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ENGINEERING
P.L.L.C.

Hydraulics

Hydrology

Water Resources

February 23, 2009

Mr. Tim Luke
Idaho Department of Water Resources
1341 Fillmore Street, Suite 200
Twin Falls, ID 83301

RECEIVED
FEB 25 2009
DEPT. OF WATER RESOURCES
SOUTHERN REGION

Re: Water Right 37-7822 / South Gimlet Water Users – Preliminary
Hydrologic Evaluation of Channel Seepage Impact
Project No. 998-01-2007

Dear Tim:

Our client, the South Gimlet Water User's Association, holds water right 37-7822 from the Big Wood River which allows non-consumptive diversion of up to 20 cfs from the river for recreation and aesthetic purposes. Since the right was licensed in 1988, the Watermaster of District 37 has not administered the right in priority with other rights on the river due to its non-consumptive status. However, the Watermaster has recently indicated that the above-referenced water right may be regulated in 2009 unless it can be demonstrated that the right is non-consumptive and that out-of-priority diversions under this right are not causing injury to other water users. On October 6, 2008 you provided guidance to the Watermaster relative to this and other administrative questions, indicating that 37-7822 should be curtailed or mitigated "if uses on these systems [Rinker 11 and 11A headgates] are found to be consumptive."

The purpose of this letter is to convey the results of a preliminary hydrologic investigation pertaining to the fate of seepage from the Gimlet system and whether it should be considered a consumptive use that would cause injury to other water users. It was determined that seepage, to the extent it occurs, will not be consumed but will return to the river above East Fork after a short time delay, and it does not appear warranted at this time to break with the longstanding regulation practice of 37-7822 unless or until more detailed investigations or groundwater modeling can be performed.

Water Right Overview

Water right 37-7822 authorizes a diversion rate of 20 cfs for the purposes of recreation and aesthetics. The two authorized points of diversion are known on the watermaster's records as the Rinker 11 (north diversion) and Rinker

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11A (south diversion) headgates, as shown on Figure 1. In addition to this right, five (5) other rights are diverted from one or both of the headgates. All rights are tabulated below:

Water Right	Owner	Use	Discharge cfs	Priority Date
37-0154B	Rinker (ownership not changed)	Recreation	0.44	12/13/1887
37-21329	Holzman	Aesthetic, wildlife	0.06	12/13/1887
37-21330	Holzman	Irrigation	0.16	12/13/1887
37-21331	Holzman	Aesthetic, wildlife	0.03	3/24/1883
37-21332	Holzman	Irrigation	0.07	3/24/1883
37-7822	S. Gimlet Water Users	Aesthetic, recreation	20.0	3/25/1980
37-8838 (permit)	Holzman	Div to Storage, Storage	2.5 (included in 37-7822 div. rate)	8/25/1999
Total not including permit			20.76 cfs	

Water is diverted from the river into two channels which appear to be partly natural flood channels of the river and partly improved channels. These channels flow southward within the east flood plain of the river. The channels combine into a single channel at a point approximately two-thirds of the way along their length, and water flows thence to the point of return to the river.

The application for permit was originally filed by Harry Rinker on March 25, 1980 and Proof was filed on July 1, 1988 along with a beneficial use field report prepared by C. E. Brockway, P.E. In order to determine the system capacity and the reach gain or loss through the ditches, the field examiner made discharge measurements at both points of diversion using standard open-channel devices, and at the point of return using a current meter. He found a total of 21.93 cfs diverted from the two headgates, and a return flow of 22.27 cfs, for a gain of 0.34 cfs. This gain was occurring from groundwater as a result of the ditches intersecting the natural groundwater table. Because of the gain, the examiner recommended that no measuring device be required at the return point, and the right was licensed without such a requirement.

At the time the permit was filed, the use was stated to be non-consumptive due to the high groundwater table, and no specific mitigation was required by the Department for seepage or evaporative losses. However, the permit was approved with an interesting condition requiring that "any water that is diverted under this permit that is lost between the point of diversion and point of return to the river shall be replaced with groundwater."

At the time of the field exam, the examiner noted that 37-154B was appurtenant to this system and could be utilized for mitigation, if required, in lieu of groundwater pumping. This right has a diversion rate of 0.44 cfs and was at the time an irrigation right for approximately 22 acres. When right 37-7822 was licensed, the requirement to mitigate with groundwater, if needed, was replaced by a more general condition as follows:

Upon a future determination by the Department of Water Resources that water is lost to the injury of prior right holders, the losses shall be replaced from a source acceptable to the Department.

This condition appears to leave open the possibility that 37-154B, or any other valid consumptive right, could be utilized as replacement water upon approval by the Department, without a transfer or other administrative proceeding.

Potential for Regulation

Water right 37-7822 has not historically been regulated by the Watermaster of District 37. The current watermaster, Kevin Lakey, requested guidance from the Department on this right and a host of other rights in the Big Wood system. The Department's direction to the watermaster included the following language:

The Rinker 11 and 11A system should have a measuring device at both diversions and at the discharge back to the river. If uses on these systems are found to be consumptive, then the diversions should be curtailed or mitigated.
(correspondence from Tim Luke, 5/20/08)

The watermaster has indicated verbally that his regulation approach would be to simply measure the inflow and outflow, subtract the two to arrive at the total loss, and compare that figure to the sum of the diversion rates on all consumptive rights on his decree book for these two points of diversion. This sum currently stands at 0.76 cfs. Note that the two recreation and aesthetic rights owned by Holzman should be included in the consumptive total, because these rights are portions of irrigation rights which were converted from irrigation to recreation/aesthetic to mitigate for a new permit for a pond. Therefore, they have a consumptive component and are performing this function now.

Since the measurements made by C. E. Brockway in 1988, the only known concurrent inflow and outflow measurements were made by Kevin Lakey in 2008 using a current meter at both the inflow and outflow points since the measuring weir was not functioning due to low river levels. There may be other data in IDWR's files or watermaster records. It is believed that these readings were made at approximately the same location as the 1988 measurements. Mr. Lakey provided his data, which are tabulated as follows:

Date	Diversion (cfs)	Return (cfs)	Gain/Loss (cfs)
August 11, 2008	4.41	0.55	-3.86
August 13, 2008	3.96	0.52	-3.44
August 15, 2008	3.64	0.58	-3.06
September 9, 2008	2.48	Not measured, but approx. the same	

These measurements indicate a substantial loss through the system, which is apparently occurring primarily via seepage. This finding is contrary to the field examiner's measurements in 1988. The channels and ponds are in essentially the same configuration as they were in 1988, with the exception of Mr. Holzman's pond which is fully lined with membrane liner, and the evaporation has been fully mitigated. Hypothetically, the measured loss may be the result of groundwater declines due to drought which have caused the water table to drop below the channel invert. However, monitoring well data is extremely sporadic in this area and insufficient to adequately test this hypothesis over a range of high and low water years. No significant increase in groundwater pumping has occurred in the Gimlet area which may have lowered the water table – only domestic wells are located in the area. The nearest monitoring well in the Big Wood alluvium with a systematic record is 01N18E01DAA1, located just south of Bellevue. This well does not indicate a decline in water levels since 1988.

Because of the unexplained anomaly between the field examiner's measurements in 1988 and the watermaster's measurements in 2008, additional measurements may be warranted in 2009.

Fate of Channel Seepage

Clearly, channel seepage is not a consumptive loss in the sense of water being removed from the Big Wood system. In contrast, evaporation from the water surface and evapotranspiration of phreatophytes along the canal are true consumptive losses. However, evapotranspiration has always occurred along

the channels due to the high groundwater table, and should not be counted against the water users.

If it is true that the channels are in fact losing water to the aquifer via seepage, the fate of this seepage will be important for the administration of the right to the extent that the seepage loss is truly a loss to the Big Wood River that may injure senior-priority water users. This question may be evaluated by examining the river-aquifer relationship in this area.

The Gimlet reach of the Big Wood River has been shown to be a gaining reach by Brockway and Luttrell (1984), who measured a gain from groundwater of 47 cfs from Ketchum to Gimlet and 23 cfs from Gimlet to Deer Creek. As indicated above, it appears that it has generally been accepted by the Department and other parties involved, that the channels act as drains to some extent and that the river gains in this reach.

A brief hydrologic study was performed of the river-aquifer system from the north of the Rinker 11 diversion to 0.25 miles below the confluence with East Fork. This study utilized readily available data from well drilling records obtained from Department records, and elevation data from the USGS DEM dataset. It did not involve any new data collection. The drilling records were evaluated to determine 1) the primary composition of the aquifer, and 2) static water levels relative to the Big Wood River.

The aquifer in this vicinity, like most of the Big Wood valley alluvium, is comprised chiefly of sand, gravel, and river cobble, with occasional interbeds of finer material that drillers often report as "clay". Drilling records are very uniform in this regard. Depth to bedrock, which essentially forms the bottom of the alluvial system, ranges from nearly zero at the edges of the aquifer to greater than 70 feet near the center of the valley. Static water levels below ground are very shallow within the flood plain area, typically ranging from 3 to 12 feet. Hydraulic conductivity of the aquifer is likely on the order of 300 ft/day. This value is an average figure calculated by an extensive analysis of well logs for the recent Big Wood aquifer modeling effort by Brockway Engineering. Comparing the static water levels with the adjacent river elevation confirms that the river and aquifer are hydraulically connected in this reach, a finding which was reached by various previous investigators.

To conduct a more detailed analysis of static water elevations, well logs were screened to remove those wells which are not open to the unconfined alluvial system. Many wells are cased through the alluvium to the bedrock, and draw water from the rock formations. Reported static water levels in these wells are

likely not indicative of the alluvial system of interest. The wells remaining after the initial screen are shown on the attached figure. Static water elevation at each well was estimated using the USGS DEM elevation at the well location and the reported depth to water. River elevations were estimated in the same manner (it is important to note that the river bed location on the DEM layer does not exactly correspond to the location on the 2006 photo due to channel avulsion since the DEM data was developed). The 2006 flood, in particular, caused significant changes in the channel.

Groundwater contours were created from the elevation data using both the radial basis function and kriging methods. The two methods yield nearly identical contours which are well-behaved and appear to fit the data well. These contours are depicted on the attached map.

One immediately obvious feature of the contours is that a prominent depression or drain is indicated in the south Gimlet area east of the river. This would agree with the 1988 measurements and conventional wisdom that the two Gimlet channels act as drains.

The other feature of the river-aquifer system in this area, which is clear by simple observation but which is confirmed by this quantitative study, is that groundwater in the south Gimlet area, east of the river, is tributary to the river above the point where the river contacts the eastern edge of the aquifer about 1000 feet below East Fork bridge near the confluence with East Fork. This can be demonstrated by a simple flow net analysis: because the river and aquifer are hydraulically connected, and because the river swings eastward to the extreme eastern edge of the alluvium, the groundwater must necessarily flow to the river above this point. The only other known diversions from the river between Rinker 11A and East Fork are two small rights for 1 acre each in Little Mackawao subdivision, with points of diversion in NESE and SWNE of Section 7.

This current study, along with previous investigations, provides clear evidence that the seepage loss, if any, from the south Gimlet channels, will return to the river above East Fork, and that the return will occur in a relatively short period of time. The time lag between seepage entering the aquifer and the full realization of the increased gain in the river cannot be accurately calculated without some form of groundwater modeling. Previous groundwater modeling by Brockway Engineering in the Big Wood valley for similar situations suggests that the time lag is likely no greater than 15 days.

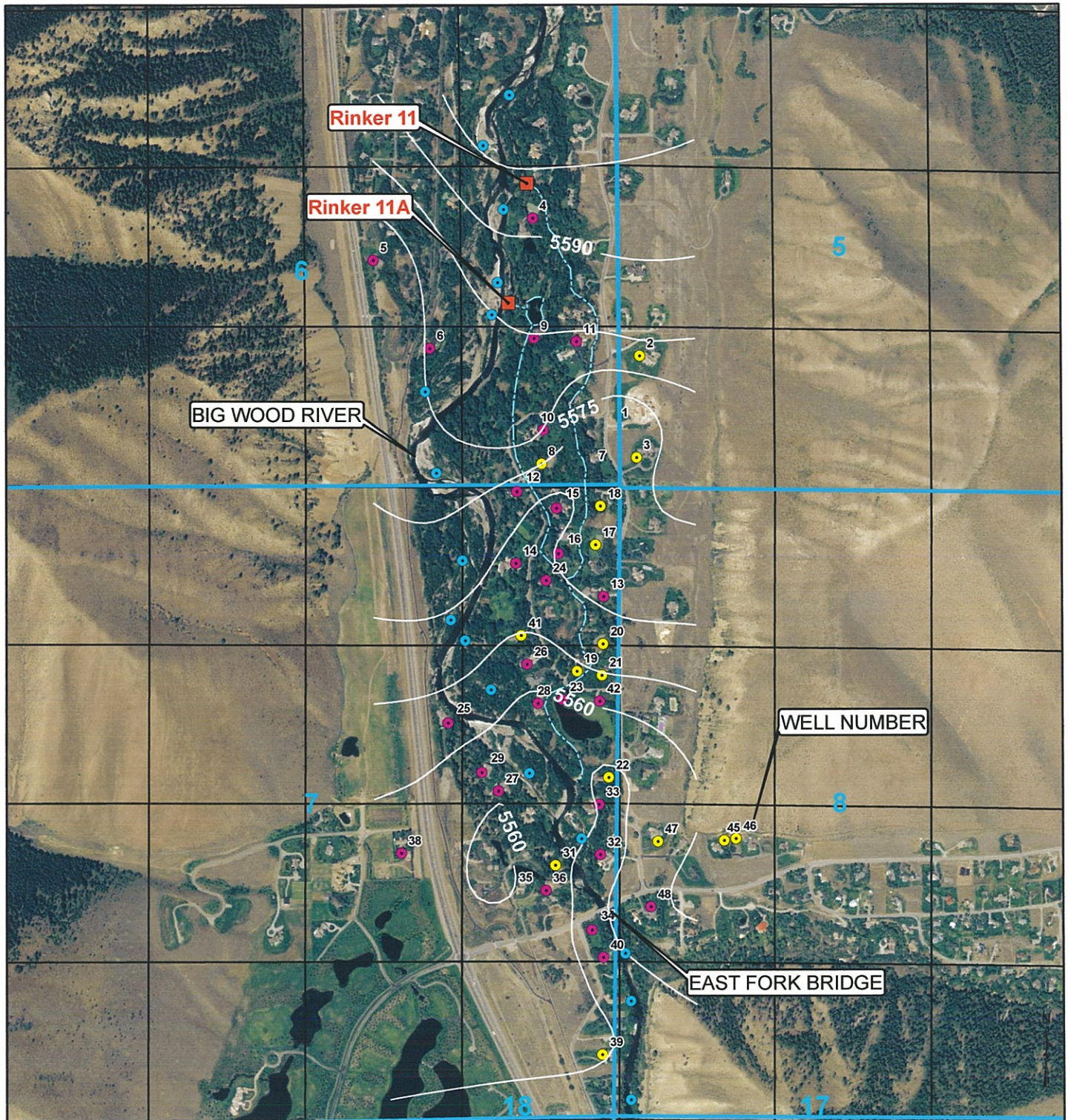
The Big Wood River groundwater model developed by Brockway Engineering may eventually be extended northward to encompass the Gimlet area. When that occurs, a more definitive evaluation of the fate of channel seepage and temporal pattern of return to the river could be made. Until that time, however, it appears adequately justified by the available hydrologic data to continue the historic practice of regulating water right 37-7822 as a non-consumptive right without curtailment by priority, even if the inflow exceeds the outflow. I would formally request on behalf of South Gimlet Water Users Association that the Department make this determination and direct the Watermaster accordingly, prior to the commencement of the irrigation season in 2009.

Please do not hesitate to contact me if you have any questions.

Cordially,


Charles G. Brockway, P.E.

Enc. Aerial map
Cc: Craig Nalen, S. Gimlet Water Users
 Kevin Lakey, Watermaster
 Allen Merritt, IDWR



1 inch equals 1,200 feet

SOUTH GIMLET WATER USERS GROUND WATER CONTOURS NAIP 2004 AERIAL



- Points of Diversion
- Sections
- Contours
- RIVER ELEVATIONS FROM DEM
- Ditch
- Wells used in Analysis**
- LOCATED
- LOCATED
- LOC. UNCERTAIN

State of Idaho
Department of Water Resources

WATER RIGHT LICENSE

WATER RIGHT NO. 37-07822

Priority: March 25, 1980

Maximum Diversion Rate: 20.00 CFS
Maximum Diversion Volume:¹ 7300.0 AF

This is to certify, that WOOD RIVER PROPERTIES INC.

P.O. BOX 7250

NEWPORT BEACH CA 92663

has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated March 25, 1980; and has submitted Proof of Beneficial Use on July 1, 1988. An examination indicates that the works have a diversion capacity of 21.900 cfs of water from:

BIG WOOD RIVER tributary to SNAKE RIVER

source, and a water right has been established as follows:

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>RATE OF DIVERSION</u>	<u>ANNUAL VOLUME</u>
RECREATION	01/01 to 12/31	20.00 CFS	7300.0 AF
AESTHETIC	01/01 to 12/31	20.00 CFS	7300.0 AF
	Totals	20.00 CFS	7300.0 AF

LOCATION OF POINT(S) OF DIVERSION:

NESE , Sec. 6, Township 03N, Range 18E
BLAINE County

PLACE OF USE: RECREATION

TWN RGE SEC

03N 18E	6	NESE	SESE
	7	NENE	SENE

PLACE OF USE: AESTHETIC, same as RECREATION use

CONDITIONS/REMARKS:

1. The maximum diversion volume is defined as the maximum allowable volume of water that may be diverted annually from the source under this right. The use of water confirmed by this right is limited to the amount which can actually be beneficially used. The maximum diversion volume may be adjusted to more accurately describe the beneficial use or to implement accepted standards of diversion and use efficiency.
2. This water right is appurtenant to the described place of use.
3. This right is subject to all prior water rights and may be forfeited by five years of non-use.
4. Modifications to or variance from this license must be made within the limits of Section 42-222, Idaho Code, or the applicable Idaho law.

NOV 15 1991

State of Idaho
Department of Water Resources**WATER RIGHT LICENSE**

WATER RIGHT NO. 37-07822

CONDITIONS/REMARKS:

5. Use of water under this water right will be regulated by the watermaster of State Water District No. 37.
6. Use of water under this right shall be non-consumptive.
7. The issuance of this permit in no way grants any right-of-way or easement across the land of another.
8. Measuring devices of a type approved by the Department shall be maintained at the points of diversion.
9. The Director retains jurisdiction of this right to require installation of measuring devices at the points where water returns to the Big Wood River.
10. This project shall be operated in a manner that will not conflict or interfere with the future upstream diversion of water for irrigation or other beneficial consumption.
11. Upon a future determination by the Department of Water Resources that water is lost to the injury of prior right holders, the losses shall be replaced from a source acceptable to the Department.
12. The water shall be returned to the Big Wood River at the discharge point located in lot 31, Gimlet 11 Subdivision, located within the SENE Section 7, T03N R18E B.M.
13. Water diverted under this right shall meet Idaho Water Quality Standards.

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. Witness the seal and signature of the Director, affixed at Boise, this 15th day of NOVEMBER, 1991.

Acting for

R. Keith Higginson, Director

NOV 15 1991