ADMINISTRATOR'S MEMORANDUM

Transfer Processing Memo No. 26

To: Regional Offices
Water Allocation Bureau

From: L. Glen Saxton

Re: **CONSUMPTIVE USE FOR PONDS**

Date: February 23, 2004

The attached memo and calculations provide an estimate of the annual volume of consumptive use associated with evaporation due to development of ponds. Based on the results of the analysis, the annual volume of consumptive use associated with evaporation from ponds can be considered equivalent to the mean annual consumptive irrigation requirement (CIR) for alfalfa hay.

A transfer application proposing to change the nature of use from irrigation to pond use will not require a detailed analysis to compare the historic beneficial use for the irrigation use to the consumption due to evaporation for the proposed pond use; instead, except as noted below, a one to one exchange for irrigated land vs. pond surface area will be considered acceptable. This simplification should only be considered applicable for irrigated land that is reasonably productive cropland where alfalfa hay (or in some cases, a productive stand of grass pasture/hay) has likely been grown historically. In cases where the productivity of the irrigated land is questionable, the applicant should provide an estimate of historical CIR for the irrigated land to establish the extent of beneficial use available for transfer.

This memo is not intended to prohibit applicants from providing their own analyses to estimate the consumptive use for ponds. If applicants choose to provide their own analyses, they should justify any significant differences between their analyses and the analysis provided on the attached memo.

It is important to note that the one to one exchange for irrigated land vs. pond surface area only addresses the consumption of water due to evaporation for the proposed pond use. It does not address any additional quantity of water, consumptive or otherwise, that may be associated with the development of ponds. A transfer proposing to change the nature of use of a water right to pond use must not enlarge the original use by total diversion rate or volume, including consumptive volume. The transfer application (or associated application for permit) must provide for the total quantity associated with the pond development. Such quantities may include the following, in addition to evaporation from a pond:

- water required to fill a pond
- maintenance of the water level in a pond due to seepage losses
- flow-through water for maintenance of water quality or temperature in a pond
- other water use(s) from a pond (e.g. stockwater)

MEMORANDUM

Date: February 6, 2004

To: File

From: Jeff Peppersack

Re: Consumptive Use for Ponds and Calculations to Determine the Number of Irrigated Acres to Dry Up for a Transfer to Change the Nature of Use from Irrigation to Pond Use

Development of ponds will expose water to evaporation. The consumptive use under a water right authorizing pond use can be determined by estimating the amount of water evaporated from a pond that exceeds the amount already evaporating or evapotranspirating naturally from the land surface in native state.

Estimation of annual evaporation or evapotranspiration from the land surface in native state involves some uncertainties, but can be simplified by considering published mean precipitation and free water surface evaporation rates on a monthly basis. During the non-growing season, evapotranspiration rates will not apply and evaporation from the land surface will occur minimally, and not greater than the free water surface evaporation rate. If it is assumed that the land surface is sufficiently moist during the non-growing season, then evaporation from the land surface may approach the levels of free water surface evaporation. This assumption will likely result in an overestimate, but since evaporation is minimal during the non-growing season, the simplification is acceptable.

During the growing season, estimation of evaporation and/or evapotranspiration from the land surface in native state is limited to the amount of precipitation that occurs. There is likely little deep percolation or runoff due to precipitation during the growing season (for semi-arid lands in Idaho), so the mean precipitation rate can be used as an estimate. Note that soil moisture carryover from the non-growing season and soil moisture due to a high ground water table are not considered in this discussion; they are also not generally considered for published consumptive irrigation requirement rates for crops.

Based on the assumptions noted above, the consumptive use under a water right authorizing pond use can be estimated by considering the mean free water surface evaporation on a monthly basis, and subtracting mean monthly precipitation. Precipitation is subtracted because it is assumed to be the amount that already evaporates or evapotranspirates naturally from the land surface in native state. During the non-growing season, the precipitation can only be subtracted to the extent of the free water surface evaporation rate (excess precipitation during the non-growing season will likely percolate into the soil or run off the land surface). The resultant consumptive use for the non-growing season will generally be zero. The attached analysis provides an example of the calculations.

For a transfer changing the nature of use from irrigation to pond use, the annual volume of water consumed is generally the limiting factor. The consumptive use for irrigation diversions must be compared to the consumptive use for ponds. The mean

consumptive use rate for irrigation diversions has been estimated by Allen and Brockway (1983) and is defined as the crop evapotranspiration rate minus effective precipitation.

The example calculations assume that the irrigated cropland included alfalfa hay at some time during normal crop rotations. Alfalfa hay is considered one of the highest water consumptive crops in the state (in some areas, a productive stand of grass pasture/hay is similar in water consumption). Based on the assumption, it can be seen that the number of irrigated acres necessary to dry up to change the nature of use to year-round pond use is roughly a one to one swap. In general, it can be considered sufficient to dry up one acre of irrigated cropland for each acre of pond surface area. Where the irrigated land is of marginal production (e.g. pasture on unproductive soil with limited irrigation), then additional documentation would be required from the applicant to estimate the consumptive use for the irrigated land. The one to one swap is only applicable for the evaporative component of water use from a pond and would not apply to other water uses from the pond or to additional rate or volume necessary to fill a pond, to maintain the water level due to seepage, or to maintain water quality or temperature in a pond.

Pond Consumptive Use Calculations
Climate Station: Twin Falls 2 NNE

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Annual FWS Evaporation (inches)*	45	45	45	45	45	45	45	45	45	45	45	45	45
Monthly Distribution (%)*	0.5	1.5	4	8	14	15	17	16	10	6	5	3	100
Monthly FWS Evaporation (in/mo)	0.2	0.7	1.8	3.6	6.3	6.8	7.7	7.2	4.5	2.7	2.3	1.4	45
Avg. Total Precipitation (in/mo)**	1.11	0.79	0.84	0.93	1	0.85	0.29	0.25	0.51	0.77	1.03	0.95	9.32
Pond Loss (Evap. - Precip., in)	0.00	0.00	0.96	2.67	5.30	5.90	7.36	6.95	3.99	1.93	1.22	0.40	36.68
Pond Surface Area (acres)	3	3	3	3	3	3	3	3	3	3	3	3	3
Total Pond Loss (ac-in)	0.0	0.0	2.9	8.0	15.9	17.7	22.1	20.9	12.0	5.8	3.7	1.2	110.0
Total Pond Loss (ac-ft)	0.0	0.0	0.2	0.7	1.3	1.5	1.8	1.7	1.0	0.5	0.3	0.1	9.2

Note: for months where precipitation exceeds evaporation, the resultant pond loss is set to zero

Irrigation Consumption		Crop
Mean Irrig. Requirement (in/seas.)***	35.6	Alfalfa hay
Mean Irrig. Requirement (ft/seas.)	2.97	
Acres to dry up for pond use	**3.1**	

* Molnau,Myron, Kpordze, Kojo C.S., and Craine,Katherine L., 1992. Monthly shallow pond evaporation in Idaho. ASAE paper PNW 92-111

**Data obtained from the Western Regional Climate Center, Monthly Climate Summary, Period of Record 9/1/1905 to 5/31/1974. See attached.

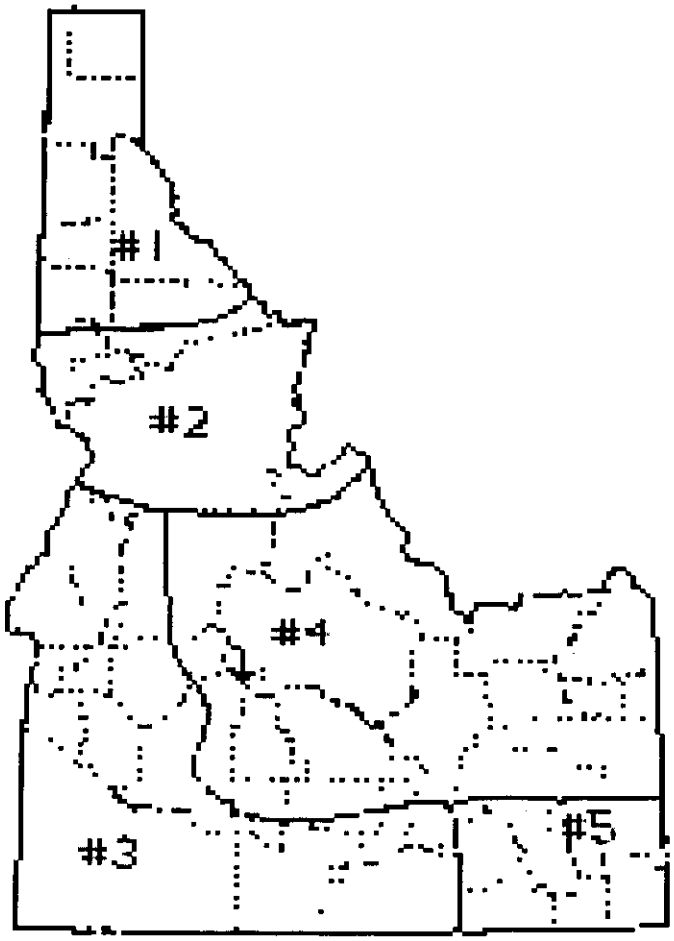
***Appendix E of the University of Idaho report: "Estimating Consumptive Irrigation Requirements for Crops in Idaho" published in 1983 by R. G. Allen and C. E. Brockway. See attached

MONTHLY SHALLOW POND EVAPORATION IN IDAHO

Molnau,Myron, Kpordze, Kojo C.S., and Craine,Katherine L., 1992. Monthly shallow pond evaporation in Idaho. ASAE paper PNW 92-111 *(http://snow.ag.uidaho.edu/publications/pond_evap/pond.html#TABLE%201)*

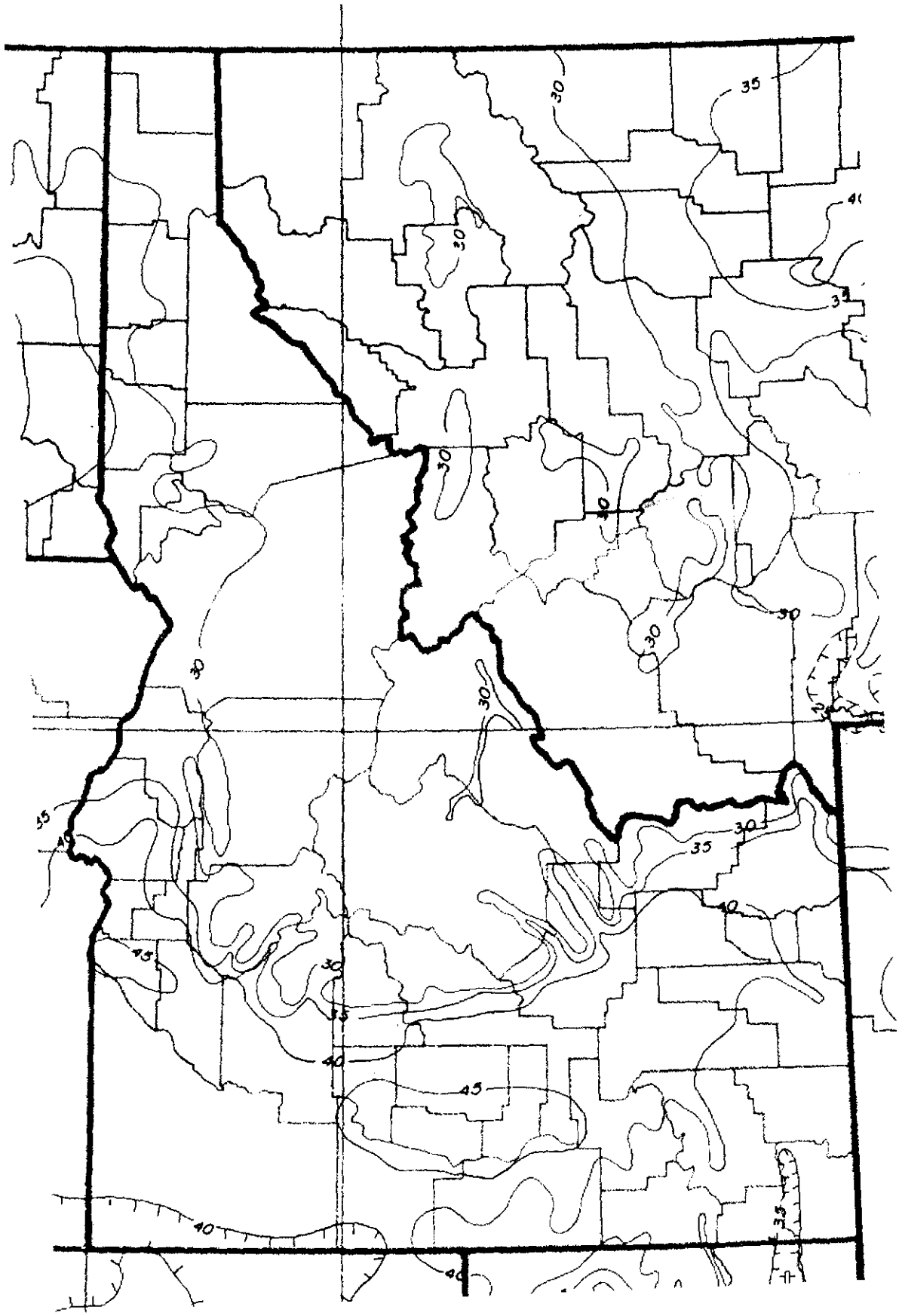
TABLE 1. Monthly shallow lake evaporation percentages for Idaho to be used with the map showing regions of monthly FWS evaporation

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.0	1.5	3	9	12	14	19	18	11	6	4	1.5
2	0.5	1.5	3	8	12	15	19	17	11	6	4	3
3	0.5	1.5	4	8	14	15	17	16	10	6	5	3
4	1.0	2.0	4	7	12	15	19	16	11	6	4	3
5	1.0	3.0	5	10	12	14	16	15	10	6	5	3



Regions of Monthly FWS Evaporation

Annual FWS Evaporation Map



TWIN FALLS 2 NNE, IDAHO (109294)

Period of Record Monthly Climate Summary

Period of Record : 9/ 1/1905 to 5/31/1974

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	36.5	42.6	52.0	62.3	71.6	79.9	90.3	88.1	77.8	65.6	50.0	39.1	63.0
Average Min. Temperature (F)	18.1	23.3	27.7	33.6	41.0	47.4	53.6	50.7	42.0	34.1	26.3	20.5	34.9
Average Total Precipitation (in.)	1.11	0.79	0.84	0.93	1.00	0.85	0.29	0.25	0.51	0.77	1.03	0.95	9.33
Average Total SnowFall (in.)	6.4	3.5	1.9	0.9	0.3	0.0	0.0	0.0	0.0	0.3	1.5	4.7	19.4
Average Snow Depth (in.)	1	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.
Max. Temp.: 99% Min. Temp.: 98.9% Precipitation: 98.9% Snowfall: 99% Snow Depth: 95.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Est. CU and CIR. Twin Falls 2 NNE (Allen & Brockway,1983) mm/day and mm/season

	MO	NYRS	PREC	ETR	ALFH.	ALFS.	BEANS	F.CRN	SILGE	S.CRN	PEAS	POTAT	SBEET	SGRAN	WGRAN	PAST.	ORCHD	VEGES	ONION
AVE ET	3	44	.86	2.13											.97				
AVE IR	3	44	100.00												.56				
STDD ET	3	44	.58	.32											.15				
STDD IR	3	44	100.00												.29				
SKEW ET	3	44	1.26	.54											.54				
SKEW IR	3	44	100.00												-1.11				
AVE ET	4	44	.92	4.75	2.95	3.35					1.44	1.42	1.42	1.46	4.34	2.96	1.94		1.42
AVE IR	4	44	100.00		2.40	2.78					.99	1.05	.93	1.02	3.78	2.43	1.44		1.05
STDD ET	4	44	.77	.47	.29	.33					.14	.14	.14	.14	.43	.29	.19		.14
STDD IR	4	44	100.00		.61	.65					.43	.38	.47	.43	.72	.60	.51		.38
SKEW ET	4	44	1.59	.11	.11	.11					.11	.11	.11	.11	.11	.11	.11		.11
SKEW IR	4	44	100.00		-.56	-.49					-.85	-.76	-.90	-.83	-.30	-.53	-.75		-.76
AVE ET	5	44	.98	6.34	5.88	5.70	1.90	1.90	1.90	1.90	3.60	2.05	1.91	4.46	6.34	4.88	3.73	1.93	2.52
AVE IR	5	44	97.73		5.19	5.02	1.45	1.39	1.39	1.39	3.07	1.65	1.39	3.92	5.68	4.26	3.15	1.54	2.12
STDD ET	5	44	.68	.48	.44	.43	.14	.14	.14	.14	.27	.15	.14	.33	.48	.37	.28	.14	.19
STDD IR	5	44	97.73		.78	.76	.41	.45	.45	.45	.54	.38	.45	.60	.79	.68	.58	.37	.41
SKEW ET	5	44	.74	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14	.15	.14	.14
SKEW IR	5	44	97.73		-.08	-.08	-.29	-.31	-.31	-.31	-.15	-.24	-.31	-.10	-.05	-.11	-.17	-.25	-.19
AVE ET	6	43	.91	7.92	6.92	6.88	3.47	3.45	3.45	3.45	6.42	5.43	3.92	7.88	7.92	6.10	6.37	4.14	4.70
AVE IR	6	43	97.67		6.23	6.19	2.99	2.92	2.92	2.92	5.83	4.97	3.37	7.25	7.24	5.47	5.74	3.72	4.26
STDD ET	6	43	.80	.45	.39	.39	.20	.20	.20	.20	.36	.31	.22	.45	.45	.35	.36	.23	.27
STDD IR	6	43	97.67		.91	.90	.57	.62	.62	.62	.80	.65	.66	.90	.95	.82	.84	.56	.60
SKEW ET	6	43	1.28	.60	.59	.59	.59	.58	.58	.58	.58	.60	.59	.59	.60	.60	.59	.59	.59
SKEW IR	6	43	97.67		-.61	-.62	-.77	-.80	-.80	-.80	-.58	-.55	-.77	-.50	-.54	-.64	-.62	-.65	-.61
AVE ET	7	43	.27	8.32	6.79	5.56	7.50	7.48	7.48	7.39	2.91	6.99	8.05	7.17	6.63	6.41	7.07	6.40	6.24
AVE IR	7	43	86.05		6.64	5.42	7.37	7.33	7.33	7.24	2.81	6.87	7.89	7.04	6.49	6.26	6.92	6.29	6.13
STDD ET	7	43	.24	.27	.22	.18	.24	.24	.24	.24	.09	.23	.26	.23	.21	.21	.23	.21	.20
STDD IR	7	43	86.05		.33	.29	.34	.35	.35	.35	.18	.30	.37	.32	.31	.31	.34	.28	.27
SKEW ET	7	43	1.72	-.15	-.14	-.13	-.11	-.10	-.10	-.13	-.09	-.18	-.13	-.16	-.20	-.15	-.15	-.08	-.14
SKEW IR	7	43	86.05		-.80	-.88	-.67	-.73	-.73	-.74	-1.16	-.60	-.69	-.68	-.76	-.80	-.76	-.60	-.64
AVE ET	8	43	.32	6.78	5.14	2.91	3.93	6.25	6.25	5.96		5.25	6.63	1.51	1.24	5.22	5.76	5.39	5.42
AVE IR	8	43	79.07		4.99	2.79	3.82	6.10	6.10	5.81		5.14	6.47	1.41	1.14	5.08	5.61	5.28	5.31
STDD ET	8	43	.51	.32	.24	.14	.18	.29	.29	.28		.25	.31	.07	.06	.25	.27	.25	.25
STDD IR	8	43	79.07		.48	.36	.38	.53	.53	.51		.41	.56	.26	.27	.47	.50	.42	.42
SKEW ET	8	43	3.68	-.09	-.08	-.07	-.08	-.12	-.12	-.09		-.06	-.09	-.09	-.08	-.08	-.09	-.08	-.09
SKEW IR	8	43	79.07		-2.82	-3.27	-2.88	-2.60	-2.60	-2.64		-2.40	-2.57	-3.55	-3.64	-2.75	-2.67	-2.38	-2.38
AVE ET	9	43	.61	5.22	3.52	1.49		3.90	3.90			3.06	4.48			4.02	4.37	3.56	4.15
AVE IR	9	43	86.05		3.21	1.21		3.60	3.60			2.83	4.15			3.71	4.06	3.33	3.91
STDD ET	9	43	.78	.41	.27	.12		.30	.30			.24	.35			.31	.34	.28	.32
STDD IR	9	43	86.05		.60	.46		.62	.62			.46	.67			.63	.66	.50	.55
SKEW ET	9	43	2.49	-.48	-.48	-.48		-.48	-.48			-.47	-.48			-.48	-.48	-.48	-.47
SKEW IR	9	43	86.05		-1.22	-1.81		-1.11	-1.11			-1.04	-1.03			-1.09	-1.03	-.93	-.83
AVE ET	10	43	.72	3.52	1.26	.47		.98					2.26			2.71	2.32		
AVE IR	10	43	97.67		.89	.12		.63					1.88			2.32	1.94		
STDD ET	10	43	.62	.35	.13	.05		.10					.23			.27	.23		
STDD IR	10	43	97.67		.39	.34		.36					.47			.50	.47		
SKEW ET	10	43	1.46	-.36	-.36	-.36		-.36					-.36			-.36	-.36		
SKEW IR	10	43	97.67		-.90	-1.13		-.97					-.66			-.58	-.65		
AVE ET	SE	43	135.9	1377.	993.	806.	518.	736.	705.	576.	438.	741.	879.	688.	839.	988.	966.	657.	748.
AVE IR	SE	43	0.0	0	904.	719.	481.	674.	655.	535.	387.	689.	800.	632.	760.	904.	883.	618.	697.
STDD ET	SE	43	43.4	42.	30.	27.	15.	20.	20.	17.	17.	21.	23.	23.	32.	28.	26.	19.	22.
STDD IR	SE	43	0.0	0.	55.	52.	30.	37.	38.	34.	40.	39.	45.	46.	57.	51.	49.	32.	40.
SKEW ET	SE	43	-.04	.06	.09	.26	.05	-.26	-.23	.01	.31	-.08	-.40	.31	.43	-.02	-.07	-.24	-.24
SKEW IR	SE	43			.03	-.03	-.02	.16	-.11	-.10	-.35	-.26	-.00	-.20	-.01	.03	-.01	-.10	-.22

Data also available @ www.kimberly.uidaho.edu/water/appndxet/index.shtml