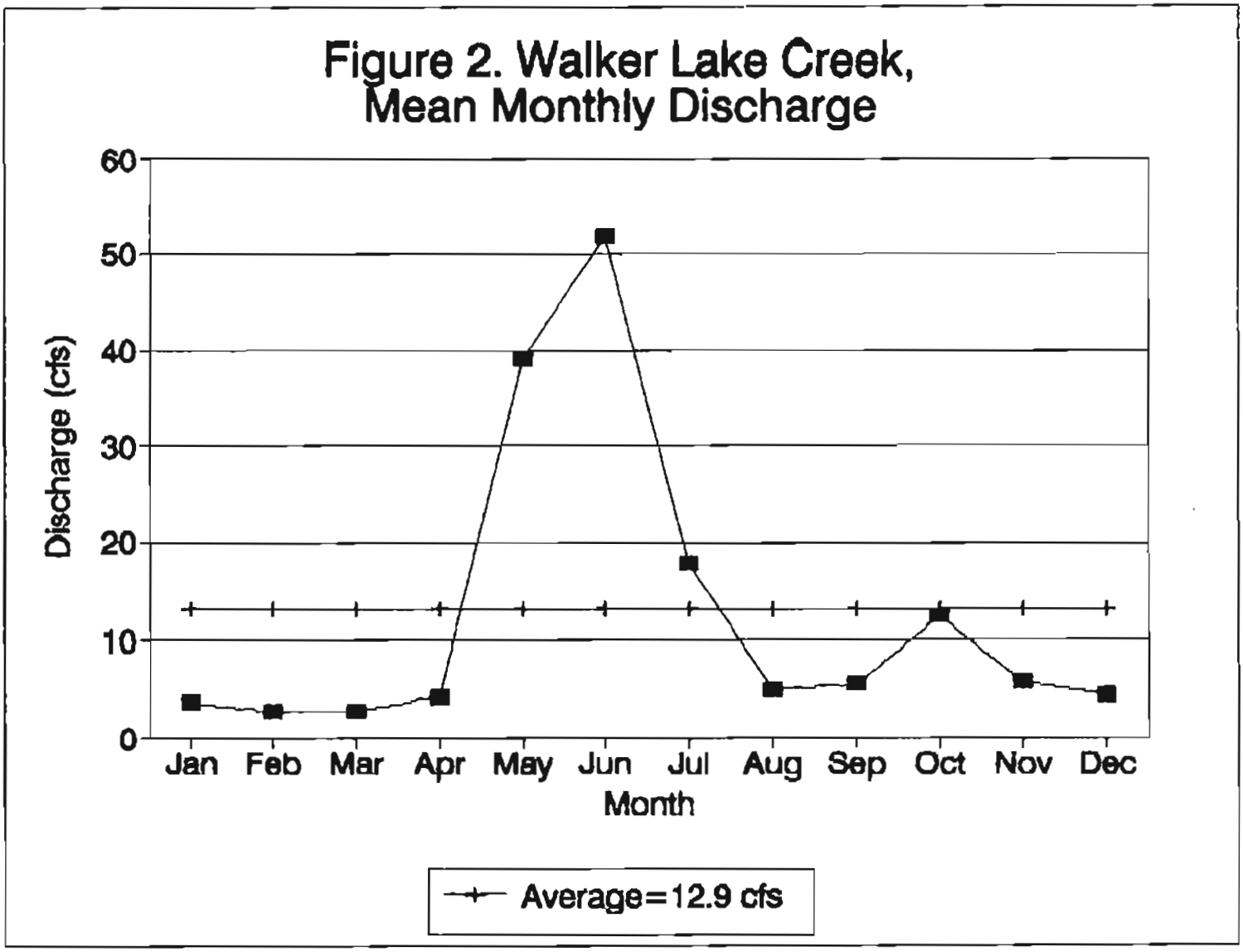


Figure 2. Walker Lake Creek,
Mean Monthly Discharge
Discharge (cfs)
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Average=12.9 cfs

the stream -- from 79 cfs to 59 cfs, or a 25 percent loss to the alluvial gravel.

During the summer months of May through September, Walker Lake Creek has an average discharge of approximately 24 cfs, or 43 percent of the average summer discharge of the Little Salmon River gaging site. Walker Lake Creek streamflow destined for the proposed small-hydro project could be augmented by water from the Little Salmon River above the Walker Lake site during periods of low flow.

Field stage and discharge data for Walker Lake Creek and Little Salmon River are as follows:

Site	Date	Stage (ft)	Discharge (cfs)
Walker Lake Creek	09/20/85	1.43	2.1
"	11/07/85	1.48	3.3
"	03/12/86	1.65	3.8
"	05/06/86	1.84	14.8
"	08/20/86	n/a	5.0
"	04/28/87	1.76	5.1
"	07/01/87	2.20	39.8
"	04/26/88	2.02	9.1
"	09/20/88	1.81	9.5
Little Salmon River	09/20/85	0.75	9.8
"	05/06/86	1.10	34.6
"	08/20/86	n/a	25.3
"	04/28/87	0.85	10.6
"	07/01/87	2.25	171.9
"	11/19/87	1.25	36.3
"	04/26/88	1.15	24.4
"	07/27/88	2.10	68.0
"	09/20/88	1.15	26.7

The attached streamflow data summaries for Walker Lake Creek and Little Salmon River are each organized in the following order:

REFERENCES

Bugliosi, E.F., 1988, Hydrologic reconnaissance of the Chilkat River basin, Southeast Alaska: U.S. Geological Survey Water Resources Investigations Report 88-4023, 38 p.

Patric, J.H., and Black, P.E., 1968, Potential evaoptranspiration and climate in Alaska by Thornthwaite's classification: U.S. Forest Service Research Paper PNW-71, p. 12.

Selkregg, L., ed., 1974, Alaska regional profiles, volume IV--southeast: Arctic Environmental Data and Information Center, p. 4-34.