M E M O R A N D U M

DATE: May 7, 2004

TO: Gary Spackman through Tim Luke

FROM: S. Burrell

RE: Review of: *Supplemental Technical Information for Mitigation Plan Submitted by Gary and Helen DeMoss; WR# 37-7385B*

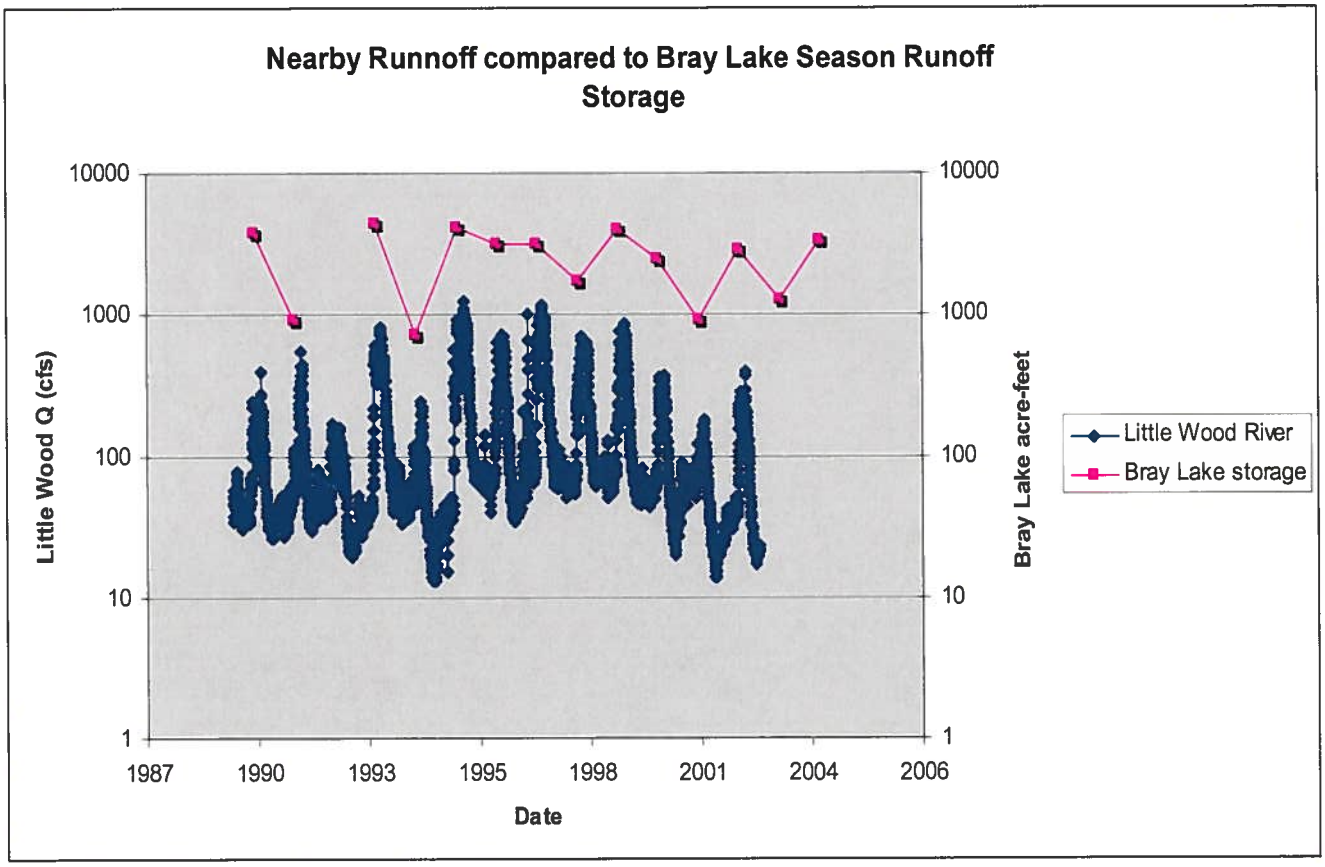
I reviewed the report referenced above to determine the rational for the proposed mitigation plan and suitability of the hydrologic data presented in support of the plan. The water user proposes to offset groundwater withdrawal (used to supplement surface water from storage) by the higher conveyance and deep percolation losses that occur when sufficient surface storage is available to make use of the supplemental groundwater unnecessary. It is proposed that the mitigation would occur through use of surface water exclusively during some irrigation seasons, and losses of sufficient quantity would average out to offset the groundwater pumpage used only in low water years.

Water right no. 37-7385B previous to February 2003 was for irrigation from ground water only of 124 acres. The user had three additional rights for surface water storage from Dry Creek to irrigate separate acres. Storage is held in Bray Lake. Transfer 69896 was approved in 2003 and combined the three surface rights and the ground water right to allow surface water use on the groundwater acres. Some of the storage rights also have natural flow rights, but they are junior to downstream rights and rarely used, the report states. A summary of the rights for this user are shown below.

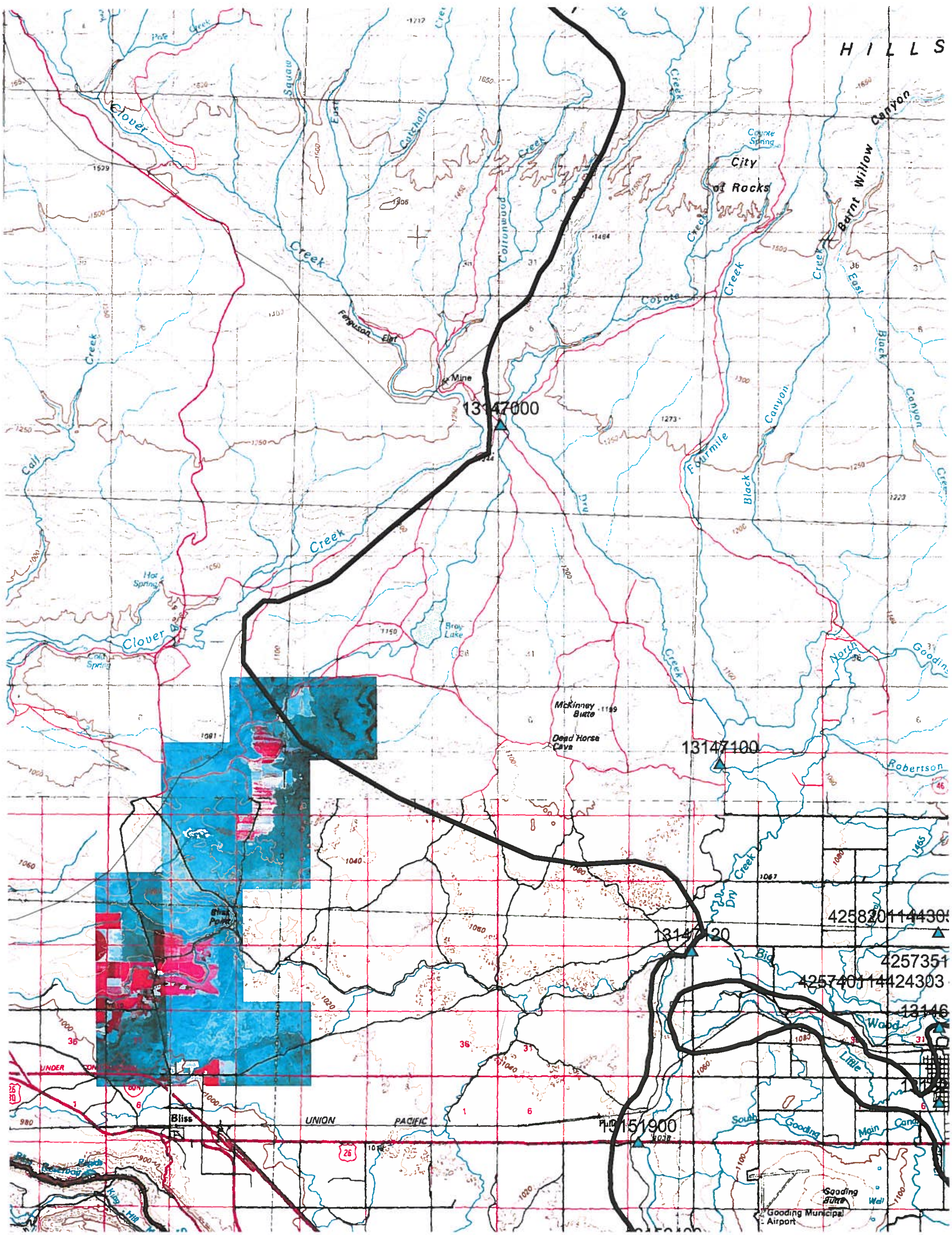
WR No.	Priority Date	Source	Bray Lake Storage (AF)	Pre-2003 acres	Current combined total acres
37-7754	12/14/1978	Dry Creek	1565	313	808
37-7385B	09/20/1974	Groundwater		124	124*
37-2780	04/13/1954	Dry Creek	905		808
37-2778	02/26/1957	Dry Creek	1210	242	808
37-856	02/01/1917	Dry Creek	775	160	808
* Allowed anywhere in the 808 acres					

The report says the user usually only irrigates 714 acres of the 808 available. A spreadsheet analyses is presented in the report that is based on the 714 acres, with 590 irrigated with surface water, and 124 irrigated with only groundwater (prior to 2003).

The user's records of reservoir storage since 1990 are shown in the spreadsheet. The storage capacity was verified using planimetered areas from 1:24000 USGS maps. Information from the USGS internet site for a discontinued USGS gage station (13147000) above Bray Lake on Dry Creek lists the drainage area as 34 square miles. I checked the area from USGS 1:100000 scale maps and came up with 24 square miles. Either of these drainage areas would provide sufficient runoff to fill the reservoir to the volumes listed in the spreadsheet, assuming 10 inches of precipitation annually. A comparison of runoff from the closest active USGS gage site to the annual stored volumes shows a reasonable correlation (see figure below).



The assumed annual reservoir evaporation of 10% is also appropriate (see attached calculations). Seepage/conveyance losses of 20% also seem reasonable, based on previous U of I studies in the general area (i.e. *Predicting Attainable Irrigation Efficiencies in the Upper Snake River Region*, Claiborn, 1975). A farm efficiency of 50% is used based on the user reporting that 2700 acre feet of storage will satisfy the season irrigation requirements for his farm. This farm efficiency appears reasonable based on studies by Claiborn (1975), and assuming furrow irrigation is the method used.



HILLS
Clover Creek
Squaw
Catchall
Creek
Cottonwood
City of Rocks
Coyote Spring
Barnt Willow Canyon
Creek
Creek
East
Coyote
Creek
Ferguson Flat
Mine
13147000
Fourmile
Black Canyon
Black
Canyon
Dry
Creek
Calf
Creek
Hot Spring
Clover
Bray Lake
Cold Spring
McKinney Butte
Dead Horse Cave
13147100
Robertson
North
Gooding
Dry Creek
13147120
425820114430
4257351
425740114424303
13146
Big
Wood
Little
Bliss Point
UNDER CONSTRUCTION
Bliss
UNION PACIFIC
13151900
South
Gooding
Main Canal
Gooding Butte
Gooding Municipal Airport
Kirk Hill

An average annual consumptive use (CU) requirement of 1.6 feet is assumed, and is consistent with IDWR calculations (conversation with John Lingren, 04/28/2004). Farm headgate water requirements are 3.2 feet, based on the 50% farm efficiency.

According to information in *Soil Survey of Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties* (USDA NRCS, 2002), soils in the area are the Chilcott/Linkletter complex . A hardpan layer is prevalent at 20" to 40", and "slow permeability of subsoil results in saturation of surface layer in spring". This drainage impediment could inhibit the percolation and conveyance loss's movement to the aquifer, but is to complex an issue to determine for this review.

The spreadsheet analysis in the report shows the amount of additional conveyance loss and deep percolation that would have occurred during the years prior to 2003 if surface water had been used to irrigate the 124 ground water only acres instead of depending on the pump. Apparently, prior to the 2003 transfer, any leftover storage was carried over to the next season. Carryover is determined to exist when the 590 surface water only acres headgate CU requirements were met (1888 af). When carryover water is available, the spreadsheet analysis uses the carryover water available to apply to the 124 ground water only acres, and figures the additional conveyance and deep percolation losses would have averaged out to be 182 af/year over the last 13 years.

This additional average seepage loss of 182/ af/year is compared to the groundwater use needed during season when no carryover existed. The analysis in the report assumes that when groundwater is used to irrigate the 124 ground water only acres, it is applied at 100% efficiency. In other words, the headgate requirement is 1.6 ft x 124 acres = 198 af/year when the pump is used, compared with the reservoir headgate requirement of 397 af/year for the same 124 acres. Using these report numbers, the average groundwater use for the last 13 years would have only been 77 af/year, if it were permitted prior to 2003 to use the leftover stored surface water on the 124 groundwater acres. Thus, the analysis is showing that over the long term, the use of surface water storage now permitted on the 124 previously groundwater only acres will offset the groundwater pumped on the 124 acres during low runoff water years.

I don't think the assumption used in the analysis of 100% farm efficiency for groundwater use is valid. For instance, the annual volume reported to IDWR for this well for 2003 is 258.63 af., compared to 198 af assumed in the report. An efficiency of 76% may be more appropriate.

I did a separatae analysis using the same data and assumptions as the user's analysis to determine the amount of carryover and deficit each season (see next sheet). This analysis also shows reported pump use for the years available. From this analysis, it does appear that surface water can irrigate the entire acreage this year. The concept of this mitigation plan does have some merit, and if approved, could be evaluated using measured flows from both from reservoir storage and groundwater, per conditions in the water rights.

Acres/CU		Total SW Farm Delivery requirements	
SW	SW/GW	Pre 2003	Post 2003
590	124	1888	2284.8
944	198.4		

Annual Seepage losses for NCCC were roughly 30%, as reported in UI study (Fig D-1, Claiborn)

All values in acre-feet

Year	Stage	Begin Season Stor	Reservoir Storage From runoff	Reservoir Evap.	Reservior/ conveyance Loss	Deliveriable	Carryover	Deficit	Reported WMIS Pump use
1990	28	3,786	3,786	378.6	681.48	2725.92	838	-	
1991	16	1,757	919	175.7	316.26	1265.04	-	(623)	
1992	0	-	-	0	0	0	-	(1,888)	
1993	31.5	4,491	4,491	449.1	808.38	3233.52	1,346	-	
1994	18	2,059	713	205.9	370.62	1482.48	-	(406)	
1995	30	4,197	4,197	419.7	755.46	3021.84	1,134	-	
1996	30.6	4,318	3,184	431.8	777.24	3108.96	1,221	-	
1997	31	4,395	3,174	439.5	791.1	3164.4	1,276	-	
1998	24	3,029	1,753	302.9	545.22	2180.88	293	-	210
1999	31	4,395	4,102	439.5	791.1	3164.4	1,276	-	?
2000	28	3,786	2,510	378.6	681.48	2725.92	838	-	?
2001	16	1,757	919	175.7	316.26	1265.04	-	(623)	313.75
2002	23	2,861	2,861	286.1	514.98	2059.92	172	-	175.17
2003	14	1,461	1,289	146.1	262.98	1051.92	-	(1,233)	258.63
2004	26	3,397	3,236	339.7	611.46	2445.84	161	-	

Carryover based on 2888 af CU for 590 SW acres

Carryover based on 2284 af CU for 714 SW acres