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From: Steven Thurin, John Koreny and Emily Larson, HDR Engineering, Inc. Chuck Brockway, Brockway Engineering, Inc.	Project: Surface Water Coalition
CC:	
Date: June 18, 2007	Job No: 27055

**RE: Updated 2007 SWC Water Supply Assessment**

**INTRODUCTION**

This technical memorandum updates the 2007 surface water supply assessment for the Surface Water Coalition<sup>1</sup>. This update is provided to reflect the changes in water supply and climatic conditions since the previous assessment completed at the beginning of the irrigation season. In the Fifth Supplemental Order Amending Replacement Water Requirements dated May 23, 2007, the Director states that, *“The Director will continue to monitor water supply and climatic conditions through the 2007 irrigation season and issue additional orders regarding replacement water needs in 2007.”* This update is provided to assist in monitoring the 2007 water supply and climatic conditions to evaluate whether additional shortages have occurred since the evaluation completed at the beginning of the irrigation season using water supply and climate forecasts.

This memo first discusses the 2007 water supply conditions based on the current conditions occurring since the beginning of the irrigation season. The water supply is then evaluated using the method in the IDWR Order dated May 23, 2007 and the method described in the 2007 Water Supply Assessment prepared on April 13, 2007<sup>2</sup>.

**2007 WATER SUPPLY CONDITION UPDATE**

**Climatic Conditions**

The NOAA Climate Prediction Center (CPC) climatic forecast for the 2007 irrigation season continues to predict hot and dry conditions typical of a drought year and the worst since forecasts were recorded beginning in 1996. The June 1, 2007 NRCS Water Supply Outlook predicts that the Snake River near Heise will experience the 5<sup>th</sup> driest summer in the 1971 to 2006 period, and quotes

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<sup>1</sup> The Surface Water Coalition includes A&B Irrigation District, American Falls Reservoir District No. 2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, Northside Canal Company and Twin Falls Canal Company.

<sup>2</sup> HDR Engineering, Inc. and Brockway Engineering PLLC, April 13, 2007. Surface Water Coalition 2007 Water Supply Assessment. Prepared for Surface Water Coalition.

Water Supply Specialist Ron Abromovich, that “winter was too short and summer arrived a month early”. The Surface Water Supply Index (SWSI) for the Snake River above Heise is -3.2, indicating that approximately 90% of years have better water supply conditions. This condition is classified as well below normal. Agricultural supply shortages may occur when the SWSI is below -1.6. The SNOTEL gages for the Upper Snake Basin indicate that June 15 snowpack is well below normal, and essentially gone.

### Snake River Heise Natural Flow Forecast

In early April the Bureau of Reclamation (Reclamation) forecasted the April-July natural Snake River flow at Heise at 2.370 MAF. The April-July natural Snake River flow forecast was updated in May to 2.338 MAF (including an actual flow of 0.338 MAF in April and 2.000 MAF forecasted for May through July). Further updates are not available after May from Reclamation<sup>3</sup>.

NOAA has updated the natural Snake River flow at Heise forecast for May and June. The initial April-May forecast produced by NOAA in May was 2.380 MAF. NOAA updated their April-July Snake River natural flow forecast at Heise in June to 1.840 MAF, down from their April 2007 prediction by about 540,000 acre-feet. The updated forecast is for a significantly lower supply of water for irrigation and other uses in the Upper Snake River Basin than was predicted earlier in the season.

The USBR water operations staff<sup>4</sup> is currently considering that the water supply in the Upper Snake River Basin for 2007 is most similar to that occurring in 2001, which was the driest natural flow runoff year in the last 15-years. From a numerical standpoint, the NOAA forecasted flow at Heise would make it most similar to water year 1992, when the April-July flow near Heise was 1.692 MAF. The flow near Heise in 2001 was 1.569 MAF.

**Table 1 Summary of Snake River April-July natural flow at Heise forecasts and actual flow values for other low flow years**

Snake River Natural Flow Near Heise April-July	
USBR forecast (April, 2007)	2.380 MAF
USBR forecast (May, 2007)	2.338 MAF
NOAA forecast (April, 2007)	2.370 MAF
NOAA forecast (June, 2007)	1.840 MAF
2004 Actual	2.386 MAF
2002 Actual	2.307 MAF
1992 Actual	1.692 MAF
2001 Actual	1.569 MAF

<sup>3</sup> Based on phone call with John Roache, Reclamation Boise Office on June 15, 2007.

<sup>4</sup> Based on phone call with Mike Beus, Reclamation Upper Snake River Area Office on June 14, 2007.

## UPDATED 2007 SWC SHORTAGE USING METHOD FROM 5/23/07 IDWR ORDER

The method used in the May 23, 2007, “Fifth Supplemental Order Amending Replacement Water Requirements” was repeated using updated hydrologic and forecast data for the 2007 water year. This was completed to provide information to assist with the provision in the order that, “*The Director will continue to monitor water supply and climatic conditions through the 2007 irrigation season and issue additional orders regarding replacement water needs in 2007*”. Replacement tables provided in this section are numbered to correspond with the paragraphs and page numbers in the Fifth Supplemental Order document. The Order describes in detail the methodology used. The same procedures were implemented as stated in the Order, using the most-current water supply condition data as follows:<sup>5</sup>

- 1) The 2007 actual reservoir allocations are substituted for the previously assumed full reservoir storage less evaporation.
- 2) The most-recent Snake River natural flow at Heise forecast available for the April through July period is the June 1, 2007 NOAA forecast of 1.840 MAF. This is in contrast to the earlier Reclamation forecasts of 2.380 MAF.

The IDWR Director computed a 2007 shortage for the SWC of 58,914 acre-feet and a combined shortage + reduced carryover of 140,331 acre-feet using estimated full reservoir allocation for 2007 and the April 1 forecast for April-July Heise natural flow. Using the actual reservoir allocations and an updated Snake River natural flow forecast, we completed the same analysis using the same method using the actual 2007 reservoir allocation and the NOAA update to the Heise natural flow forecast for April – July. This computation is presented on Tables 1 to 4 and summarized on Table 5. The analysis shows that the shortages and reduced carryover predicted increases by a factor of about 2, as described on Table 5.

The rationale for using the 2007 actual reservoir allocations in the 5/23/07 Order method is that in April the Upper Snake Basin reservoirs were projected to fill and so the 5/23/07 Order used full reservoir allocations for the SWC. The actual reservoir storage allocations on the May 29, 2007 date when reservoir allocation was issued by WD 01 were less than full. Since the SWC did not receive a full allocation, it is more appropriate to use actual storage supplies, instead of the previously estimated reservoir storage data. Table 2 combines the latest forecast for natural flow with the actual allocated reservoir storage to get a new total supply value.

The rationale for using the June 3, 2007 NOAA Snake River natural flow at Heise forecast is that it is the most recent available flow forecast. It is also consistent with the other available information that indicates that the 2007 water year is drier than initially expected. The forecast indicates that

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<sup>5</sup> The method used in the May 23, 2007 Fifth Supplemental Order is repeated with updated data to identify whether additional shortages are predicted by the method.

2007 runoff conditions may be about 500,000 acre-ft less than initially forecasted. See Table 1 for the updated, predicted natural flow diversions for 2007. The runoff and natural flow conditions during June and July will most influence actual Snake River natural flow conditions at Heise, and should be continued to be monitored along with updated natural flow predictions to evaluate actual natural flow supplies.

**Table 1 Updated Calculations from 5/23/07 Order Paragraph 19 – Page 9**

<b>Irrigation Company or District</b>	<b>Predicted 2007 Natural Flow Diversions</b>
	(acre-feet)
A&B Irrigation District:	0
American Falls Res. Dist. #2:	0
Burley Irrigation District:	88,416
Milner Irrigation District:	0
Minidoka Irrigation District:	62,000
North Side Canal Company:	222,121
Twin Falls Canal Company:	739,860

**Table 2 Updated Calculations from 5/23/07 Order Paragraph 21 – Page 11**

<b>Irrigation Company or District</b>	<b>2007 Natural Flow</b>	<b>2007 Storage</b>	<b>Total 2007 Supply</b>
	(acre-feet)	(acre-feet)	(acre-feet)
A&B Irrigation District:	0	117,177	117,177
American Falls Res. Dist. #2:	0	383,201	383,201
Burley Irrigation District:	88,416	213,265	301,681
Milner Irrigation District:	0	79,008	79,008
Minidoka Irrigation District:	62,000	334,143	396,143
North Side Canal Company:	222,121	788,363	1,010,484
Twin Falls Canal Company:	739,860	230,956	970,816

**Table 3 Updated Calculations from 5/23/07 Order Paragraph 23 – Page 12**

<b>Irrigation Company or District</b>	<b>Minimum Full Supply Needed</b>	<b>Predicted 2007 Supply</b>	<b>Predicted Shortages in 2007 (- is surplus)</b>
	(acre-feet)	(acre-feet)	(acre-feet)
A&B Irrigation District:	50,000	117,177	-67,177
American Falls Res. Dist. #2:	405,600	383,201	22,399
Burley Irrigation District:	220,200	301,681	-81,481
Milner Irrigation District:	50,800	79,008	-28,208
Minidoka Irrigation District:	314,300	396,143	-81,843
North Side Canal Company:	988,200	1,010,484	-22,284
Twin Falls Canal Company:	1,075,900	970,816	105,084
		Total Shortage	127,483

**Table 4 Updated Calculations from 5/23/07 Order Paragraph 25 – Page 13**

Irrigation Company or District	Predicted 2007 Material Injury Shortages + Carryover Shortfalls	Predicted 2007 Carryover
	(acre-feet)	(acre-feet)
A&B Irrigation District:	0	67,177
American Falls Res. Dist. #2:	73,599	0
Burley Irrigation District:	0	81,481
Milner Irrigation District:	0	28,208
Minidoka Irrigation District:	0	81,843
North Side Canal Company:	61,016	22,284
Twin Falls Canal Company:	143,484	0
Totals:	278,099	280,993

**Table 5 Summary of updated 2007 SWC shortage computed using method from 5/23/07 IDWR Order**

	IDWR Estimated Shortage	IDWR Estimated Shortage + Reduced Carryover
5/23/07 Order	58,914 ac-ft (TFCC only)	140,331 ac-ft
5/23/07 Order updated for actual 2007 reservoir allocation	66,659 ac-ft (TFCC only)	150,075 ac-ft
5/23/07 Order updated for actual 2007 reservoir allocation + updated NOAA Heise natural flow forecast for April-July	105,084 ac-ft (TFCC) 22,399 ac-ft (AFRD2) 127,483 ac-ft (TFCC + AFRD2)	278,099 ac-ft

**UPDATED 2007 SWC SHORTAGE USING MONTHLY WATER BUDGET METHOD FROM 4/17/07 SWC REPORT**

The water supply assessment from the “Surface Water Coalition 2007 Water Supply Assessment” dated April 13, 2007 was updated to account for actual reservoir allocations and for updated Snake River natural flow at Heise April-July forecasts by NOAA. The method used in this analysis is more detailed because it uses a monthly prediction of water supply and irrigation requirements and bases the irrigation requirements on actual computed irrigation demand for each SWC entity instead of arbitrarily picking 1995 conditions (a time when the irrigation requirements were the lowest over a 25 year record) as reflective of 2007 irrigation demand (which is forecasted to be one of the hottest

and driest years on records with high irrigation demand). Replacement tables included in this section are numbered to correspond with the tables in the original document. The same methods and assumptions are the same as reported in the original document, with the following changes:

- 1) Actual reservoir allocations are substituted for the assumed full storage, less evaporation losses (Table 3.1)
- 2) Actual April and May natural flow diversions are substituted for estimated natural flow diversion for those months (Table 3.5)
- 3) Based on the updated NOAA forecast for the Snake River natural flow at Heise, water year 1992 natural flow diversions are used as a predictor of 2007 diversions, instead of water year 2004 natural flow diversions for the remainder of the year, other than July and August (i.e., for June, September, and October) July and August predicted natural flow diversions remain unchanged because the natural flow for these months were based on reach gains as predicted by the Spring Creek to Blackfoot-Neeley reach gains relationship. (Table 3.5)
- 4) Actual April and May diversions are substituted for estimated irrigation diversion requirements for the first two months of the irrigation season (Table 4.2)

In April, reservoirs were projected to fill. Actual reservoir storage allocations on May 29, 2007 were less than full, and thus it is more appropriate to use the actual storage supply, instead of the previously estimated reservoir storage data. Table 3.1 shows the actual allocated SWC storage used in the remainder of the water supply calculations.

Runoff forecasts for the Snake River near Heise continue to decline. The June 3, 2007 NOAA forecast for the same location and period is 1.840 MAF. This forecast may be more-realistic for the flow conditions for the remainder of the water year. The forecast of 1.840 MAF is more similar to the 1992 water year, when the Snake River flow near Heise was 1.692 MAF, than to any other year since 1990. The next larger historical flow near Heise was 2.012 MAF in 1994. The 1992 year was selected as a predictor of runoff and SWC natural flow supply for the remainder of 2007 because it is closest to the current, 1.840 MAF forecast. The April 2007 estimate of water supply conditions used 2004 as a predictor of 2007 natural flow supply, because it was closest to the 2.370 MAF runoff forecast.

The SWC natural flow diversions in 1992 are summarized in Table 3.4. Table 3.5 shows the expected and observed SWC natural flow supply, based on the use of historical data for April and May, predicted ground water reach gains for July and August, and 1992 historical natural flow diversions for June, September, and October.

Water year 2007 irrigation diversion requirements are estimated based on two information sources. For April and May, diversion requirements are assumed to be equal to the reported diversions by

SWC members, as reported on the WD01 web-page<sup>6</sup>. For the remainder of the year, diversion requirements are estimated based on 2006 diversion requirements, as documented in the April 2007 Water Supply Assessment. Table 4.2 summarizes the estimated 2007 SWC irrigation diversion requirements.

The SWC diversion requirements summarized in Table 4.2 are compared against the estimated natural flow supplies presented in Table 3.5, in Table 5.1. The estimated reservoir storage that would need to be used to meet the difference between diversion requirements and natural flow supply is summarized in Table 5.2. This table shows that the estimated 2007 SWC supply shortage is 261,795 acre-feet

The revised estimate shows a total material injury shortage of 261,795 acre-feet, to NSCC, TFCC, and AFRD#2. This total shortage has increased from an estimated 128,906 acre-feet in our April 13, 2007 estimate. This estimate is conservative because it makes no provision for uncertainty in the actual natural flow supply that may occur and assumes that entities with deficits will completely use all storage to meet deficits without holding any storage for carryover. The shortage estimate would be much greater if provisions were made for reservoir carryover for the 2008 irrigation season.

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<sup>6</sup> The April and May 2007 SWC diversions do not necessarily meet the full water supply needs of all of the SWC members. Certain SWC members were already using their reservoir storage, and already cutting back on deliveries in anticipation of a restricted water supply. However, it is probably more accurate to use the actual diversions during the early irrigation season to estimate irrigation diversion requirements than computed estimates. This assumption would not be accurate for the middle and later portion of the irrigation season when SWC entities are supply limited and reduce diversions to meet supply.

Updated Tables from SWC 2007 Water Supply Assessment Report by HDR Engineering and Brockway Engineering using updated water supply forecast and hydrology data.

Table 3.1

2007 SWC Storage (actual allocation)							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B	Total
2007 SWC Storage Allocation	230,956	788,363	547,408	79008	383,201	117,177	2,146,113
Storage Used through 5/31	13,432	67,923	40,740	7,572	65,270	10,051	204,989
Remainig 2007 SWC Storage	217,524	720,440	506,668	71,436	317,931	107,126	1,941,124

Table 3.4

1992 Natural Flow Diversions (af/m)							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B	Total
April	115,068	86,175	82,689	0	0	0	283,932
May	132,661	21,124	32,941	0	0	0	186,726
June	123,543	23,329	18,992	0	0	0	165,864
July	105,519	14,069	0	0	0	0	119,588
August	129,387	18,171	276	0	0	0	147,833
September	106,108	27,025	24,808	0	0	0	157,941
October	59,723	14,535	21,675	0	0	0	95,932
Total June-Sept	464,556	82,594	44,076	0	0	0	591,226
Total Annual	772,008	204,428	181,380	0	0	0	1,157,816

Table 3.5

Combined 2007 Predicted Natural Flow (April & May reported, July & August Natural Flow, remainder 1992 Natural Flow Diversions (af/m))							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B	Total
April	78,861	86,172	41,057	2,047	24,526	322	232,985
May	167,656	111,499	94,482	4,646	19,522	1,093	398,898
June	123,531	23,326	18,982	0	0	0	165,838
July	<b>116,442</b>	<b>15,526</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>131,967</b>
August	<b>118,420</b>	<b>15,789</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>134,209</b>
September	106,108	27,025	24,808	0	0	0	157,941
October	59,723	14,535	21,675	0	0	0	95,932
Total June-Sept	464,500	81,666	43,790	0	0	0	589,955
Total Annual	770,740	293,871	201,003	6,693	44,048	1,416	1,317,771

Table 4.2

Calculated Irrigation Requirement (Based on 2007 diversion data and 2006 Irrigation Requirement)							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B*	Total
April	78,861	86,172	41,057	2,087	30,304	954	239,435
May	175,875	179,422	135,222	12,178	79,014	10,513	592,224
June	226,108	231,826	154,210	14,864	89,235	16,423	732,665
July	233,645	253,627	191,178	17,008	96,057	16,970	808,485
August	221,075	224,118	131,358	10,894	80,353	10,643	678,441
September	140,332	157,769	68,273	3,640	60,909	6,529	437,451
October	34,114	50,512	17,711	839	18,038	1,766	122,980
Total June-Sep	821,160	867,341	545,020	46,405	326,552	50,564	2,657,042
Total Annual	1,110,011	1,183,447	739,009	61,509	453,908	63,797	3,611,681

\* A&B Irrigation requirements reflect 17,301 acres, up from 14,600 acres in previous Assessment

Table 5.1

Difference Between 2007 Natural Flow Supply and 2007 Estimated Irrigation Requirement							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B	Total
April	0	0	0	-40	-5,778	-632	-6,449
May	-8,219	-67,923	-40,740	-7,532	-59,492	-9,419	-193,326
June	-102,577	-208,501	-135,228	-14,864	-89,235	-16,423	-566,827
July	-117,203	-238,102	-191,178	-17,008	-96,057	-16,970	-676,518
August	-102,656	-208,329	-131,358	-10,894	-80,353	-10,643	-544,232
September	-34,224	-130,744	-43,465	-3,640	-60,909	-6,529	-279,510
October	0	-35,977	0	-839	-18,038	-1,766	-56,620
Total June-Sep	-356,660	-785,675	-501,230	-46,405	-326,552	-50,564	-2,067,087
Total Annual	-364,879	-889,576	-541,970	-54,816	-409,860	-62,381	-2,323,482
Total Annual Remaining	-356,660	-821,653	-501,230	-47,244	-344,590	-52,330	-2,123,707

Table 5.2

Estimated 2007 Storage Used and Remaining Deficit (assuming actual 2007 allocation)							
	TFCC	NSCC	BID+MID	MIL	AFRD2	A&B	Total
2007 Res. Storage Alloc.	230,956	788,363	547,408	79,008	383,201	117,177	2,146,113
2007 Storage Used to Meet Nat. Flow Deficit	230,956	788,363	541,970	54,816	383,201	62,381	2,061,687
2007 % Storage Used	100%	100%	99%	69%	100%	53%	
2007 Predicted Carryover	0	0	5,438	24,192	0	54,796	84,426
2007 Shortage	133,923	101,213	0	0	26,659	0	261,795

Note:

Assumes full use of reservoir storage to meet deficits, no provision is made for carryover for subsequent dry years.