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February 21, 2006

BOB DUKE
WATERMASTER, WATER DISTRICT NO 34
PO BOX 53
MACKAY, ID 83251-0053

Re: Big Lost River Accounting

Bob,

This letter provides a description of the water right accounting program and how it is applied to the Big Lost River Water District. This description is provided in response to inquiries by you and some of the WD 34 water users regarding a large (over 8,000 AF) excess diversion above the reservoir shown in the accounting report for the 2005 irrigation season. A draft of this letter was faxed to your office on February 17, 2006.

The water right accounting (WRA) program uses reported diversions and measured river flows to determine the available natural flow (water available to fill decreed, permitted, or licensed water rights) in the river and the latest priority date of water right that can be satisfied with the computed natural flow. The daily diversions to each canal and exchange pump inflows are reported from ditch rider records by the watermaster to the Idaho Department of Water Resources (IDWR) using an internet application. These daily canal diversions and exchange pump flows are then input to a file that is read by the WRA program. Average daily river flows are accessed from the U.S. Geological Survey internet site, or provided by the watermaster via IDWR's internet application and input the a file for the WRA program to read.

In the Big Lost Water District, the river is broken into distinct reaches as specified in the Idaho Department of Administration Procedures Act (IDAPA) rules for Water District 34. Natural flow in the river available to fill rights is calculated for each river reach by the WRA program according to this formula:

Natural Flow = Reach Outflow – Reach Inflow + Total of diversions in the reach – Total of exchange pumps in the reach + reservoir change in contents + reservoir evaporation

Reservoir contents and evaporation are ignored for river reaches without a reservoir. For the river reach containing Mackay reservoir, the daily reservoir data are provided to IDWR via the internet by the watermaster.

A list of water rights in each reach with their maximum diversion rate and priority are included in another input file for the WRA program. Routines in the WRA program attempt to distribute the available natural flow to satisfy the latest priority water rights in each river reach.

The WRA program determines the latest priority that can be filled for each canal in a reach, and then balances the distribution of natural flow so that all the same priority water rights are satisfied for each canal in a river reach. Then the WRA program compares the water right priorities being satisfied between each reach, and then attempts to balance the available natural flow in the entire river system so that the same priority dates are being filled in the entire river system.

If, after balancing all the natural flows in the entire river system to satisfy the same priority, a canal's diversion for that day exceeds what the maximum diversion amount is for the priority in effect that day, the excess diversion is attributed to storage use from Mackay reservoir, or attributed to excess diversion for the two river reaches above the reservoir. Excess diversion or storage use will also be indicated when all the water rights on a canal can be filled, and the diversion exceeds the sum of the maximum rates for all the rights.

To help clarify the above explanation, example printed output from the WRA program is shown in Figure 1 below for the two river reaches above the reservoir during the 2005 season when the river was not connected. The upper river reach above the Howell gage is used to illustrate how the WRA accounting program works. In Figure 1, the upper river reach is identified as reach #3, BIG LOST AT HOWELL. Only two diversions are included in this reach, SORENSON and HOWELL, shown in the second table of data in Figure 1.

For reach #3, there is no inflow, just measured outflow from the reach at Howell gage. The measured outflow is 155 cfs, and is shown under the ACTUAL FLOW column heading in Figure 1. This is the flow measured on the date shown (AUG 17) under the ACTUAL DATE column heading, and is lagged from the reporting date of AUG 20, 2005 shown in the heading line of Figure 1. This lagging is essential to proper water distribution, but is not pertinent to the discussion in this letter.

The 157 cfs shown under the NATURAL FLOW heading is calculated from the reach inflow, which is 0 cfs since no measurement is available, minus the reach outflow of 155 cfs, plus the total diversion of 2 cfs. The REMAINING NAT FLOW is the natural flow available in the reach minus the diversions not exceeding the water right amounts as determined by the priority date. This REMAINING NAT FLOW value is simply 157 cfs

FIGURE 1. Example WRA printout.

WATER DISTRICT 34 - BIG LOST RIVER ABOVE RESERVOIR FLOW ACCOUNTING - AUG 20, 2005 20050824

Reach # 3

REACH	REACH FLOWS IN CFS		ACTUAL DATE	NATURAL FLOW	ACTUAL FLOW	RMAINING NAT FLOW	EXCHANGE FLOW	STORED FLOW	RESERVOIR EVAP	NATURAL FLOW DIV	TOTAL RCH DIV	REACH GAIN	LAST RIGHT
3	BIG LOST AT HOWELL		AUG 17	157.	155.	155.	0.	0.	0.	2.	2.	157.	19780601
2	BIG LOST ABV MACKAY RES	*	AUG 18	416.	185.	234.	0.	-50.	0.	179.	229.	259.	19780601
									TOTALS	181.	231.	416.	

* - INDICATES FLOW ESTIMATED, NOT MEASURED

TOTAL DIVERSIONS IN REACH # 3

	DIVERSION	CFS DIVN	CFS EXC	AF EXC		DIVERSION	CFS DIVN	CFS EXC	AF EXC		DIVERSION	CFS DIVN	CFS EXC	AF EXC
1	SORENSEN	0.0	0.0	0.0	23	MTN_SPRINGS_1	0.0	0.0	253.8	45	BROKEN_R_DITC	2.4	0.0	55.2
2	HOWELL	2.0	0.0	462.3	24	MTN_SPRINGS_4	0.0	0.0	0.0	46	FREEMAN_2	2.4	0.0	0.0
3	KENT_DITCH	0.0	0.0	829.9	25	MTN_SPRINGS_2	0.0	0.0	0.0	47	FREEMAN_3	3.0	0.0	0.0
4	BRADSHAW_1	6.0	0.0	1739.6	26	DONAHUE_2	0.0	0.0	494.7	48	FREEMAN_PUMP	0.0	0.0	0.0
5	BITTON	0.0	0.0	0.0	27	SIMMONS	6.0	0.0	0.0	49	6X_RANCH_5	2.0	1.2	279.9
6	ANDERSON	0.4	0.0	444.9	28	DONAHUE_4	0.0	0.0	0.0	50	JOHNSON_NAVAR	3.0	0.0	0.0
7	THALMAN_HUNTE	3.2	0.0	31.3	29	DONAHUE_3	3.2	0.0	0.0	51	6X_RANCH_6	4.0	0.0	0.0
8	JOHNSON_HATMA	1.6	0.0	0.0	30	ZOLLINGER_2	3.2	0.0	0.0	52	HARRIS_INACTI	0.0	0.0	0.0
9	NEILSEN	23.8	0.0	881.5	31	ZOLL_NO_TELLU	8.5	0.0	0.0	53	STOECKLEIN_3	1.5	1.5	95.2
10	BRADSHAW_2	0.0	0.0	0.0	32	CHURN_DASHER	2.0	0.0	0.0	54	UPR_FISH_HATC	7.6	0.0	85.5
11	CHILLY_CANAL	52.8	0.0	1837.9	33	NO_TELLUM_1	0.0	0.0	995.8	55	FREEMAN_DITCH	4.0	1.3	69.9
12	INGRAM_DITCH	0.0	0.0	0.0	34	NO_TELLUM_2	0.0	0.0	0.0	56	STOECKLEIN_1	3.2	0.0	0.0
13	CHERIAN	0.0	0.0	0.0	35	NO_TELLUM_3	0.0	0.0	0.0	57	STOECKLEIN_2	6.0	5.4	957.6
14	PRITCHETT_PMP	0.0	0.0	0.0	36	GATES_WOODS_1	3.2	0.0	0.0	58	STOECKLEIN_4	0.9	0.0	2.7
15	LONGHURST	0.4	0.0	0.0	37	GATES_WOODS_2	4.0	0.0	0.0	59	SHOUPE_DITCH	4.6	1.2	332.7
16	MTN_SPRINGS_3	0.0	0.0	1334.7	38	NO_TELLUM_4	0.0	0.0	0.0	60	GATES_PUMP_1	2.7	0.0	0.0
17	DONAHUE_1	0.0	0.0	386.2	39	NO_TELLUM_5	0.0	0.0	0.0	61	GATES_PUMP_2	3.4	1.2	50.8
18	ZOLLINGER_1	0.0	0.0	0.0	40	GATES_WOOD_6X	14.0	27.5	5172.0	62	6X_RANCH_PUMP	3.7	1.9	172.8
19	ZOLLINGER_3	0.0	0.0	468.8	41	SMITH_PUMPS	6.0	0.0	43.2	63	6X_RANCH_NAVA	2.0	0.0	0.0
20	PENCE	0.0	0.0	13.3	42	6X_HAR_INACTI	0.0	0.0	0.0	64	GATES_WOODS_3	6.0	2.8	545.9
21	UNGER	0.0	0.0	0.0	43	FREEMAN_KENT	3.0	5.6	1053.3	65	6X_RANCH_3	10.0	0.0	0.0
22	6X_RANCH_1	2.4	0.0	0.0	44	BROKEN_R_PUMP	3.0	0.0	0.0	66	6X_RANCH_4	10.0	0.0	0.0

(1) BITTON USE COMBINED WITH KENT DITCH
(2) BRADSHAW 2 USE COMBINED WITH BRADSHAW 1
(3) JOHNSON/HATMAKER USE COMBINED WITH ANDERSON
(4) SIMMONS USE COMBINED WITH NEILSEN

minus 2 cfs, or 155 cfs. The other columns in the first data table of Figure 1 are explained below:

EXCHANGE FLOW:	Inflow to the river reach from exchange pumps.
STORED FLOW:	The amount of the total diversions in the reach which are in excess of the natural flow diversion amounts permitted under the priority date in effect.
RESERVIOR EVAP	Reservoir evaporation if reservoir present.
NATURAL FLOW DIV	That portion of the total canal diversions in a reach that can be satisfied by natural flow according to priority date.
REACH GAIN	Reach inflow minus reach outflow plus diversions minus exchange flow.
LAST RIGHT	The priority date calculated for which all rights with that priority can be satisfied in the river reach.

The second table of data in Figure 1 shows the diversions in the river system arranged in upstream to downstream order. The column headings are described below:

CFS DIVSN:	The reported daily diversion rate for the listed canal
CFS EXC:	The amount of the reported diversion that is in excess of the natural flow permitted under the priority date in effect. This is also shown as CFS STOR for the connected river condition, and for diversions below the reservoir.
AF EXC	The season accumulated total of excess diversions in acre-feet. This is also shown as AF USED for the connected river condition, and for diversions below the reservoir.

For the diversions below the reservoir, it cannot be determined from the WRA output whether there is excess diverting. This is because any water used in excess of the natural flow rights that can be filled is attributed to storage use from the reservoir. The Big Lost River Irrigation District tracks storage use for each user. A comparison could be made between what the WRA accounting output shows as storage use and what the Big Lost Irrigation District shows for storage use for a diversion in order to determine if excess natural flow has been used. This comparison is currently not done by IDWR.

As with any computer program, the accuracy of the results is limited by the accuracy of the program setup and the input data. A cursory review of the accounting program setup and the diversion data you input throughout the irrigation season confirmed that the program functions as intended, and that the excess diversions reported by the accounting accurately reflect the diversion data reported by the water district.

A review of the diversion data for diversion locations showing excess diversion suggested that diversions in excess of that allowed by the water right was reported by the water district. While there may be other contributing factors, such as groundwater

recharge and measurement accuracy issues, it appears that the reported excess diversion is generally restricted to diversions for water rights which authorize multiple points of diversion. In such cases, the reported diversion from each authorized point of diversion was equal to the total authorized diversion for the right, as opposed to diverting a total of the authorized amount from both diversions. The result is a reported diversion that is double or triple the authorized diversion rate under the right, depending on the number of diversions authorized by the right.

An example of this is the Bradshaw 1 diversion above the reservoir. The water rights for Bradshaw 1 can also be diverted through Bradshaw 2. The sum of the diversion rates of all the water rights is 12.4 cfs, so the sum of the diversions for Bradshaw 1 and Bradshaw 2 should not exceed 12.4 cfs. The most junior priority is 1916. On June 2, 2005, 12 cfs was reported to be diverted to Bradshaw 1 and 12 cfs was reported as diverted to the Bradshaw 2 heading. The priority in effect that day was 1987. Thus, all rights were good, meaning a maximum of 12.4 cfs could be diverted through the combined diversions. Since the combined diversion rate from Bradshaw 1 and Bradshaw 2 was 24 cfs on that day, an 11.6 cfs excess diversion occurs.

Note that in the above example, as with any use of the reported diversion data, the Department assumes that the reported values accurately reflect what was physically delivered. You indicated during our phone conversation on February 13, 2006 that you believe there may have been an error in reporting and that the amounts physically delivered were not in excess of the water right. Given the stream gauging data that we have, as well as the margin of error in the measurements relative to the amounts diverted, we cannot independently calculate the diversion rates for last season.

Given the discrepancy between the reported diversion, and your understanding of the actual diversion, as well as the regrettable fact that the discrepancy went unnoticed until after the irrigation season, closer monitoring of the accounting is warranted for the upcoming year. The Department will perform periodic office review of the water deliveries above the reservoir as reported and inform you of any apparent excess delivery or possible reporting errors.

Given the appearance of excess diversion above the reservoir, water users in the district may feel that excess diversion may occur below the reservoir as well. As mentioned earlier, over diversions that occur below the reservoir will be allocated by the accounting program as storage delivery. Because of this, we cannot assess, using the accounting program, if excess diversion below the reservoir occurred. The Department feels that the best way to build confidence in the community that mistakes or deliberate excess diversion are not occurring, is through independently conducted random checks of deliveries.

You and other water users have raised additional questions about how the accounting handles various details of the general provisions and the partial decree. There has also been some interest in discussing ways to improve the accounting, such as

additional stream gauging, or refining tributary accounting. The Department is willing to meet and discuss these issues. If you are interested, please contact our office to schedule a meeting.

Please contact our office if you have any further questions.

Sincerely,

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Water Distribution Section

Steve Burrell
Hydrology Section

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WD 34 2005 file
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