



Seepage Study on the Henrys Fork and Snake River, Idaho

FINAL PROGRESS REPORT

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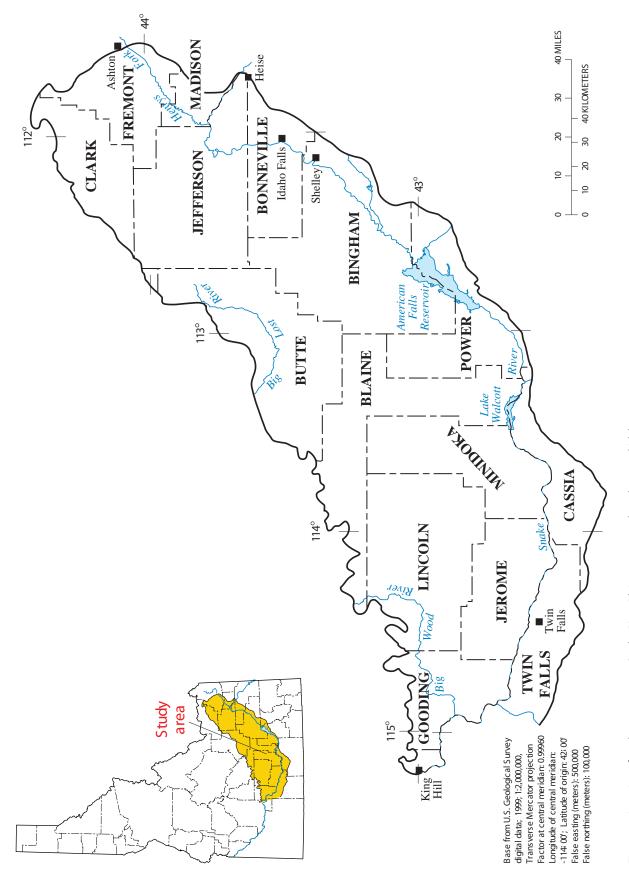
Seepage Study on the Henrys Fork and Snake River, Idaho

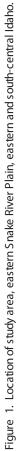
INTRODUCTION AND OBJECTIVES

This study was one component of the general Eastern Snake Hydrologic Modeling Committee strategy to refine and enhance the conceptual and computer models of the Eastern Snake River Plain (ESRP) hydrologic system. Information gathered during this study will be combined with the results of other work being done on the plain to enhance the conceptual model of the hydrologic system and refine ground-water and surface-water computer flow models. Data collection and analyses were performed in a collaborative effort by the U.S. Geological Survey (USGS) and Idaho Power Company (IPCo). The specific objective of this study was to estimate gains from and losses to ground water in selected river reaches in the ESRP during five detailed seepage studies.

APPROACH

Seepage studies were designed and conducted in three separate reaches of the Snake River and Henrys Fork (fig.1). These reaches included (1) the reach of the Snake River from the gaging station near the outlet of Lake Walcott (Minidoka Dam) downstream to the gaging station at King Hill (lower reach); (2) the reach from the gaging station near Shelley downstream to the gaging station near Lake Walcott (middle reach); and reach of the Snake River, from the gaging station near Heise downstream to the gaging station near Shelley, and the Henrys Fork, from the gaging station near Ashton downstream to the mouth (upper reach). Data collected in each reach included discharge values from USGS and/or IPCo gaging stations, discharge values at several intermediate locations obtained using acoustic Doppler instrumentation (Acoustic Doppler Current Profilers, ADCPs; and Acoustic Doppler Profilers, ADPs), and measured and/or inspected discharge values for several miscellaneous inflows (mostly tributaries) along the entire length of each reach obtained by field personnel.









EQUIPMENT

The collaborative effort between the USGS and IPCo resulted in a large variety and highly diverse set of equipment resources from which to choose, allowing for measurements to be performed under a wide range of river conditions. Examples of watercraft that were used during this study include: aluminum hulled jet boats, inflatable motor-powered watercrafts, a motor-powered cataraft, and a self-propelled kayak. Examples of the different types of acoustic Doppler instruments used include: 600 kHz transducers (capable of measuring in depths around 200 feet deep), 1200 kHz transducers (capable of measuring in depths ranging from approximately 2 to 60 feet) and 3,000 kHz transducers (capable of measuring in depths from approximately 1.5 feet to 22 feet).

ACCURACY AND LIMITATIONS

Implementation of modern acoustic Doppler instrumentation specifically designed to measure river discharge currently allows us to measure discharge more efficiently than ever. However, there are still limitations in the application of this instrumentation to measure discharge, which should be discussed. These limitations include the inability to measure water velocities at all points in a specific cross section and the potential for error. Although the existence of unmeasured areas may ultimately contribute to the overall error of a measurement, these subjects are discussed separately.

Unmeasured Areas

Acoustic Doppler instrumentation is not capable of measuring water velocities in every area of a river cross section. These unmeasured areas (top, bottom, left edge, and right edge) are illustrated in figure 2. The depth of the unmeasured top section is a function of the transducer depth (distance the transducer extends into the water) and the blanking distance (time lag between when the sensor sends a signal and when it is ready to receive that signal). A section at the bottom cannot be measured because of side-lobe interference (physical characteristic of the acoustic beam where the side-lobe reflects off of the bottom before the main beam, which ultimately interferes with the reception of the remaining velocity data). Discharge in the top and





bottom unmeasured sections is estimated using either (1) a power law method, (2) a constant method, or (3) a three-point regression method, depending on the velocity characteristics at the section and the type of instrument being used.

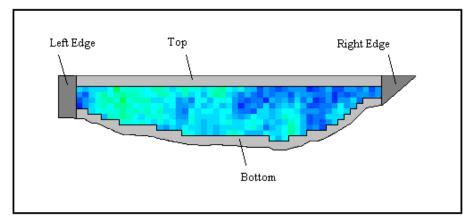


Figure 2. A typical river cross section with sections where velocity data cannot be measured.

A portion a each edge of a cross section also cannot be measured because of minimum operational depth requirements and beam interference along vertical or nearly vertical edges. In general, the minimum measurement depth decreases with increasing transducer frequency. For example, the highest frequency instrument used in this study was a 3,000 kHz unit with a minimum operational depth of approximately 1.5 feet, and the lowest frequency transducer used was a 600 kHz unit with a minimum operational depth of approximately 1 feet. Beam interference can occur along vertical walls in much the same manner as described previously with regard to the river bottom. Edge discharges are estimated using an interpolation method based on the last recorded water velocities, the distance to the edge of water, and the general shape of the unmeasured section (triangular or vertical).

Error

Analysis of discharge measurements can reveal two different types of error; random error and systematic error (bias). The first type of error that can enter into a set of discharge measurements is random error. Random error can be attributed to the accuracy of the instrumentation with regard to pulse length, transmit frequency, signal-to-noise ratio, and beam angle. However,





channel and flow characteristics can greatly affect the magnitude of random error. The following is a list of conditions that may cause higher magnitudes of random error.

- channel bottom is fairly irregular or lined with large boulders
- turbulent or non-laminar flow
- unstable water surface conditions, caused by wave action
- unstable control of the acoustic Doppler instrument in general
- inability to retrace identical measurement path
- inability to maintain steady boat velocity and direction
- interference caused by objects such as fish not moving at the same speed and in the same direction as the flow

The effects of random error can be minimized first by carefully and thoughtfully performing each set of measurements in a manner to minimize the effects mentioned above. The effects are also minimized by averaging several individual measurements.

The second type of error is systematic error (bias). This error can be separated into two parts; instrument-caused and operator-caused. Instrument-caused systematic errors relate to the operation of the instrument and the physical properties of the acoustic signal. Most of these errors are thought by manufacturers to be small and insignificant. However, if not closely monitored, the following can significantly affect the accuracy of discharge measurements.

- beam-angle errors
- depth-measurement errors
- speed-of-sound errors (temperature and salinity)
- improper estimation techniques for the top and bottom unmeasured portions

The operator-caused systematic errors listed below can be easily monitored and rectified, however, failure to do so could significantly affect the accuracy of discharge measurements.

- inaccurate setting of transducer depth
- consistently over or under estimation of distance-to-edge
- inaccurate characterization of edge shapes
- moving bed a quantity of sediment moving near the bottom that is large enough to completely attenuate the bottom echo, causing a loss of bottom track - this phenomenon results in a consistent underestimation of discharge



Coefficient of Variation (COV)



- boat velocities that are consistently higher than average water velocities
- poor cross section selection

It can be very difficult to identify or quantify systematic error from a measurement summary. Thus, it is critical (especially in a study such as this) to take great care to ensure that these influences are not present.

As with any discharge measurement, the final assessment of the measurement is based on a qualitative judgment of measuring conditions and a quantitative evaluation of the individual measurements. The coefficient of variation (COV) is a useful statistic for making the quantitative assessment of the measurement. The coefficient of variation is equal to the standard deviation of the individual measurements divided by the mean of the measurements. These calculations are illustrated in tables 1 and 2 for different numbers of individual measurements.

Table 1. Example of standard de	eviation and	Table 2. Example of standard dev	iation and
coefficient of variation calculation	s for a group of	coefficient of variation calculations	for a group of
eight individual measurements.		four individual measurements.	
	Measured discharge, in cubic feet per		Measured discharge, in cubic feet per
Individual measurements	second	Individual measurements	second
Measurement #1	1,325	Measurement #1	932
Measurement #2	1,115	Measurement #2	927
Measurement #3	1,297	Measurement #3	911
Measurement #4	1,182	Measurement #4	951
Measurement #5	1,261	Mean (μ)	930
Measurement #6	1,291	Standard Deviation (σ)	16
Measurement #7	1,086	Coefficient of Variation (COV)	0.02
Measurement #8	1,347		
Mean (μ)	1,238		
Standard Deviation (σ)	113		

While performing a set of discharge measurements, if the COV of the first four individual measurements for a site is greater than 0.05, USGS policy requires that four more individual measurements. The final discharge value is then the average of all eight measurements. Idaho

0.09





Power Company followed similar procedures during this study and in some cases made more than eight individual measurements at a single site. Often, when more than four individual measurements were made at a site, the COV still remained above 0.05. High magnitudes of COV can indicate either or both of the following; flow variability at the time of the measurements and/or the presence of random error influences discussed earlier. However, this is not directly related to the overall accuracy of the measurement.

CALCULATION METHODS

Gains or losses for each subreach were calculated using a basic conservation of mass equation (Inflow +/- Δ Storage = Outflow). For any specific subreach of the study area, the equation is as follows:

$$Gain/(Loss) = U/S$$
 Discharge + Inflow - Outflow + Δ Storage - D/S Discharge.

Performing the seepage studies during the non-irrigation season allows for the removal of the "Outflow" term in most instances. Coordinating steady releases from the dams located within the study area virtually negates the " Δ Storage" term in most cases. Thus, the equation most often used in the final calculations is as follows:

Gain/(Loss) = U/S Discharge + Inflow – D/S Discharge.

Values for the U/S and D/S Discharge terms were obtained from either gaging stations or instantaneous acoustic Doppler measurements. If gaging station data were used, the actual value typically was the instantaneous value based on an estimated travel time downstream to the next measurement site. In a few instances where unsteady releases from a power plant resulted in unsteady discharges, 30-day average discharges were used at adjacent gaging stations for comparisons.

Although efforts were made to coordinate steady releases from all dams within the study reaches, actual reservoir levels were somewhat variable during some seepage runs. In these instances, estimates of changes in storage were made by analyzing the reservoir level data and determining an estimate of change in storage over a specific time period. This storage volume was then transformed to an average flow rate over the analysis time period.





ACOUSTIC DOPPLER MEASUREMENT LOCATIONS

The criteria used when determining the locations of measurement sites between gaging stations included: (1) the likelihood of it being a good measuring section; (2) accessibility by road or boat; and (3) river distance to the adjacent measurement sites. River channel data for each of the specific acoustic Doppler measurement sites are presented in Appendix D at the back of this report. This data includes a site map, the site location, width and depth during one flow, and a picture of the site, if available.

TIMING OF ACOUSTIC DOPPLER MEASUREMENTS

The timing of the acoustic Doppler measurements turned out to be more important than originally thought mainly because of difficulties in coordinating steady flows, as well as other entities' ability to ensure steady flow during specific time periods. The timing of measurements was especially important in the middle reach because of the possible occurrence of unsteady flows resulting from two small hydro-generation facilities located upstream near Idaho Falls. Following the initial seepage runs in the Spring of 2001, more emphasis was placed on analyzing flow conditions at gaging stations and making all acoustic Doppler measurements within a specific subreach within a specific time frame. Intermediate acoustic Doppler measurements were started only after flow conditions were steady for an amount of time that was consistent with the estimated travel time within that subreach. The hydrographs in figure 3 show flow conditions during April 3-4, 2001 in the middle reach between Shelley and Blackfoot. Plotting the acoustic Doppler measurement times shows how unsteady flow conditions likely had some effect on the analysis in this reach during the Spring of 2001.





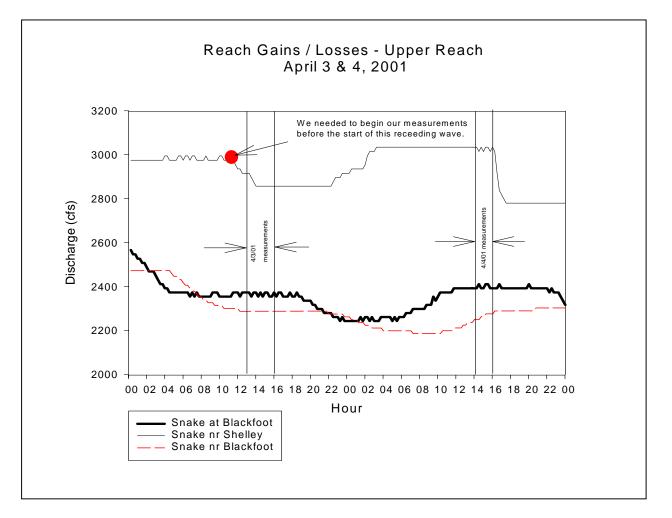


Figure 3. Hydrographs and acoustic Doppler measurement times showing how unsteady flows may affect gain/loss estimates.

REACH ANALYSES

The study area was divided into three reaches primarily to improve the efficiency of the data collection efforts and data analyses. The lower (Minidoka Dam downstream to King Hill) and middle (Shelley downstream to Minidoka Dam) reaches were studied a total of five times beginning in March 2001 and ending in November 2002. The upper reach (Heise downstream to Shelley and Ashton downstream to the mouth) was studied four times beginning in November 2001 and ending in November 2002.





Lower Reach (Minidoka to King Hill)

A map showing the locations of all gaging stations and intermediate acoustic Doppler measurement locations within this reach is presented in Appendix A, figure A1.

Spring 2001

Field Activities

The initial seepage run for this reach was performed during March 5-6, 2001, and coincided with the bi-annual springs measurements performed along portions of the lower reach by the USGS for IDWR. A total of 12 main-channel measurements were performed within the lower reach using acoustic Doppler instruments. Discharge data from 7 gaging stations located within this reach were also obtained. One person each from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some tributary and drain sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Spring 2001 seepage run for this reach is presented in Appendix A. Included in this information are a detailed summary table (table A1), a gaging station discharge summary table (table A2), an acoustic Doppler discharge summary table (table A3), and an inflow and outflow inspection summary table (table A4). A map showing all mainchannel measurement locations and gain/loss estimates for the Spring of 2001 is presented in figure A2.

No measurement was made at site L2 because of poor weather and unsafe river conditions. A measurement was made at site L3 but was not used in the final calculations because it was not consistent with adjacent data.

Fall 2001

Field Activities

The seepage run for this reach was performed during November 5-7, 2001, and again coincided with springs measurements performed along portions of the lower reach by the USGS for IDWR.





A total of 13 main-channel measurements were performed within the lower reach using acoustic Doppler instruments. Discharge data from 7 gaging stations located within this reach were also obtained. One person each from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some tributary and drain sites as necessary. Based on field observations and past experience, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Fall 2001 seepage run for this reach is presented in Appendix A. Included in this information are a detailed summary table (table A5), a gaging station discharge summary table (table A6), an acoustic Doppler discharge summary table (table A7), and an inflow and outflow inspection summary table (table A8). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2001 is presented in figure A3.

Above normal algae growth, as a result of extended low flows for much of 2001, hampered measurement procedures at some locations. This resulted in extremely high variances associated with some estimates, most noticeably at sites L2 and L3. At other sites, the actual measurement location was moved slightly because of algae growth at the original location. An estimate was not determined for the reach between L15 and L16 because of unsteady reservoir levels above Lower Salmon Falls Power Plant. In addition, the measurement at L17 likely was affected by unsteady flow conditions out of Lower Salmon Falls Power Plant and was not used in the final analysis.

Spring 2002

Field Activities

The seepage run for this reach was performed during March 11-12, 2002, and again coincided with springs measurements performed along portions of the lower reach by the USGS for IDWR. A total of 12 main-channel measurements were performed within the lower reach using acoustic Doppler instruments. Discharge data from 7 gaging stations located within this reach were also





obtained. One person each from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some tributary and drain sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Spring 2002 seepage run for this reach is presented in Appendix A. Included in this information are a detailed summary table (table A9), a gaging station discharge summary table (table A10), an acoustic Doppler discharge summary table (table A11), and an inflow and outflow inspection summary table (table A12). A map showing all main-channel measurement locations and gain/loss estimates for the Spring of 2001 is presented in figure A4.

No measurement was made at site L3 because of poor weather and unsafe river conditions. An estimate was not determined for the reach between sites L19 and L20 because, although an estimate of 100 ft³/s inflow from Clover Creek was made on March 20, it is likely that Clover Creek flows, resulting from snowmelt runoff, were much greater on March 12.

Summer 2002

Field Activities

The seepage run for this reach was performed during July 24-25, 2002. A total of 13 mainchannel measurements were performed within the lower reach using acoustic Doppler instruments. Discharge data from 7 gaging stations located within this reach were also obtained. Because of the large number of expected agricultural returns and tributary inflows during the summer months, several persons from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority (possibly up to 90%) of the actual inflows occurring at the time of the study.





Summary

A summary of the data collected during the Summer 2002 seepage run for this reach is presented in Appendix A. Included in this information are a detailed summary table (table A13), a gaging station discharge summary table (table A14), an acoustic Doppler discharge summary table (table A15), and an inflow and outflow inspection summary table (table A16). A map showing all main-channel measurement locations and gain/loss estimates for the Summer of 2002 is presented in figure A5.

Flow conditions and reservoir levels were relatively steady throughout the summer study period. There were some large variations in outflows from Lower Salmon Falls Power Plant and Bliss Dam, but these did not seem to affect any of the calculations. As noted previously, a large number of agricultural drains were active during this seepage run. Although extensive efforts were made to ensure that a majority of the inflows were inspected, it is possible that some significant inflow sites were not inspected and thus, are not reflected in the final calculations.

Fall 2002

Field Activities

The seepage run for this reach was performed during November 6-8, 2002. A total of 12 mainchannel measurements were performed within the lower reach using acoustic Doppler instruments. Discharge data from 7 gaging stations located within this reach were also obtained. Since the USGS and IPCo gaging station data for this time period is included in water year 2003, it has not be published as final data and is still subject to review. However, the data was analyzed and adjusted if necessary, based on data from actual measurements made very close to the time of the seepage runs, to ensure that it is as accurate as possible. One person each from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some tributary and drain sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.





Summary

A summary of the data collected during the Fall 2002 seepage run for this reach is presented in Appendix A. Included in this information are a detailed summary table (table A17), a gaging station discharge summary table (table A18), an acoustic Doppler discharge summary table (table A19), and an inflow and outflow inspection summary table (table A20). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2002 is presented in figure A6.

Flow conditions out of Milner Dam were somewhat unsteady and may have affected some of the final calculations, especially those between sites L6 and L9. A measurement was made at site L17 but was not used in the final analysis because it was not consistent with other adjacent measurements. No measurement was made at site L19 because of unsafe river conditions.

Reach Summary

Streamflow data for the reach of the Snake River between Minidoka Dam and King Hill were collected and analyzed during five separate seepage runs performed between March 2001 and November 2002. These included two spring runs, two fall runs, and one summer run. Estimates of gains and/or losses for specific subreaches were determined. Further analysis may be required to analyze trends with respect to time. A summary of the estimated gains and losses for the lower study reach, excluding the summer estimates, is presented in graphical format in Appendix A, figure A7.

Middle Reach (Shelley to Minidoka)

A map showing the locations of all gaging stations and intermediate acoustic Doppler measurement locations within this reach is presented in Appendix B, figure B1.

Spring 2001

Field Activities

The initial seepage run for this reach was performed during April 3-4, 2001. A total of 11 acoustic Doppler measurements were performed within the reach. Discharge data from 5 gaging stations located within this reach were also obtained. Two persons from the USGS, Idaho Falls





Field Office, were involved in the inspection of tributaries and agricultural drains, as well as river guidance based on their knowledge and experience in the area. One of IPCo's river crews also assisted with field inspections. Wading measurements were made at certain locations as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Spring 2001 seepage run for this reach is presented in Appendix B. Included in this information are a detailed summary table (table B1), a gaging station discharge summary table (table B2), an acoustic Doppler discharge summary table (table B3), and an inflow and outflow inspection summary table (table B4). A map showing all mainchannel measurement locations and gain/loss estimates for the Spring of 2001 is presented in figure B2.

Two small hydro-generation facilities are located on the Snake River near Idaho Falls. Because of their power-generation requirements, coordination of steady flows with these entities was not possible. Although these hydro-generation facilities are small, they do have the ability to affect flows. As a result, unsteady flows were encountered in the middle reach during portions of the study period. In addition, Bureau of Reclamation (BOR) had planned to hold flows steady out of Palisades and American Falls Reservoirs during the study period. Unfortunately, the unexpected suspension of flow into a major irrigation canal on April 3 created a surcharge condition in American Falls Reservoir. In order to relieve the situation, BOR had no choice but to increase flows out of American Falls. As a result, the measurements made at sites M13, M14, and M15 were made during very unsteady flow conditions and were not used in the final analysis.

Fall 2001

Field Activities

The seepage run for this reach was performed during October 31 and November 1, 2001. The sites between Neeley and Minidoka were not visited until November 20, 2001 because of access problems due to low streamflow conditions.

15





A total of 10 acoustic Doppler measurements were performed within the reach. Discharge data from 5 gaging stations located within this reach were also obtained. This included one measurement at a location approximately 12 miles upstream from American Falls Dam, which is typically located in the reservoir. Below normal reservoir levels during this study period allowed for a measurement at this location. The measurement data is presented for general use, but it was not used in the final analyses. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations and past experience, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Fall 2001 seepage run for this reach is presented in Appendix B. Included in this information are a detailed summary table (table B5), a gaging station discharge summary table (table B6), an acoustic Doppler discharge summary table (table B7), and an inflow and outflow inspection summary table (table B8). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2001 is presented in figure B3.

As previously discussed, two small hydro-generation facilities located on the Snake River near Idaho Falls have the ability to affect flows. As a result, unsteady flow conditions may have affected the analysis of certain subreaches. Inspection of the data revealed that the estimates for the reach between sites M2 and M3 and between sites M7 and M8 were very likely affected by unsteady flows and may not have the same accuracy as other estimates. In addition, site M14 was not accessible because of extremely low flow conditions and therefore, was not measured.

Spring 2002

Field Activities

The seepage run for this reach was performed during April 9-10, 2002. The sites between Neeley and Minidoka were not visited until May 7, 2002 because of unsteady streamflow releases from American Falls Dam.





A total of 9 acoustic Doppler measurements were performed within the reach. Discharge data from 5 gaging stations located within this reach were also obtained. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations and past experience, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Spring 2002 seepage run for this reach is presented in Appendix B. Included in this information are a detailed summary table (table B9), a gaging station discharge summary table (table B10), an acoustic Doppler discharge summary table (table B11), and an inflow and outflow inspection summary table (table B12). A map showing all main-channel measurement locations and gain/loss estimates for the Spring of 2002 is presented in figure B4.

Unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls did not affect the analysis during this seepage run. Flows were relatively steady along the entire study reach during the study period. Site M10 was not accessible and site M15 was not measured because of unsafe measuring conditions.

Summer 2002

Field Activities

The seepage run for this reach was performed during July 23-24, 2002. A total of 9 acoustic Doppler measurements were performed within the reach. Discharge data from 5 gaging stations located within this reach were also obtained. Because of the large number of expected agricultural returns and tributary inflows during the summer months, several persons from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reach. Wading measurements were made at some sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority (possibly up to 90%) of the actual inflows occurring at the time of the study.





Summary

A summary of the data collected during the Summer 2002 seepage run for this reach is presented in Appendix B. Included in this information are a detailed summary table (table B13), a gaging station discharge summary table (table B14), an acoustic Doppler discharge summary table (table B15), and an inflow and outflow inspection summary table (table B16). A map showing all main-channel measurement locations and gain/loss estimates for the Summer of 2002 is presented in figure B5.

Unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls did not affect the analysis during this seepage run. Flows were relatively steady along the entire study reach during the study period. Site M10 was not accessible and site M11 could not be measured because of sediment buildup and braided channel conditions.

Fall 2002

Field Activities

The seepage run for this reach was performed during November 5-6, 2002. A total of 11 acoustic Doppler measurements were performed within the reach. Discharge data from 5 gaging stations located within this reach were also obtained. Since the USGS gaging station data for this time period is included in water year 2003, it has not be published as final data and is still subject to review. However, the data was analyzed and adjusted if necessary, based on data from actual measurements made very close to the time of the seepage runs, to ensure that it is as accurate as possible. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations and past experience, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Fall 2002 seepage run for this reach is presented in Appendix B. Included in this information are a detailed summary table (table B17), a gaging station discharge summary table (table B18), an acoustic Doppler discharge summary table (table





B19), and an inflow and outflow inspection summary table (table B20). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2002 is presented in figure B6.

Unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls did not affect the analysis during this seepage run. Flows were relatively steady along the entire study reach during the study period and all sites were accessible and able to be measured.

Reach Summary

Streamflow data for the reach of the Snake River between Shelley and Minidoka Dam were collected and analyzed during five separate seepage runs performed between March 2001 and November 2002. These included two spring runs, two fall runs, and one summer run. Estimates of gains and/or losses for specific subreaches were determined. Further analysis may be required to analyze trends with respect to time. A summary of the estimated gains and losses for the middle study reach is presented in graphical format in Appendix B, figure B7.

Upper Reach (Ashton to mouth / Heise to Shelley)

A map showing the locations of all gaging stations and intermediate acoustic Doppler measurement locations within this reach is presented in Appendix C, figure C1.

Fall 2001

Field Activities

The initial seepage run for these reaches was performed during October 29-31, 2001. A total of 10 acoustic Doppler measurements were performed within the reaches. Discharge data from 8 gaging stations located within the reaches were also obtained. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.





Summary

A summary of the data collected during the Fall 2001 seepage measurements for this reach is presented in Appendix C. Included in this information are a detailed summary table (table C1), a gaging station discharge summary table (table C2), an acoustic Doppler discharge summary table (table C3), and an inflow and outflow inspection summary table (table C4). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2001 is presented in figure C2.

Measurement conditions were good throughout the reaches. Measurements were made at all of the originally planned sites. After reviewing the data, it was determined that measurements on the Snake River and Henrys Fork in the areas immediately upstream from the confluence would be beneficial to the gain/loss calculations. As a result, attempts were made to measure these sites during all subsequent seepage runs. Because of the lack of data at the confluence, the gain/loss estimate between sites U12 and U14 includes any gains or losses within the approximately 9-mi subreach on the Henrys Fork between the Rexburg gaging station (U7) and the mouth.

Overall, the measurements made within these study reaches were thought to be relatively good. Because unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls make it difficult to accurately calculate gains/losses over a short time period, 30-day average daily mean discharges were used in the calculations. The use of average values may reduce some of the variability in the gain/loss calculations, however, any variability in inflows or outflows within this reach would not be accounted for and could possibly result in estimates with somewhat high levels of error.

Spring 2002

Field Activities

The seepage run for these reaches was performed during April 8-9, 2002. A total of 12 acoustic Doppler measurements were performed within the reaches. Discharge data from 8 gaging stations located within the reaches were also obtained. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations, it was assumed that the total





inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Spring 2002 seepage measurements for this reach is presented in Appendix C. Included in this information are a detailed summary table (table C5), a gaging station discharge summary table (table C6), an acoustic Doppler discharge summary table (table C7), and an inflow and outflow inspection summary table (table C8). A map showing all main-channel measurement locations and gain/loss estimates for the Spring of 2002 is presented in figure C3.

Measurement conditions were good throughout the reaches. Measurements were made at all of the planned sites. Overall, the measurements made within these study reaches were thought to be very good. There were some questions concerning the ability to measure all of the flow at the site located immediately above the confluence (U13) on the Snake River. As a result, this measurement was not included in the final calculations. Because unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls make it difficult to accurately calculate gains/losses over a short time period, 30-day average daily mean discharges were used in the calculations. The use of average values may reduce some of the variability in the gain/loss calculations, however, any variability in inflows or outflows within this reach would not be accounted for and could possibly result in estimates with somewhat high levels of error.

Summer 2002

Field Activities

The seepage run for these reaches was performed during July 22-23, 2002. A total of 10 acoustic Doppler measurements were performed within the reaches. Discharge data from 8 gaging stations located within the reaches were also obtained. Because of the large number of expected agricultural returns and tributary inflows during the summer months, several persons from the USGS and IPCo inspected tributaries and agricultural return drains for inflows within the reaches. Wading measurements were made at some sites as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach

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represented a majority (possibly up to 90%) of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Summer 2002 seepage run for this reach is presented in Appendix C. Included in this information are a detailed summary table (table C9), a gaging station discharge summary table (table C10), an acoustic Doppler discharge summary table (table C11), and an inflow and outflow inspection summary table (table C12). A map showing all main-channel measurement locations and gain/loss estimates for the Summer of 2002 is presented in figure C4.

Because of relatively large discharges, measurement conditions were somewhat difficult at several locations. Measurements were made at all but two of the planned sites. A combination of equipment problems and high water velocities at sites U8 and U13, near the confluence, prevented the collections of data at these sites. In addition, measuring conditions at site U18 were very poor and although data were collected, the data were not used in the calculation of any gain/loss estimates.

Because unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls make it difficult to accurately calculate gains/losses over a short time period, 30-day average daily mean discharges were used in the calculations. The use of average values may reduce some of the variability in the gain/loss calculations, however, any variability in inflows or outflows within this reach would not be accounted for and may result in estimates with somewhat high levels of error. This would be especially true during the summer seepage run when inflows and outflow may be quite variable over a 30-day period.

Fall 2002

Field Activities

The seepage run for these reaches was performed during November 4-5, 2002. A total of 10 acoustic Doppler measurements were performed within these reaches. Discharge data from 8 gaging stations located within the reaches were also obtained. Since USGS gaging station data for this time period is included in water year 2003, it has not be published as final data and is still





subject to review. However, the data was analyzed and adjusted if necessary, based on information from actual measurements made very close to the time of the seepage runs, to ensure that it is as accurate as possible. Personnel from the USGS and IPCo were involved in the inspection of tributaries and agricultural drains. Wading measurements were made at certain locations as necessary. Based on field observations, it was assumed that the total inflow values determined for each subreach represented a majority if not all of the actual inflows occurring at the time of the study.

Summary

A summary of the data collected during the Fall 2002 seepage measurements for this reach is presented in Appendix C. Included in this information are a detailed summary table (table C13), a gaging station discharge summary table (table C14), an acoustic Doppler discharge summary table (table C15), and an inflow and outflow inspection summary table (table C16). A map showing all main-channel measurement locations and gain/loss estimates for the Fall of 2002 is presented in figure C5.

Measurement conditions were relatively good at most locations within the study reaches. Measurements were made at all but two of the planned sites. Overall, the measurements made within these study reaches were thought to be very good. Again, there were some question concerning the ability to measure all of the flow at the site located immediately above the confluence (U13) on the Snake River. No measurements were made at sites U3 and U17 because of ice in the river channel. Because unsteady releases from the two small hydro-generation facilities located on the Snake River near Idaho Falls make it difficult to accurately calculate gains/losses over a short time period, 30-day average daily mean discharges were used in the calculations. The use of average values may reduce some of the variability in the gain/loss calculations, however, any variability in inflows or outflows within this reach would not be accounted for and may result in estimates with somewhat high levels of error.

Reach Summary

Streamflow data for the reaches of the Snake River between Heise and Shelley and the Henrys Fork between Ashton and the mouth were collected and analyzed during four separate seepage runs performed between October 2001 and November 2002. These included one spring run, two

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fall runs, and one summer run. Estimates of gains and/or losses for specific subreaches were determined. Further analysis may be required to analyze trends with respect to time. A summary of the estimated gains and losses for the upper study reaches is presented in graphical format in Appendix C, figure C6.

SUMMARY

Streamflow discharge data were collected over a two-year period on portions of the Snake River and Henrys Fork in south-central and southeastern Idaho. The data was collected for analysis of gains and losses as one component of the general Eastern Snake Hydrologic Modeling Committee strategy to refine and enhance the conceptual and computer models of the ESRP hydrologic system. The information gathered will be combined with the results of other work being done on the plain to enhance the conceptual model of the hydrologic system and refine ground-water and surface-water computer flow models. Data collection and analyses were performed in a collaborative effort by the U.S. Geological Survey (USGS) and Idaho Power Company (IPCo).

The overall data collection process was very successful . The use of boat-mounted Acoustic Doppler Current Profilers (ADCPs) and Acoustic Doppler Profilers (ADPs) allowed for measurements to be made at intermediate locations between long-term gaging stations, where previously measurements would have been extremely difficult or impossible. As with any data collection effort, some problems arose which led to poor data or no data being collected at specific times and locations. Some of these problems included unsteady flow conditions, changes in reservoir storages, and unsafe measuring conditions.

The gain/loss estimates for the specific subreaches will allow the modelers to refine and enhance the surface water/ground water interaction portions of the ESRP model. The estimates may be used to show possible differences in gains and losses between varying time periods, varying flow regimes, and varying ground-water aquifer levels. However, any extensive trend analyses with respect to time would likely require additional data collected over a number of years.





APPENDICES





APPENDIX A

Gain and loss calculations and relevant data for the Snake River between Minidoka Dam and King Hill, Idaho

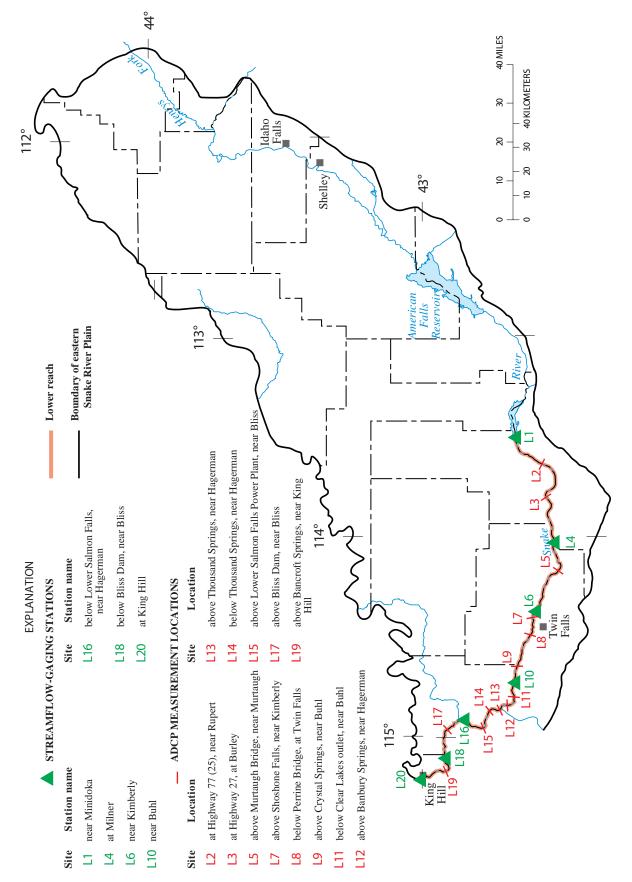


Figure A1. Locations of sites along the lower reach of the Snake River, Idaho, where streamflow was measured.

-							Total gains/	Gains/ (losses)
number (fig. #)	Gaging station name (number) ^{1/} ADCP/ADP measurement location	River mile		Discnarge (ft ³ /s)	Date	Time	(fft ³ /s)	per mue (ft ³ /s/mi)
L1	Snake River near Minidoka (13081500)	673.5		595	3/5/2001	2230		
			total estimated inflow	0				
			total estimated outflow	0				
L2	Snake River at Highway 77(25) near Rupert	664.0		2	1	1	1	1
			total estimated inflow	0				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ³	0				
L3	Snake River at Highway 27 at Burley	651.6		4	-	1	1	
			total estimated inflow	5				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ³	0				
14	Snake River at Milner (13088000)	6387		644	3/6/2001	1530	4	1
i				636	3/5/2001	0730		
			total estimated inflow	0				
			total estimated outflow	0				
L5	Snake River above Murtaugh Bridge at Murtaugh	630.5		610	3/5/2001	1140	(26)	(3)
			total estimated inflow	0				
			total estimated outflow	0				
71	Guelto Dirou acca Etimbodio (12000000)	C L 1 3		884	3/5/2001	1800	274	21
FO	DHAKE MAKET HEAL MULTIVELLY (LOUYUUUU)	7./10		892	3/5/2001	1330		
			total estimated inflow	0				
			total estimated outflow	0				
L7	Snake River above Shoshone Falls near Kimberly	615.2		890	3/5/2001	1425	(2)	(1)
			total estimated inflow	0				
			total estimated outflow	0				
L8	Snake River below Perrine Bridge at Twin Falls	611.0		950	3/5/2001	1610	60	14
			total estimated inflow	57				
			total actimated outflow	0				

$MOTOTA mercurement locationmle(r_1)_0(r_2)_0(r_1)_0(r_1)_0(r_1)_0(r_1)_0(r_2)_0(r_1)_0Stake Rver above Cystal Synga vare Buhl01.100.1100.11(r_2)_0(r_2)_0(r_3)_0(r_3)_0(r_3)_0Stake Rver above Cystal Synga vare Buhl01.1(r_2)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Euhot (130000)(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Buhlvy Springs vare Hagerman(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Buhlvy Springs vare Hagerman(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Punder Springs vare Hagerman(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Phanteuer Blas(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Phanteuer Blas(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Phanteuer Blas(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Phanteuer Blas(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0Stake River above Dover Phanteuer Blas(r_3)_0(r_3)_0(r_3)_0(r_3)_0(r_3)_0$	Map number	Gaging station name (number) ¹ /	River		Discharge			Total gains/ (losses)	Gains/ (losses) per mile
Static River above Crystal Springs near Buhl (13004000)6011(11(11(11(11)<	(fig. #)	ADCP/ADP measurement location	mile		(ft^3/s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
Static River rear bull (1309400) 30 100 Static River rear bull (1309400) 59.68 100 $3.62.001$ 10.55 Static River relation 59.68 100 $3.62.001$ 10.55 Static River blow Clear Lakes outlet neur Bult) 90.23 $3.62.001$ 10.55 Static River blow Clear Lakes outlet neur Bult) 59.28 100 estimated outflow 20 $3.62.001$ 10.55 Static River blow Clear Lakes outlet neur Bult) 58.26 100 estimated inflow 20 $3.62.001$ 10.51 Static River above Barbury Springs near Hagerman 58.26 100 estimated inflow 20 $3.52.001$ 11.56 Static River above Thousand Springs near Hagerman 58.26 100 estimated inflow 20 $3.52.001$ 1031 Static River above Thousand Springs near Hagerman 58.56 100 estimated outflow 20 $3.52.001$ 1031 Static River above Lower Salmon Falls Power Plant near Blis 57.68 100 estimated outflow 20 $3.52.001$ 1031 Static River above Lower Salmon Falls Power Plant near Blis 57.68 57.68 100 estimated outflow 20 $3.67.001$ 1031 Static River above Uower Salmon Falls Word Falls word Hagerman 57.58 57.68 $3.67.001$ 1031 Static River above Uower Salmon Falls Word Falls Word Falls Word Lower Salmon Fills 57.58 57.58 57.500 1001 1031 Static River above Bliss Dun neur Bliss 57.58 57.58 57.500 57.500 57.500 <td>$\Gamma 6$</td> <td>Snake River above Crystal Springs near Buhl</td> <td>601.1</td> <td></td> <td>1540</td> <td>3/6/2001</td> <td>0845</td> <td>533</td> <td>54</td>	$\Gamma 6$	Snake River above Crystal Springs near Buhl	601.1		1540	3/6/2001	0845	533	54
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total setimated inflowtotal setimated inflow <tht>total setimated inflowtotal setimat</tht>	L13	Snake River above Thousand Springs near Hagerman	585.6		3640	3/5/2001	1031	645	179
Snake River below Thousand Springs near Hagerman58.9total estimated outflow0Snake River below Thousand Springs near Hagerman58.9total estimated inflow72Snake River above Lower Salmon Falls Power Plant near Bliss576.8total estimated outflow0Snake River below Lower Salmon Falls Power Plant near Bliss576.8total estimated outflow0Snake River below Lower Salmon Falls576.8total estimated outflow301151River below Lower Salmon Falls near Hagerman572.5total estimated outflow03670011800Snake River below Lower Salmon Falls572.5total estimated outflow036720011230Snake River below Lower Salmon Falls572.5total estimated outflow036720011230Snake River below Lower Salmon Falls572.5total estimated inflow036720011230Snake River above Bliss Dam near Bliss572.5total estimated inflow036720011618Snake River above Bliss Dam near Bliss564.90357200116181618Snake River above Bliss Dam near Bliss564.9100161816181618Snake River above Bliss Dam near Bliss564.9100161816181618Snake River above Bliss Dam near Bliss564.9100161816181618Snake River above Bliss Dam near Bliss564.915001161816181618Snake River above Bliss Dam near Bliss564.9575011618 <td< td=""><td></td><td></td><td></td><td>total estimated inflow</td><td>0</td><td></td><td></td><td></td><td></td></td<>				total estimated inflow	0				
Snake River below Thousand Springs near Hagerman58.9 352001 0911 1 River below Thousand Springs near Hagerman 576.8 total estimated inflow 72 936.2001 1151 Snake River above Lower Salmon Falls Power Plant near Bliss 576.8 total estimated inflow 30 3662001 1151 Snake River above Lower Salmon Falls Power Plant near Bliss 576.8 total estimated inflow 30 3662001 1151 Snake River above Lower Salmon Fallstotal estimated outflow to storage 30 962001 1151 Snake River below Lower Salmon Falls near Hagerman 572.5 5590 362001 1800 Snake River below Lower Salmon Falls near Hagerman 572.5 572.6 3672001 1230 Snake River below Lower Salmon Falls near Hagerman 572.5 570.6 3672001 1230 Snake River above Bliss Dam near Bliss 572.5 564.9 3572001 1001 Snake River above Bliss Dam near Bliss 564.9 564.9 5650 3652001 1618				total estimated outflow	0				
total estimated inflow72Safe River above Lower Salmon Falls Power Plant near Bliss576.8236/20011151Safe River above Lower Salmon Falls Power Plant near Bliss576.8336/20011151River below Lower Salmon Fallstotal estimated inflow301151River below Lower Salmon Fallscotal estimated inflow301151Safe River below Lower Salmon Falls0336/20011230Sake River below Lower Salmon Falls57.50336/20011230(13135000)57.557.55500336/20011230Sake River above Bliss Dam near Bliss56.956.9336/20011230Sake River above Bliss Dam near Bliss56.956.95300168Sake River above Bliss Dam near Bliss56.956.9537/2001168Sake River above Bliss Dam near Bliss56.956.956.956.956.9Sake River above Bliss Dam near Bliss56.956.956.956.956.956.9Sake River above Bliss Dam near Bliss56.956.956.956.956.956.956.956.956.9Sake River above Bliss Dam near Bliss56.9	L14	Snake River below Thousand Springs near Hagerman	582.9		4930	3/5/2001	0911	1,290	478
Snake River above Lower Salmon Falls Power Plant near Blisstotal estimated outflow0Safe River above Lower Salmon Falls Power Plant near Bliss 576.8 5470 $3/6/2001$ 1151 River above Lower Salmon Fallstotal estimated outflow 0 $3/6/2001$ 1151 Snake River below Lower Salmon Fallsabove Lower Salmon Falls 0 $3/6/2001$ 1800 Snake River below Lower Salmon Falls 572.5 0 $3/6/2001$ 1800 Snake River below Lower Salmon Falls near Hagerman 572.5 572.6 0 $3/6/2001$ 1200 Snake River below Lower Salmon Falls near Hagerman 572.5 0 $3/6/2001$ 1200 Snake River below Lower Salmon Falls near Hagerman 572.5 0 $3/6/2001$ 1200 Snake River above Bliss Dam near Bliss 564.9 0 $3/6/2001$ 1618 Snake River above Bliss Dam near Bliss 564.9 0 $3/5/2001$ 1618				total estimated inflow	72				
				total estimated outflow	0				
	L15	Snake River above Lower Salmon Falls Power Plant near Bliss	576.8		5470	3/6/2001	1151	468	77
				total estimated inflow	30				
Shake River below Lower Salmon Falls estimated outflow to storage Shake River below Lower Salmon Falls power plant ⁵ 0 Shake River below Lower Salmon Falls 572.5 5590 3/6/2001 1800 (13135000) 572.5 total estimated inflow 5790 3/5/2001 1230 Shake River above Bliss Dam near Bliss 564.9 total estimated outflow 0 1304 Shake River above Bliss Dam near Bliss 564.9 total estimated outflow 0 3/5/2001 1618				total estimated outflow	0				
above Lower Salmon FallsSnake River below Lower Salmon Falls near Hagerman 572.5 0 Snake River below Lower Salmon Falls near Hagerman 572.5 5590 $3/6/2001$ (13135000) 572.5 5460 $3/5/2001$ 1230 (13135000) 572.5 total estimated inflow 1304 1230 Snake River above Bliss Dam near Bliss 564.9 564.9 6630 $3/5/2001$ 1618 total estimated outflow 0 6630 $3/5/2001$ 1618				estimated outflow to storage					
Snake River below Lower Salmon Falls near Hagerman 572.5 power plant ⁵ 0(13135000) 572.5 572.6 3662001 1800 (13135000) 572.6 572.6 3572001 1230 (13135000) 1304 1304 1230 Snake River above Bliss Dam near Bliss 564.9 564.9 6630 3572001 1618 Snake River above Bliss Dam near Bliss 564.9 1001 1618 1618				above Lower Salmon Falls					
Snake River below Lower Salmon Falls near Hagerman 572.5 5590 3/6/2001 1800 (13135000) 51335000 5460 3/5/2001 1230 (13135000) 133400 1304 1230 (13135000) 1304 1304 1304 Snake River above Bliss Dam near Bliss 564.9 total estimated inflow 0 total estimated inflow 0 3/5/2001 1618				power plant ⁵	0				
(13135000) 5460 3/5/2001 1230 total estimated inflow 1304 1304 1304 for a bove Bliss Dam near Bliss 564.9 6630 3/5/2001 1618 total estimated inflow 0 6630 3/5/2001 1618	L16	Snake River below Lower Salmon Falls near Hagerman	572.5		5590	3/6/2001	1800	90	21
total estimated inflow 1304 total estimated outflow 0 Snake River above Bliss Dam near Bliss 564.9 6630 3/5/2001 1618 total estimated inflow 0 6630 3/5/2001 1618		(13135000)			5460	3/5/2001	1230		
total estimated outflow 0 Snake River above Bliss Dam near Bliss 564.9 6630 3/5/2001 1618 total estimated inflow 0				total estimated inflow	1304				
Snake River above Bliss Dam near Bliss 564.9 6630 3/5/2001 1618 total estimated inflow 0				total estimated outflow	0				
	L17	Snake River above Bliss Dam near Bliss	564.9		6630	3/5/2001	1618	(134)	(18)
				total estimated inflow	0				

Hill, Idah	Hill, IdahoContinued))
							Total gains/	Gaine/ (Jaceae)
Map							gams/	
number	number Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	$(\mathbf{ft}^3/\mathbf{s})$	(ft ³ /s/mi)
			total estimated outflow	0				
			estimated outflow to storage					
			above Bliss Dam ⁵	60				
1 19	Snoba Divar halaw Rlice Dam naar Rlice (13153776)	5501		6600	3/5/2001	1930	30	5
L10	DHARE INFOL DELOW DHAS DAIL HEAL DHAS (LULUS) (0)	1.600		6880	3/5/2001	1030		
			total estimated inflow	0				
			total estimated outflow	0				
L19	Snake River above Bancroft Springs near King Hill	553.2		7010	3/5/2001	1326	130	22
			total estimated inflow	10				
			total estimated outflow	0				
L20	Snake River at King Hill (13154500)	546.6		060L	3/5/2001	1630	70	11
¹ Long-term	¹ Long-term United States Geological Survey or Idaho Power Company gagi	Company gaging stations are in bold.	in bold.					
² Unable to i	² Unable to measure because of river or weather conditions.							

Table A1. Calculations of gains and losses in specified subreaches of the Snake River during March 5-6, 2001, between Minidoka Dam and King

 3 Estimated based on reservoir stage data (USGS station number 13087900). 4 Measurement was made but not used in the calculations (see table 3).

⁵ Estimated based on reservoir stage data (Idaho Power Company).

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
L1	Snake River near Minidoka (13081500)	3/5/2001	2230	595
L4	Snake River at Milner (13088000)	3/6/2001 3/5/2001	1530 0730	644 636
L6	Snake River near Kimberly (13090000)	3/5/2001 3/5/2001	1800 1330	884 892
L10	Snake River near Buhl (13094000)	3/6/2001 3/6/2001	1045 0915	1900 1890
L16	Snake River below Lower Salmon Falls near Hagerman (13135000)	3/6/2001 3/5/2001	1800 1230	5590 5460
L18	Snake River below Bliss Dam near Bliss (13153776)	3/5/2001 3/5/2001	1930 1030	6600 6880
L20	Snake River at King Hill (13154500)	3/5/2001	1630	7090

Table A2. Gaging station discharge data during March 5-6, 2001, for the Snake River between Minidoka

 Dam and King Hill, Idaho

 [Discharge given in cubic feet per second]

Table A3. Acoustic Doppler discharge measurement data during March 5-6, 2001, for the Snake River between Minidoka Dam and King Hill, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV ([•] / _µ)
L2	Snake River at Highway 77(25) near Rupert	1			
L3	Snake River at Highway 27 at Burley	3/6/2001	0920	869	0.04
L5	Snake River above Murtaugh Bridge at Murtaugh	3/5/2001	1140	610	0.08
L7	Snake River above Shoshone Falls near Kimberly	3/5/2001	1425	890	0.09
L8	Snake River below Perrine Bride at Twin Falls	3/5/2001	1610	950	0.14
L9	Snake River above Crystal Springs near Buhl	3/6/2001	0845	1540	0.05
L11	Snake River below Clear Lakes outlet near Buhl	3/6/2001	1115	2510	0.12
L12	Snake River above Banbury Springs near Hagerman	3/5/2001	1156	2870	0.02
L13	Snake River above Thousand Springs near Hagerman	3/5/2001	1031	3640	0.04
L14	Snake River below Thousand Springs near Hagerman	3/5/2001	0911	4930	0.01
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	3/6/2001	1151	5470	0.01
L17	Snake River above Bliss Dam near Bliss	3/5/2001	1618	6630	0.04
L19	Snake River above Bancroft Springs near King Hill	3/5/2001	1326	7010	0.04

¹ No measurement made because of shallow depths and limited access.

Table A4. Discharge data for all inspected inflow and outflow sites during March 2-6, 2001, for the Snake River between Minidoka Dam and King Hill, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	L1 and L2			
F Drain near Declo	13082060	42 32 48	113 37 14	3/5/2001		0
D-3 Drain near Declo	13082032	42 36 49	113 36 10	3/5/2001		0
	Subreach betwee	n map numbers	L2 and L3			
D-5 Drain near Rupert	13082062	42 33 15	113 38 38	3/5/2001		
D-4 Drain near Rupert	13082064	42 34 15	113 38 25	3/5/2001		0
Marsh Creek near Declo	13082320	42 31 26	113 40 02	3/5/2001		3
Spring Creek near Declo	13082330	42 31 01	113 41 03	3/5/2001		3
D-16 Drain near Heyburn	13084705	42 32 30	113 45 24	3/5/2001		0
	Subreach betwee	n map numbers	L3 and L4			
B Drain near Heyburn	13084707	42 33 33	113 47 01	3/5/2001		0
D-17 Drain near Heyburn	13085060	42 32 53	113 50 51	3/5/2001		0
Main Drain North near Heyburn	13085065	42 33 02	113 51 59	3/5/2001	1200	5
G Drain near Burley	13085070	42 31 56	113 53 12	3/5/2001		
J Drain near Burley	13085080	42 31 53	113 53 29	3/5/2001		
A&B Irrigation Pump near Milner	13085500	42 32 01	113 56 51	3/5/2001	DM	0
PA Lateral Pump near Milner	13085800	42 32 02	113 58 19	3/5/2001	DM	0
Milner Irrigation Pump near Milner	13086000	42 31 10	114 00 38	3/5/2001	DM	0
Northside A Lateral near Milner	13086510	42 32 17	114 02 40	3/5/2001	DM	0
Northside Crosscut Canal near Milner	13086520	42 33 31	114 03 08	3/5/2001	DM	0
Milner-Gooding Canal near Milner	13086530	42 33 39	114 02 59	3/5/2001	DM	0
North Side Main Canal near Milner	13087000	42 31 46	114 01 10	3/5/2001	DM	0
Twin Falls Main Canal near Milner	13087500	42 31 18	114 01 03	3/5/2001	DM	0
	Subreach betwee	n map numbers	L4 and L5			
	Subreach betwee	n map numbers	L5 and L6			
Miscellaneous agriculture return near Hansen	13089690	42 33 55	114 19 24	3/5/2001		0
Twin Falls Coulee near Hansen	13089695	42 34 11	114 20 32	3/5/2001		0
Devil's Washbowl Spring near Kimberly	13089600	42 35 18	114 20 45	3/12/2001	1015	³ 12.8
	Subreach betwee	n map numbers	L6 and L7			
Devil's Corral Springs near Kimberly	13090100	42 35 38	114 21 55	3/6/2001	0850	³ 37.4
	Subreach betwee	n map numbers	L7 and L8			
Fish Hatchery Waste O near Twin Falls	13090370	42 35 31	114 26 05	3/5/2001		
Mary Alice Lake discharge near Twin Falls		42 35 46	114 26 51	3/5/2001		
	Subreach betwee	n map numbers	L8 and L9			
Perrine Coulee near Twin Falls	13090460	42 35 53	114 28 20	3/5/2001		³ 2.4
Blue Lakes Outlet near Twin Falls	13091500	42 36 30	114 28 34	3/7/2001		³ 195
Warm Creek near Twin Falls	13091700	42 37 15	114 29 55	3/5/2001	1200	20
Rock Creek above Highway 30/93 at Twin						
Falls	13092747	42 33 47	114 29 42	3/6/2001	DM	37
Jerome Golf Course Drain 1	13091733	42 38 03	114 31 02	3/5/2001		0
Miscellaneous agriculture return near Twin Falls	s	42 37 21	114 33 23	3/5/2001		0
Sonnickson Drain near Twin Falls	13093150	42 38 40	114 33 26	3/5/2001		0
Miscellaneous agriculture return near Twin Falls		42 38 23	114 33 32	3/5/2001		0
Miscellaneous agriculture return near Twin Falls	s	42 37 36	114 34 29	3/5/2001		0
Sucker Flat Drain near Filer	13093190	42 38 25	114 35 30	3/5/2001		0
Miscellaneous agriculture return near Filer		42 37 51	114 35 41	3/5/2001		0
Miscellaneous agriculture return near Filer		42 38 54	114 36 58	3/5/2001		0

Table A4. Discharge data for all inspected inflow and outflow sites during March 2-6, 2001, for the Snake
River between Minidoka Dam and King Hill, IdahoContinued

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge
	Subreach between	map numbers	L9 and L10			
Miscellaneous agriculture return near Filer		42 39 17	114 38 16	3/5/2001		
Crystal Springs near Filer	13093400	42 39 36	114 38 32	3/8/2001	1245	³ 487
Cedar Draw near Filer	13093550	42 39 13	114 39 15	3/5/2001		33
Miscellaneous agriculture return near Buhl		42 39 31	114 40 42	3/5/2001		0
Waste I near Buhl	13093900	42 39 33	114 41 28	3/5/2001		0
	Subreach between	map numbers I	L10 and L11			
Miscellaneous agriculture return near Buhl		42 40 03	114 43 10	3/6/2001		0
Miscellaneous agriculture return near Buhl		42 40 07	114 44 18	3/6/2001		0
8 Drain near Buhl		42 40 27	114 44 27	3/6/2001		0
Clear Lakes Outlet near Buhl	13094500	42 40 01	114 46 45	3/8/2001	1240	³ 471
	Subreach between	map numbers I	L11 and L12			
Mud Creek near Buhl ⁴	13094700	42 39 33	114 47 20	3/6/2001		20
Deep Creek near Buhl ⁴		42 39 29	114 48 38	3/6/2001		0
Briggs Creek Spring near Buhl	13095200	42 40 20	114 49 00	3/9/2001	1415	³ 104
	Subreach between	map numbers I	L12 and L13			
rrigation Ditch to Blind Canyon near Buhl	13095490	42 42 28	114 47 30	3/6/2001		
South Coulee (Cedar Draw) near Buhl	13095360	42 41 46	114 48 19	3/6/2001		
Box Canyon Springs near Wendell	13095500	42 42 29	114 48 35	3/2/2001	1720	³ 356
Blind Canyon Spring near Buhl	13095400	42 42 12	114 49 20	3/5/2001	1305	³ 10.1
Unnamed Spring near Buhl	13095350	42 41 51	114 49 21	3/5/2001	1225	³ 2.7
Salmon Falls Creek near Hagerman	13108150	42 41 47	114 51 15	3/5/2001	DM	125
	Subreach between	map numbers I	L13 and L14			
Sand Springs near Hagerman	13132600	42 43 36	114 50 00	3/5/2001	1115	³ 70.9
Drain near Bickel Springs near Hagerman	13133785	42 45 28	114 50 48	3/5/2001		
Bickel Spring near Hagerman	13132790	42 45 29	114 51 19	3/5/2001	1405	³ 15.8
	Subreach between	map numbers I	L14 and L15			
Riley Creek near Hagerman	13133800	42 45 50	114 51 40	3/5/2001	1430	72
	Subreach between	map numbers I	L15 and L16			
Billingsly Creek near Hagerman	13134600	42 46 44	114 51 22	3/6/2001	1310	30
	Subreach between	map numbers I	L16 and L17			
W Drain near Tuttle	13152895	42 51 50	114 51 58	3/6/2001		
Birch Creek near Hagerman	13135100	42 51 10	114 53 30	3/6/2001	1110	11
Malad Power Flume near Bliss	13152940	42 51 54	114 53 11	3/2/2001	1115	1190
Malad River near Bliss	13153500	42 51 48	114 54 04	3/2/2001	1335	103
	Subreach between	map numbers I	L17 and L18			
Fuana Gulch near Bliss		42 54 34	115 00 02	3/6/2002		0
rrigation Ditch near Bliss	13152450	42 55 56	115 00 19	3/6/2002		0
	Subreach between	map numbers I	L18 and L19			
	Subreach between	map numbers I	L19 and L20			
Clover Creek near Bliss	13154000	43 01 30	115 00 20	3/6/2001		10

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Combined spring discharge and agriculture return flows; spring flow was subtraced from field measured value to obtain an approximate agriculture return flow value.

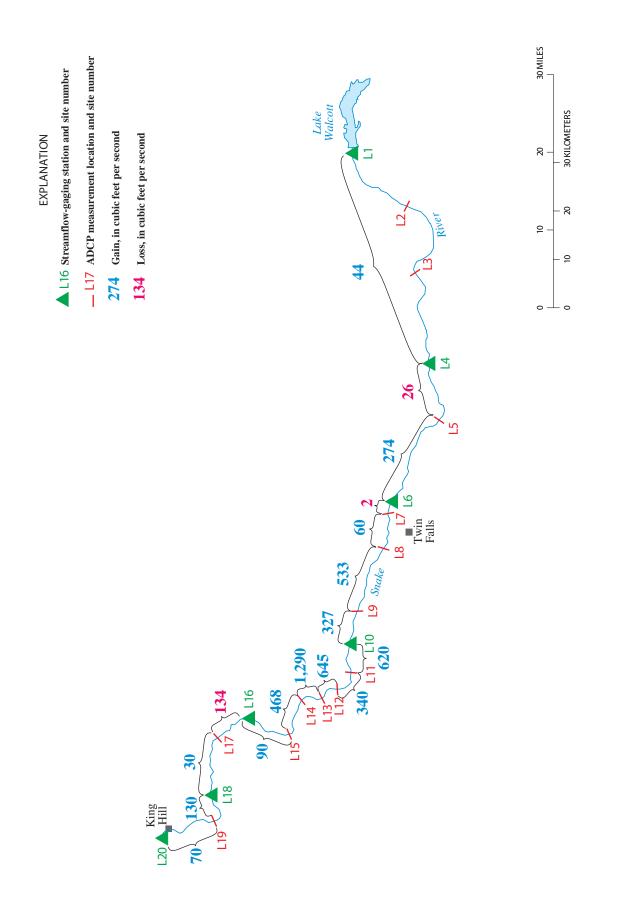


Figure A2. Streamflow gains and losses along the lower reach of the Snake River, Idaho, estimated during the March 5-6, 2001, seepage study.

Mon							Total gains/	Gains/ (losses)
Map number	· Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)		mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
L1	Snake River near Minidoka (13081500)	673.5		570	11/5/2001	0630		
			total estimated inflow	0				
			total estimated outflow	0				
L2	Snake River at Highway 77(25) near Rupert	664.0		574	11/5/2001	1100	4	0
			total estimated inflow	0				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
L3	Snake River at Highway 27 at Burley	651.6		605	11/5/2001	1300	31	3
			total estimated inflow	25				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
V I	Cucka Divor at Milnor (13086000)	6387		635	11/5/2001	2300	5	0
5				622	11/5/2001	1015		
			total estimated inflow	0				
			total estimated outflow	0				
L5	Snake River above Murtaugh Bridge at Murtaugh	630.5		694	11/5/2001	1411	72	6
			total estimated inflow	0				
			total estimated outflow	0				
16	Snoko Rivar near Kimbarly (1300000)	617.2		899	11/5/2001	2030	205	15
	DHARE INVEL REAL INTRODUCTY (LOUZONNU)	7./10		696	11/7/2001	1545		
			total estimated inflow	0				
			total estimated outflow	0				
L7	Snake River above Shoshone Falls near Kimberly	615.2		1120	11/7/2001	1640	151	76
			total estimated inflow	30				
			total estimated outflow	0				
L8	Snake River below Perrine Bridge at Twin Falls	611.0		1250	11/7/2001	1530	100	24
			total estimated inflow	143				
			total estimated outflow	0				

Table A5. Calculations of gains and losses in specified subreaches of the Snake River during November 5-7, 2001, between Minidoka Dam and

I

Map		i					Total gains/	Gains/ (losses)
number (fig. #)	Gaging station name (number)'/ ADCP/ADP measurement location	River mile		Discriarge (ft ³ /s)	Date	Time	(ft ³ /s)	per mue (ft ³ /s/mi)
L9	Snake River above Crystal Springs near Buhl	601.1		1700	11/7/2001	1340	307	31
			total estimated inflow	84				
			total estimated outflow	0				
				2380	11/7/2001	1545	596	139
L10	Snake Kiver near Buhl (13094000)	8.065		2300	11/6/2001	1130		
			total estimated inflow	0				
			total estimated outflow	0				
L11	Snake River below Clear Lakes outlet near Buhl	592.8		2920	11/6/2001	1335	620	155
			total estimated inflow	0				
			total estimated outflow	0				
L12	Snake River above Banbury Springs near Hagerman	589.2		2810	11/6/2001	1315	(110)	(31)
			total estimated inflow	157				
			total estimated outflow	0				
L13	Snake River above Thousand Springs near Hagerman	585.6		3810	11/6/2001	1350	843	234
			total estimated inflow	0				
			total estimated outflow	0				
L14	Snake River below Thousand Springs near Hagerman	582.9		5110	11/6/2001	1140	1,300	481
			total estimated inflow	80				
			total estimated outflow	0				
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	576.8		5850	11/7/2001	1145	660	108
			total estimated inflow	50				
			total estimated outflow	0				
			estimated outflow to storage					
			above Lower Salmon Falls					
			power plant ³	4				
L16	Snake River below Lower Salmon Falls near Hagerman	572.5					1	
	(ANACCTCT)			6490	11/6/2001	1030		
			total estimated inflow	1176				
L17	Snake River above Bliss Dam near Bliss	564.9	total estimated outflow	0		ł		
			5 - - - - - - - - - - - - - - - - 	0				

							Total	Gains/
Map							gains/	(losses)
5	Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #) ADC	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
			total estimated outflow	0				
			estimated outflow to storage					
			above Bliss Dam ³	(10)				
1 10 Cm2	Grothe Direct Lollon Direct Dam annu Direc (13153776)	5501		7800	11/6/2001	1700	62	5
	(0//CCTCT) SUGLIGATION DISS DANN HEAT DISS (LOTO) /0/	1.600		7820	11/6/2001	0745		
			total estimated inflow	0				
			total estimated outflow	0				
L19 Snak	Snake River above Bancroft Springs near King Hill	553.2		7800	11/6/2001	1050	(20)	(3)
			total estimated inflow	15				
			total estimated outflow	0				
L20 Snak	Snake River at King Hill (13154500)	546.6		7770	11/6/2001	1445	(45)	(2)

Table A5. Calculations of gains and losses in specified subreaches of the Snake River during November 5-7, 2001, between Minidoka Dam and

÷ nage -

 3 Estimated based on reservoir stage data (Idaho Power Company).

 4 Unable to estimate reservoir storage changes due to high variability. 5 Measurement was made but not used in the calculations (see table 7).

Table A6. Gaging station discharge data during November 5-7, 2001, for the Snake River between
Minidoka Dam and King Hill, Idaho

[Discharge given in cubic feet per secon
--

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
L1	Snake River near Minidoka (13081500)	11/5/2001	0630	570
L4	Snake River at Milner (13088000)	11/5/2001 11/5/2001	2300 1015	635 622
L6	Snake River near Kimberly (13090000)	11/5/2001 11/7/2001	2030 1545	899 969
L10	Snake River near Buhl (13094000)	11/7/2001 11/6/2001	1545 1130	2380 2300
L16	Snake River below Lower Salmon Falls near Hagerman (13135000)	11/6/2001	 1030	 6490
L18	Snake River below Bliss Dam near Bliss (13153776)	11/6/2001 11/6/2001	1700 0745	7800 7820
L20	Snake River at King Hill (13154500)	11/6/2001	1445	7770

Table A7. Acoustic Doppler discharge measurement data during November 5-7, 2001, for the Snake River between Minidoka Dam and King Hill, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	$COV(^{\sigma}/_{\mu})$
L2	Snake River at Highway 77(25) near Rupert	11/5/2001	1100	574	0.29
L3	Snake River at Highway 27 at Burley	11/5/2001	1300	605	0.54
L5	Snake River above Murtaugh Bridge at Murtaugh	11/5/2001	1411	694	0.05
L7	Snake River above Shoshone Falls near Kimberly	11/7/2001	1640	1120	0.05
L8	Snake River below Perrine Bride at Twin Falls	11/7/2001	1530	1250	0.07
L9	Snake River above Crystal Springs near Buhl	11/7/2001	1340	1700	0.05
L11	Snake River below Clear Lakes outlet near Buhl	11/6/2001	1335	2920	0.03
L12	Snake River above Banbury Springs near Hagerman	11/6/2001	1315	2810	0.06
L13	Snake River above Thousand Springs near Hagerman	11/6/2001	1350	3810	0.02
L14	Snake River below Thousand Springs near Hagerman	11/6/2001	1140	5110	0.03
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	11/7/2001	1145	5850	0.09
L17	Snake River above Bliss Dam near Bliss	11/6/2001	1408	8080	0.07
L19	Snake River above Bancroft Springs near King Hill	11/6/2001	1050	7800	0.02

Table A8. Discharge data for all inspected inflow sites during November 5-7, 2001, for the Snake River between Minidoka Dam and King Hill, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	L1 and L2			
F Drain near Declo	13082060	42 32 48	113 37 14	11/6/2001		0
D-3 Drain near Declo	13082032	42 36 49	113 36 10	11/6/2001		0
	Subreach betwee	n map numbers	L2 and L3			
D-5 Drain near Rupert	13082062	42 33 15	113 38 38	11/6/2001		0
D-4 Drain near Rupert	13082064	42 34 15	113 38 25	11/6/2001		0
Marsh Creek near Declo	13082320	42 31 26	113 40 02	11/6/2001		3
Spring Creek near Declo	13082330	42 31 01	113 41 03	11/6/2001		3
D-16 Drain near Heyburn	13084705	42 32 30	113 45 24	11/6/2001		0
	Subreach betwee	n map numbers	L3 and L4			
B Drain near Heyburn	13084707	42 33 33	113 47 01	11/6/2001		0
D-17 Drain near Heyburn	13085060	42 32 53	113 50 51	11/6/2001	0830	5
Main Drain North near Heyburn	13085065	42 33 02	113 51 59	11/6/2001	0900	20
G Drain near Burley	13085070	42 31 56	113 53 12	11/6/2001		
Drain near Burley	13085080	42 31 53	113 53 29	11/6/2001		
A&B Irrigation Pump near Milner	13085500	42 32 01	113 56 51	11/6/2001	DM	0
PA Lateral Pump near Milner	13085800	42 32 02	113 58 19	11/6/2001	DM	0
Milner Irrigation Pump near Milner	13086000	42 31 10	114 00 38	11/6/2001	DM	0
Northside A Lateral near Milner	13086510	42 32 17	114 02 40	11/6/2001	DM	0
Northside Crosscut Canal near Milner	13086520	42 33 31	114 03 08	11/6/2001	DM	0
Ailner-Gooding Canal near Milner	13086530	42 33 39	114 02 59	11/6/2001	DM	0
North Side Main Canal near Milner	13087000	42 31 46	114 01 10	11/6/2001	DM	0
Twin Falls Main Canal near Milner	13087500	42 31 18	114 01 03	11/6/2001	DM	0
	Subreach betwee					-
	Subreach betwee	n map numbers	L5 and L6			
Miscellaneous agriculture return near Hansen	13089690	42 33 55	114 19 24	11/6/2001		0
Twin Falls Coulee near Hansen	13089695	42 34 11	114 20 32	11/6/2001		0
Devil's Washbowl Spring near Kimberly	13089600	42 35 18	114 20 45	11/6/2001		
	Subreach betwee	n map numbers	L6 and L7			
Devil's Corral Springs near Kimberly	13090100	42 35 38	114 21 55	11/6/2001		
	Subreach betwee	n map numbers	L7 and L8			
Fish Hatchery Waste O near Twin Falls	13090370	42 35 31	114 26 05	11/6/2001	1130	30
Mary Alice Lake discharge near Twin Falls		42 35 46	114 26 51	11/6/2001		0
	Subreach betwee	n map numbers	L8 and L9			
Perrine Coulee near Twin Falls	13090460	42 35 53	114 28 20	11/6/2001	1200	³ 3.0
Blue Lakes Outlet near Twin Falls	13091500	42 36 30	114 28 34	11/6/2001		
Warm Creek near Twin Falls	13091700	42 37 15	114 29 55	11/6/2001	1230	40
Rock Creek above Highway 30/93 at Twin						
Falls	13092747	42 33 47	114 29 42	11/6/2001	DM	79
erome Golf Course Drain 1	13091733	42 38 03	114 31 02	11/6/2001		0
Miscellaneous agriculture return near Twin Falls	s	42 37 21	114 33 23	11/6/2001		0
Sonnickson Drain near Twin Falls	13093150	42 38 40	114 33 26	11/6/2001		0
Miscellaneous agriculture return near Twin Falls		42 38 23	114 33 32	11/6/2001		0
Miscellaneous agriculture return near Twin Falls		42 37 36	114 34 29	11/6/2001	1250	15
Sucker Flat Drain near Filer	13093190	42 38 25	114 35 30	11/6/2001	1330	5
Miscellaneous agriculture return near Filer		42 37 51	114 35 41	11/6/2001	1345	2
0						-

Station Location Inspection site¹ Discharge² number¹ Latitude Longitude Date Time Subreach between map numbers L9 and L10 Miscellaneous agriculture return near Filer 42 39 17 114 38 16 11/6/2001 0 -------Crystal Springs near Filer 13093400 42 39 36 114 38 32 11/6/2001 ------Cedar Draw near Filer 13093550 42 39 13 114 39 15 11/6/2001 1455 54 Miscellaneous agriculture return near Buhl ---42 39 31 114 40 42 11/6/2001 ----0 Waste I near Buhl 13093900 42 39 33 114 41 28 11/6/2001 1530 30 Subreach between map numbers L10 and L11 Miscellaneous agriculture return near Buhl 42 40 03 114 43 10 11/6/2001 0 ------Miscellaneous agriculture return near Buhl $42\ 40\ 07$ 114 44 18 11/6/2001 0 ------J8 Drain near Buhl 42 40 27 114 44 27 11/6/2001 0 ------Clear Lakes Outlet near Buhl 13094500 42 40 01 114 46 45 11/6/2001 ------Subreach between map numbers L11 and L12 Mud Creek near Buhl⁴ 13094700 42 39 33 114 47 20 11/6/2001 ------Deep Creek near Buhl⁴ ----42 39 29 114 48 38 11/6/2001 -------Briggs Creek Spring near Buhl 13095200 42 40 20 114 49 00 11/6/2001 Subreach between map numbers L12 and L13 Irrigation Ditch to Blind Canyon near Buhl 13095490 42 42 28 114 47 30 11/6/2001 ---South Coulee (Cedar Draw) near Buhl 13095360 42 41 46 114 48 19 11/6/2001 ---**Box Canyon Springs near Wendell** 13095500 42 42 29 114 48 35 11/6/2001 DM ³346 Blind Canyon Spring near Buhl 13095400 42 42 12 114 49 20 11/6/2001 Unnamed Spring near Buhl 114 49 21 13095350 42 41 51 11/6/2001 ------Salmon Falls Creek near Hagerman 13108150 42 41 47 114 51 15 11/6/2001 DM 157 Subreach between map numbers L13 and L14 Sand Springs near Hagerman 13132600 42 43 36 114 50 00 11/6/2001 ---Drain near Bickel Springs near Hagerman 13133785 42 45 28 114 50 48 11/6/2001 ---Bickel Spring near Hagerman 42 45 29 13132790 114 51 19 11/6/2001 ------Subreach between map numbers L14 and L15 Riley Creek near Hagerman 13133800 42 45 50 114 51 40 11/6/2001 80 ---Subreach between map numbers L15 and L16 Billingsly Creek near Hagerman 13134600 42 46 44 114 51 22 11/6/2001 50 ---Subreach between map numbers L16 and L17 W Drain near Tuttle 13152895 42 51 50 114 51 58 11/6/2001 ----Birch Creek near Hagerman 42 51 10 10 13135100 114 53 30 11/6/2001 ---**Malad Power Flume near Bliss** 13152940 42 51 54 114 53 11 11/6/2001 DM 1070 Malad River near Bliss 13153500 42 51 48 114 54 04 11/6/2001 DM 96 Subreach between map numbers L17 and L18 Tuana Gulch near Bliss ---42 54 34 115 00 02 11/6/2001 2 Irrigation Ditch near Bliss 13152450 42 55 56 115 00 19 11/6/2001 0 ---Subreach between map numbers L18 and L19 ____ ------------Subreach between map numbers L19 and L20 Clover Creek near Bliss 13154000 43 01 30 115 00 20 11/6/2001 15

Table A8: Discharge data for all inspected inflow sites during November 5-7, 2001, for the Snake River

 between Minidoka Dam and King Hill, Idaho--Continued

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

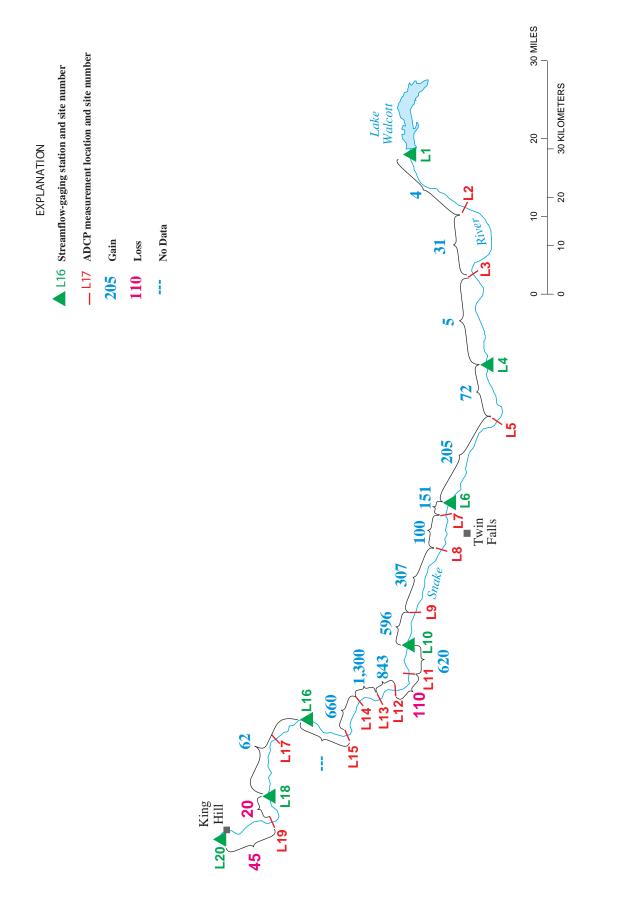


Figure A3. Streamflow gains and losses along the lower reach of the Snake River, Idaho, estimated during the November 5-7, 2001, seepage study.

Map number	Gazing station name (number) ¹ /	River		Discharge			Total gains/ (losses)	Gains/ (losses) per mile
(fig. #)		mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
L1	Snake River near Minidoka (13081500)	673.5		590	3/11/2002	0530		
			total estimated inflow	4				
			total estimated outflow	0				
L2	Snake River at Highway 77(25) near Rupert	664.0		594	3/11/2002	1000	0	0
			total estimated inflow	17				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
L3	Snake River at Highway 27 at Burley	651.6			-	1	1	1
			total estimated inflow	3				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
r I		1007		609	3/11/2002	1600	(5)	0
5	CONDOCATION ALIVER ALIVER ALIVATION OF ALIVATIONO OFTA	1.000		614	3/11/2002	1200		
			total estimated inflow	0				
			total estimated outflow	0				
L5	Snake River above Murtaugh Bridge at Murtaugh	630.5		697	3/11/2002	1600	83	10
			total estimated inflow	0				
			total estimated outflow	0				
71	Cucho Divou noon Vimbouly (12000000)	6170		834	3/11/2002	2230	137	10
F1	SHAKE INVEL HEAL MULTIVELLY (12020000)	7./10		808	3/12/2002	0830		
			total estimated inflow	0				
			total estimated outflow	0				
L7	Snake River above Shoshone Falls near Kimberly	615.2		868	3/12/2002	0630	06	45
			total estimated inflow	0				
			total estimated outflow	0				
L8	Snake River below Perrine Bridge at Twin Falls	611.0		939	3/12/2002	0945	41	10
			total estimated inflow	94				
			total estimated outflow	0				

Table A9. Calculations of gains and losses in specified subreaches of the Snake River during March 11-12, 2002, between Minidoka Dam and

Map number (fig. #) L9							Total	Gains/
mber g. #) L9		÷		Discharge			gains/ (loccec)	(losses) ner mile
67	Gaging station name (number) / ADCP/ADP measurement location	Kıver mile		(ft ³ /s)	Date	Time	(ft ³ /s)	ft ³ /s/mi)
	Snake River above Crystal Springs near Buhl	601.1		1270	3/12/2002	1200	237	24
			total estimated inflow	34				
			total estimated outflow	0				
L10	Snake River near Buhl (13094000)	596.8		1930 1950	3/12/2002 3/12/2002	1400 1145	626	146
			total estimated inflow	0				
			total estimated outflow	0				
L11	Snake River below Clear Lakes outlet near Buhl	592.8		2750	3/12/2002	1255	800	200
			total estimated inflow	22				
			total estimated outflow	0				
L12	Snake River above Banbury Springs near Hagerman	589.2		2670	3/12/2002	1030	(102)	(28)
			total estimated inflow	116				
			total estimated outflow	0				
L13	Snake River above Thousand Springs near Hagerman	585.6		3500	3/12/2002	0940	714	198
			total estimated inflow	0				
			total estimated outflow	0				
L14	Snake River below Thousand Springs near Hagerman	582.9		4700	3/12/2002	0060	1,200	444
			total estimated inflow	71				
			total estimated outflow	0				
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	576.8		5170	3/12/2002	1200	399	65
			total estimated inflow	23				
			total estimated outflow	0				
			estimated outflow to storage					
			above Lower Salmon Falls					
			power plant ⁴	-80				
L16	Snake River below Lower Salmon Falls near Hagerman	572.5		5310	3/12/2002	1400	37	6
	(13135000)			5310	3/12/2002	1000		
			total estimated inflow	1209				
			total estimated outflow	0				
L17	Snake River above Bliss Dam near Bliss	564.9		6630	3/12/2002	1400	111	15
			total estimated inflow	1				

Table A9. Calculations of gains and losses in specified subreaches of the Snake River during March 11-12, 2002, between Minidoka Dam and

Map							Total gains/	Gains/ (losses)
number Gaging station name (number) ¹ /	number) ¹ /	River		Discharge			(losses)	per mile
(fig. #) ADCP/ADP measurement location	nent location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
			total estimated outflow	0				
			estimated outflow to storage					
			above Bliss Dam ⁴	40				
	Dam 1100 Dian (12152776)	1 022		6740	3/12/2002	1700	149	26
LIO BHAKE KIVEL DEIOW DISS L	(0//CCTCT) SSIIG JIEAL HEAL DISS DAILI HEAL SHICK (0//CCTCT) SSIIG JIEAL	1.400		6740	3/12/2002	1215		
			total estimated inflow	0				
			total estimated outflow	0				
L19 Snake River above Bancroft Springs near King Hill	ft Springs near King Hill	553.2		6730	3/12/2002	1515	(10)	(2)
			total estimated inflow	5				
			total estimated outflow	0				
L20 Snake River at King Hill (13154500)	(13154500)	546.6		7310	3/12/2002	1830		1

Table A9. Calculations of gains and losses in specified subreaches of the Snake River during March 11-12, 2002, between Minidoka Dam and

³ Unable to measure because of river or weather conditions.

⁴ Estimated based on reservoir stage data (Idaho Power Company).

⁵ Apparent snowmelt runoff event; flow on March 12, 2002 was likely much greater than the 100 ft^3 /s reported on March 20, 2002. ⁶ Not calculated because of unknown, and likely large, inflows from Clover Creek.

Table A10. Gaging station discharge data during March 11-12, 2002, for the Snake River between
Minidoka Dam and King Hill, Idaho

[Discharge	oiven	in	cubic	feet	ner	second]
[Discharge	given	ш	cubic	ICCL	per	second

Map number				
(fig. #)	Gaging station name (number)	Date	Time	Discharge
L1	Snake River near Minidoka (13081500)	3/11/2002	0530	590
L4	Snake River at Milner (13088000)	3/11/2002	1600	609
LT		3/11/2002	1200	614
L6	Snake River near Kimberly (13090000)	3/11/2002	2230	834
LO	Shake River hear Kiniberry (15090000)	3/12/2002	0830	808
1 10	5 L D' D 11/1200/0000	3/12/2002	1400	1930
L10	Snake River near Buhl (13094000)	3/12/2002	1145	1950
• • •		3/12/2002	1400	5310
L16	Snake River below Lower Salmon Falls near Hagerman (13135000)	3/12/2002	1000	5310
		3/12/2002	1700	6740
L18	Snake River below Bliss Dam near Bliss (13153776)	3/12/2002	1215	6740
L20	Snake River at King Hill (13154500)	3/12/2002	1830	7310

Table A11. Acoustic Doppler discharge measurement data during March 11-12, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^σ / _μ)
L2	Snake River at Highway 77(25) near Rupert	3/11/2002	1000	594	0.07
L3	Snake River at Highway 27 at Burley	1			
L5	Snake River above Murtaugh Bridge at Murtaugh	3/11/2002	1600	697	0.03
L7	Snake River above Shoshone Falls near Kimberly	3/12/2002	0930	898	0.12
L8	Snake River below Perrine Bride at Twin Falls	3/12/2002	0945	939	0.03
L9	Snake River above Crystal Springs near Buhl	3/12/2002	1200	1270	0.06
L11	Snake River below Clear Lakes outlet near Buhl	3/12/2002	1255	2750	0.04
L12	Snake River above Banbury Springs near Hagerman	3/12/2002	1030	2670	0.04
L13	Snake River above Thousand Springs near Hagerman	3/12/2002	0940	3500	0.04
L14	Snake River below Thousand Springs near Hagerman	3/12/2002	0900	4700	0.01
L15	Snake River above Lower Salmon Falls Power Plant near Bliss				
		3/12/2002	1200	5170	0.01
L17	Snake River above Bliss Dam near Bliss	3/12/2002	1400	6630	0.04
L19	Snake River above Bancroft Springs near King Hill	3/12/2002	1515	6730	0.02

¹ No measurement made because of extremely high winds.

Table A12. Discharge data for all inspected inflow and outflow sites during March 11-12, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loca	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	L1 and L2			
F Drain near Declo	13082060	42 32 48	113 37 14	3/12/2002		2
D-3 Drain near Declo	13082032	42 36 49	113 36 10	3/12/2002		2
	Subreach betwee	n map numbers	L2 and L3			
D-5 Drain near Rupert	13082062	42 33 15	113 38 38	3/12/2002		2
D-4 Drain near Rupert	13082064	42 34 15	113 38 25	3/12/2002		3
Marsh Creek near Declo	13082320	42 31 26	113 40 02	3/12/2002		6
Spring Creek near Declo	13082330	42 31 01	113 41 03	3/12/2002		6
D-16 Drain near Heyburn	13084705	42 32 30	113 45 24	3/12/2002		0
	Subreach betwee	n map numbers	L3 and L4			
3 Drain near Heyburn	13084707	42 33 33	113 47 01	3/13/2002		1
D-17 Drain near Heyburn	13085060	42 32 53	113 50 51	3/13/2002		0
Main Drain North near Heyburn	13085065	42 33 02	113 51 59	3/13/2002		0
G Drain near Burley	13085070	42 31 56	113 53 12	3/13/2002		2
Drain near Burley	13085080	42 31 53	113 53 29	3/13/2002		0
A&B Irrigation Pump near Milner	13085500	42 32 01	113 56 51	3/13/2002	DM	0
PA Lateral Pump near Milner	13085800	42 32 02	113 58 19	3/13/2002	DM	0
Milner Irrigation Pump near Milner	13086000	42 31 10	114 00 38	3/13/2002	DM	0
Northside A Lateral near Milner	13086510	42 32 17	114 02 40	3/13/2002	DM	0
Jorthside Crosscut Canal near Milner	13086520	42 33 31	114 03 08	3/13/2002	DM	0
Ailner-Gooding Canal near Milner	13086530	42 33 39	114 02 59	3/13/2002	DM	0
Jorth Side Main Canal near Milner	13087000	42 31 46	114 01 10	3/13/2002	DM	0
Win Falls Main Canal near Milner	13087500	42 31 18	114 01 03	3/13/2002	DM	0
	Subreach betwee					
	Subreach betwee	n map numbers	L5 and L6			
Aiscellaneous agriculture return near Hansen	13089690	42 33 55	114 19 24	3/13/2002		0
Twin Falls Coulee near Hansen	13089695	42 34 11	114 20 32	3/13/2002		0
Devil's Washbowl Spring near Kimberly	13089600	42 35 18	114 20 45	3/14/2002	1545	³ 11.1
	Subreach betwee	n map numbers	L6 and L7			
Devil's Corral Springs near Kimberly	13090100	42 35 38	114 21 55	3/11/2002	1000	³ 35.9
	Subreach betwee	n map numbers	L7 and L8			
Fish Hatchery Waste O near Twin Falls	13090370	42 35 31	114 26 05	3/13/2002		0
Mary Alice Lake discharge near Twin Falls		42 35 46	114 26 51	3/12/2002		0
	Subreach betwee	n map numbers	L8 and L9			
Perrine Coulee near Twin Falls	13090460	42 35 53	114 28 20			3
Blue Lakes Outlet near Twin Falls	13091500	42 36 30	114 28 34	3/14/2002	1515	³ 183
Warm Creek near Twin Falls	13091700	42 37 15	114 29 55	3/14/2002		40
Rock Creek above Highway 30/93 at Twin						
Falls	13092747	42 33 47	114 29 42	3/13/2002	DM	43
erome Golf Course Drain 1	13091733	42 38 03	114 31 02	3/13/2002		0
Aiscellaneous agriculture return near Twin Falls		42 37 21	114 33 23	3/13/2002		0
Sonnickson Drain near Twin Falls	13093150	42 38 40	114 33 26	3/13/2002		0
Miscellaneous agriculture return near Twin Falls		42 38 23	114 33 32	3/13/2002		0
Miscellaneous agriculture return near Twin Falls		42 37 36	114 34 29	3/13/2002	0945	5
Sucker Flat Drain near Filer	13093190	42 38 25	114 35 30	3/13/2002	0900	5
Miscellaneous agriculture return near Filer		42 37 51	114 35 41	3/13/2002	1020	1
Miscellaneous agriculture return near Filer		42 38 54	114 36 58	3/13/2002		0

Table A12: Discharge data for all inspected inflow and outflow sites during March 11-12, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho--Continued

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge
	Subreach betweer	n map numbers	L9 and L10			
Miscellaneous agriculture return near Filer		42 39 17	114 38 16	3/13/2002	1310	1
Crystal Springs near Filer	13093400	42 39 36	114 38 32	3/13/2002	1200	³ 455
Cedar Draw near Filer	13093550	42 39 13	114 39 15	3/13/2002	1345	29
Miscellaneous agriculture return near Buhl		42 39 31	114 40 42	3/13/2002	1445	4
Waste I near Buhl	13093900	42 39 33	114 41 28	3/13/2002		0
	Subreach between	map numbers	L10 and L11			
Miscellaneous agriculture return near Buhl		42 40 03	114 43 10	3/13/2002		0
Miscellaneous agriculture return near Buhl		42 40 07	114 44 18	3/13/2002		0
18 Drain near Buhl		42 40 27	114 44 27	3/13/2002		0
Clear Lakes Outlet near Buhl	13094500	42 40 01	114 46 45	3/20/2002	1025	³ 468
	Subreach between	map numbers	L11 and L12			
Mud Creek near Buhl ⁴	13094700	42 39 33	114 47 20	3/13/2002	1120	22
Deep Creek near Buhl ⁴		42 39 29	114 48 38	3/12/2002	1710	0
Briggs Creek Spring near Buhl	13095200	42 40 20	114 49 00	3/15/2002	1110	³ 103
	Subreach between	map numbers	L12 and L13			
rrigation Ditch to Blind Canyon near Buhl	13095490	42 42 28	114 47 30	3/13/2002		
South Coulee (Cedar Draw) near Buhl	13095360	42 41 46	114 48 19	3/13/2002		
Box Canyon Springs near Wendell	13095500	42 42 29	114 48 35	3/12/2002	1240	³ 335
Blind Canyon Spring near Buhl	13095400	42 42 12	114 49 20	3/12/2002	1125	³ 11.4
Unnamed Spring near Buhl	13095350	42 41 51	114 49 21	3/13/2002	1225	³ 2.7
Salmon Falls Creek near Hagerman	13108150	42 41 47	114 51 15	3/13/2002	DM	116
_	Subreach between	map numbers	L13 and L14			
Sand Springs near Hagerman	13132600	42 43 36	114 50 00	3/12/2002	1140	³ 67.0
Drain near Bickel Springs near Hagerman	13133785	42 45 28	114 50 48	3/12/2002		
Bickel Spring near Hagerman	13132790	42 45 29	114 51 19	3/12/2002	1535	³ 15.8
	Subreach between	map numbers	L14 and L15			
Riley Creek near Hagerman	13133800	42 45 50	114 51 40	3/12/2002	1530	71
	Subreach between	map numbers	L15 and L16			
Billingsly Creek near Hagerman	13134600	42 46 44	114 51 22	3/11/2002	1415	23.1
	Subreach between	map numbers				
W Drain near Tuttle	13152895	42 51 50	114 51 58	3/12/2002		0
Birch Creek near Hagerman	13135100	42 51 10	114 53 30	3/11/2002	1220	10.5
Malad Power Flume near Bliss	13152940	42 51 54	114 53 11	3/11/2002	0825	1110
Malad River near Bliss	13153500	42 51 48	114 54 04	3/11/2002	1040	88.4
	Subreach between					
Fuana Gulch near Bliss		42 54 34	115 00 02	3/11/2002	1455	1
Irrigation Ditch near Bliss	13152450	42 55 56	115 00 12	3/11/2002	1220	0
	Subreach between					-
	Subreach between		L19 and L20			
Clover Creek near Bliss	13154000	43 01 30	115 00 20	3/20/2002	0945	100^{5}
	10101000	.0 01 00	110 00 20	5, 20, 2002	07 10	-00

¹Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Combined spring discharge and agriculture return flows; spring flow was subtraced from field measured value to obtain an approximate agriculture return flow value.

⁵ Apparent snowmelt runoff event; flow on March 12, 2002 may have been much greater than 100 ft³/s.

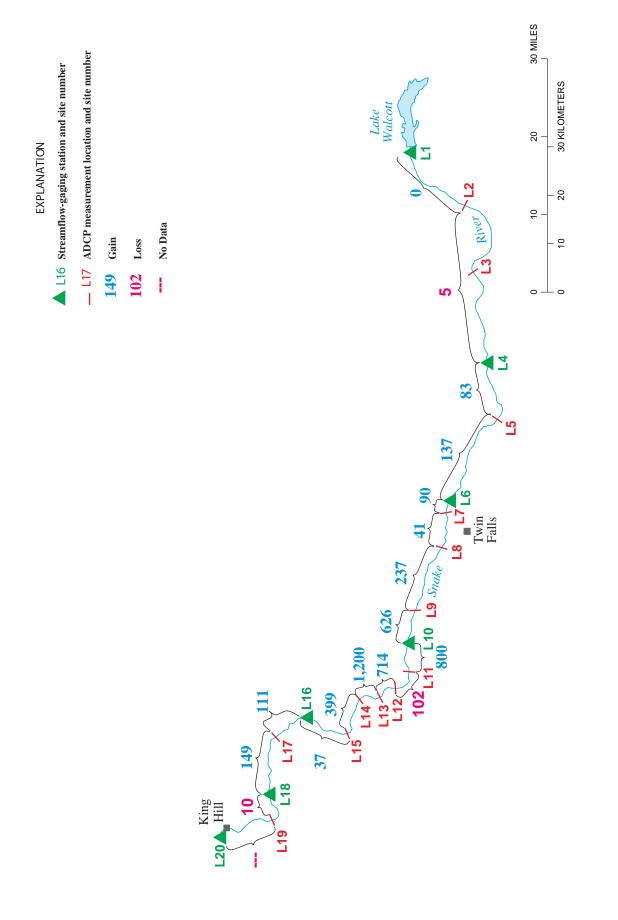


Figure A4. Streamflow gains and losses along the lower reach of the Snake River, Idaho, estimated during the March 11-12, 2002, seepage study.

Map	Mandania and and and and a	- D		Discharce			Total gains/ (losses)	Gains/ (losses) ner mile
(fig. #)		mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
L1	Snake River near Minidoka (13081500)	673.5		8650	7/25/2002	0200		~ ~
			total estimated inflow	24				
			total estimated outflow	0				
L2	Snake River at Highway 77(25) near Rupert	664.0		8320	7/25/2002	0630	(354)	(37)
			total estimated inflow	29				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
L3	Snake River at Highway 27 at Burley	651.6		8540	7/25/2002	0735	191	(0)
			total estimated inflow	35				
			total estimated outflow	8200				
			estimated outflow to storage in					
			Milner Lake ²	0				
V I	Cucks Diron of Milnon (12008000)	6207		238	7/25/2002	1345	54	2
5	CONDOCATION (TODOCOUCH)	1.000		247	7/24/2002	0815		
			total estimated inflow	0				
			total estimated outflow	0				
L5	Snake River above Murtaugh Bridge at Murtaugh	630.5		295	7/24/2002	1210	48	9
			total estimated inflow	1				
			total estimated outflow	0				
16	Snaka River near Kimherly (1300000)	6177		578	7/24/2002	1645	282	21
		7.110		581	7/24/2002	1130		
			total estimated inflow	0				
			total estimated outflow	0				
L7	Snake River above Shoshone Falls near Kimberly	615.2		725	7/24/2002	1228	144	72
			total estimated inflow	18				
			total estimated outflow	0				
L8	Snake River below Perrine Bridge at Twin Falls	611.0		732	7/24/2002	1504	(11)	(2)
			total estimated inflow	235				
				c				

Table A13. Calculations of gains and losses in specified subreaches of the Snake River during July 24-25, 2002, between Minidoka Dam and

							Total	Gains/
Map							gains/	(losses)
number (E _ 4)	Gaging station name (number) ¹ /	River		Discharge		Ē	(losses)	per mile
(#• 8 m)	Shore ADOF ADD Inteasurement incation Snake River above Crystal Springs near Buhl	601.1		(11 /s) 1310	7/2.4/2.002	1719	343	(III /S/IIII) 35
			total estimated inflow	89			2	3
			total estimated outflow	0				
0		0 202		2000	7/24/2002	1930	622	145
L1 0	Snake Kiver near Buni (13094000)	8.066		2040	7/25/2002	1315		
			total estimated inflow	9				
			total estimated outflow	0				
L11	Snake River below Clear Lakes outlet near Buhl	592.8		2430	7/25/2002	1509	384	96
			total estimated inflow	78				
			total estimated outflow	0				
L12	Snake River above Banbury Springs near Hagerman	589.2		2770	7/25/2002	1100	262	73
			total estimated inflow	83				
			total estimated outflow	0				
L13	Snake River above Thousand Springs near Hagerman	585.6		3720	7/25/2002	1014	867	241
			total estimated inflow	3				
			total estimated outflow	0				
L14	Snake River below Thousand Springs near Hagerman	582.9		4710	7/25/2002	0939	987	365
			total estimated inflow	50				
			total estimated outflow	0				
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	576.8		4760	7/25/2002	1300	0	0
			total estimated inflow	20				
			total estimated outflow	0				
			estimated outflow to storage					
			above Lower Salmon Falls					
			power plant ³	0				
1 16	Snake River below Lower Salmon Falls near Hagerman	5 025		4980	7/25/2002	1500	200	47
	(13135000)	0.110		5000	7/25/2002	0730		
			total estimated inflow	1177				
			total estimated outflow	0				
L17	Snake River above Bliss Dam near Bliss	564.9		6310	7/25/2002	1110	133	18
			5	10				

Table A13. Calculations of gains and losses in specified subreaches of the Snake River during July 24-25, 2002, between Minidoka Dam and

Map							Total gains/	Gains/ (losses)
mber	number Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
			total estimated outflow	0				
			estimated outflow to storage					
			above Bliss Dam ³	0				
1 10	Sucho Dirror holory Digo: Dom noon Digo: (13153776)	5501		6330	7/25/2002	1400	ς	0
10	(0//CCTCT) SSHELINGH INCHT INCHT DHSS (TTTTT) / (0)	1.600		6330	7/25/2002	1330		
			total estimated inflow	0				
			total estimated outflow	0				
L19	Snake River above Bancroft Springs near King Hill	553.2		6310	7/25/2002	1510	(20)	(3)
			total estimated inflow	13				
			total estimated outflow	0				
L20	Snake River at King Hill (13154500)	546.6		6780	7/25/2002	1630	457	69

Table A13. Calculations of gains and losses in specified subreaches of the Snake River during July 24-25, 2002, between Minidoka Dam and

 2 Estimated based on reservoir stage data (USGS station number 13087900). 3 Estimated based on reservoir stage data (Idaho Power Company).

Table A14. Gaging station discharge data during July 24-25, 2002, for the Snake River between
Minidok Dam and King Hill, Idaho

[Discharge	given	in cubic	feet	per	second]
[Disenarge	Siten	in cuoie	1000	per	seconaj

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
L1	Snake River near Minidoka (13081500)	7/25/2002	0200	8650
L4	Snake River at Milner (13088000)	7/25/2002 7/24/2002	1345 0815	238 247
L6	Snake River near Kimberly (13090000)	7/24/2002 7/24/2002	1645 1130	578 581
L10	Snake River near Buhl (13094000)	7/24/2002 7/25/2002	1930 1315	2000 2040
L16	Snake River below Lower Salmon Falls near Hagerman (13135000)	7/25/2002 7/25/2002	1500 0730	4980 5000
L18	Snake River below Bliss Dam near Bliss (13153776)	7/25/2002 7/25/2002	1400 1330	6330 6330
L20	Snake River at King Hill (13154500)	7/25/2002	1630	6780

Table A15. Acoustic Doppler discharge measurement data during July 24-25, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					CON (U)
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^o / _µ)
L2	Snake River at Highway 77(25) near Rupert	7/25/2002	0630	8320	0.01
L3	Snake River at Highway 27 at Burley	7/25/2002	0735	8540	0.03
L5	Snake River above Murtaugh Bridge at Murtaugh	7/24/2002	1210	295	0.09
L7	Snake River above Shoshone Falls near Kimberly	7/24/2002	1228	725	0.11
L8	Snake River below Perrine Bride at Twin Falls	7/24/2002	1504	732	0.04
L9	Snake River above Crystal Springs near Buhl	7/24/2002	1719	1310	0.06
L11	Snake River below Clear Lakes outlet near Buhl	7/25/2002	1509	2430	0.02
L12	Snake River above Banbury Springs near Hagerman	7/25/2002	1100	2770	0.07
L13	Snake River above Thousand Springs near Hagerman	7/25/2002	1014	3720	0.05
L14	Snake River below Thousand Springs near Hagerman	7/25/2002	0939	4710	0.02
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	7/25/2002	1300	4760	0.05
L17	Snake River above Bliss Dam near Bliss	7/25/2002	1110	6310	0.02
L19	Snake River above Bancroft Springs near King Hill	7/25/2002	1510	6310	0.02

Table A16. Discharge data for all inspected inflow and outflow sites during July 24-25, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	cation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge
	Subreach betwee					8
F Drain near Declo	13082060	42 32 48	113 37 14	7/25/2002		17.8
D-3 Drain near Declo	13082032	42 36 49	113 36 10	7/25/2002		6.5
	Subreach betwee	n map numbers	s L2 and L3			
D-5 Drain near Rupert	13082062	42 33 15	113 38 38	7/25/2002		5.3
D-4 Drain near Rupert	13082064	42 34 15	113 38 25	7/25/2002		7.5
Aarsh Creek near Declo ³	13082320	42 31 26	113 40 02	7/25/2002		10.0
pring Creek near Declo ³	13082330	42 31 01	113 41 03	7/25/2002		0
D-16 Drain near Heyburn	13084705	42 32 30	113 45 24	7/25/2002		6.5
-	Subreach betwee			112312002		0.5
Drain near Heyburn	13084707	42 33 33	113 47 01	7/25/2002		4.3
D-17 Drain near Heyburn	13085060	42 32 53	113 50 51	7/25/2002		4.5
Aain Drain North near Heyburn	13085065	42 32 33	113 51 59	7/25/2002		13.1
B Drain near Burley	13085005	42 33 02	113 51 59	7/25/2002		12.9
Drain near Burley	13085080	42 31 50	113 53 12 113 53 29	7/25/2002		.2
&B Irrigation Pump near Milner		42 31 33			 DM	.2
c	13085500		113 56 51	7/25/2002	DM	62
A Lateral Pump near Milner	13085800	42 32 02	113 58 19	7/25/2002	DM DM	
Ailner Irrigation Pump near Milner	13086000	42 31 10	114 00 38	7/25/2002	DM	237
forthside A Lateral near Milner	13086510	42 32 17	114 02 40	7/25/2002	DM	54
forthside Crosscut Canal near Milner	13086520	42 33 31	114 03 08	7/25/2002	DM	659
Iilner-Gooding Canal near Milner	13086530	42 33 39	114 02 59	7/25/2002	DM	1445
North Side Main Canal near Milner	13087000	42 31 46	114 01 10	7/25/2002	DM	2351
win Falls Main Canal near Milner	13087500	42 31 18	114 01 03	7/25/2002	DM	3215
	Subreach betwee	-				
	Subreach betwee	-				
Aiscellaneous agriculture return near Hansen	13089690	42 33 55	114 19 24	7/23/2002	1730	1
win Falls Coulee near Hansen	13089695	42 34 11	114 20 32	7/24/2002	1700	.2
evil's Washbowl Spring near Kimberly	13089600	42 35 18	114 20 45			
	Subreach betwee	-				
evil's Corral Springs near Kimberly	13090100	42 35 38	114 21 55			
	Subreach betwee	-	s L7 and L8			
ish Hatchery Waste O near Twin Falls	13090370	42 35 31	114 26 05	7/24/2002	0945	16.5
Iary Alice Lake discharge near Twin Falls		42 35 46	114 26 51	7/24/2002	1700	1
	Subreach betwee	-				
errine Coulee near Twin Falls	13090460	42 35 53	114 28 20	7/24/2002	1800	⁴ 3
Blue Lakes Outlet near Twin Falls	13091500	42 36 30	114 28 34			
Varm Creek near Twin Falls	13091700	42 37 15	114 29 55	7/25/2002		30
Rock Creek above Highway 30/93 at Twin						
alls	13092747	42 33 47	114 29 42	7/25/2002	DM	90
erome Golf Course Drain 1	13091733	42 38 03	114 31 02	7/25/2002	0800	4.8
Iiscellaneous agriculture return near Twin Falls		42 37 21	114 33 23	7/25/2002		15
onnickson Drain near Twin Falls	13093150	42 38 40	114 33 26	7/24/2002		35
liscellaneous agriculture return near Twin Falls		42 38 23	114 33 32			
Aiscellaneous agriculture return near Twin Falls		42 37 36	114 34 29	7/25/2002	1520	16.6
ucker Flat Drain near Filer	13093190	42 38 25	114 35 30	7/25/2002	0700	40
Aiscellaneous agriculture return near Filer		42 37 51	114 35 41			
Miscellaneous agriculture return near Filer		42 38 54	114 36 58	7/25/2002	1315	3

Table A16. Discharge data for all inspected inflow and outflow sites during July 24-25, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho--Continued

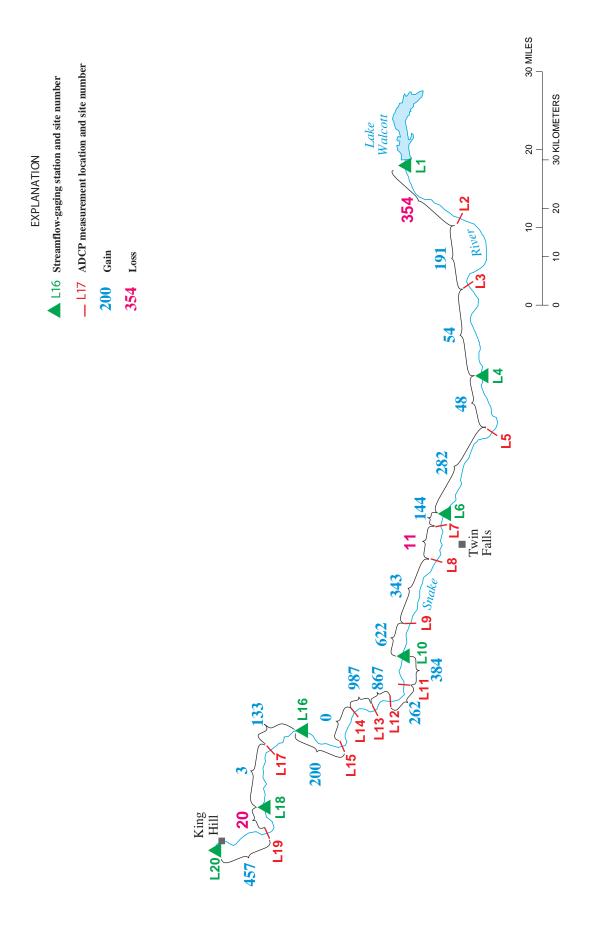
	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge
	Subreach between	n map numbers	L9 and L10			
Miscellaneous agriculture return near Filer		42 39 17	114 38 16	7/25/2002	1235	3
Crystal Springs near Filer	13093400	42 39 36	114 38 32			
Cedar Draw near Filer	13093550	42 39 13	114 39 15	7/24/2002	DM	56
Miscellaneous agriculture return near Buhl		42 39 31	114 40 42	7/25/2002	1005	2.6
Waste I near Buhl	13093900	42 39 33	114 41 28	7/25/2002	1300	6.7
	Subreach between	map numbers	L10 and L11			
Miscellaneous agriculture return near Buhl		42 40 03	114 43 10	7/24/2002	1625	1
Miscellaneous agriculture return near Buhl		42 40 07	114 44 18	7/24/2002	1550	5
18 Drain near Buhl		42 40 27	114 44 27			
Clear Lakes Outlet near Buhl	13094500	42 40 01	114 46 45			
	Subreach between	map numbers	L11 and L12			
Mud Creek near Buhl ³	13094700	42 39 33	114 47 20	7/25/2002	DM	21
Deep Creek near Buhl ³		42 39 29	114 48 38	7/25/2002	0825	57
Briggs Creek Spring near Buhl	13095200	42 40 20	114 49 00			
	Subreach between	map numbers	L12 and L13			
rrigation Ditch to Blind Canyon near Buhl	13095490	42 42 28	114 47 30	7/25/2002	DM	25.2
South Coulee (Cedar Draw) near Buhl	13095360	42 41 46	114 48 19	7/26/2002	0800	3.7
Box Canyon Springs near Wendell	13095500	42 42 29	114 48 35			
Blind Canyon Spring near Buhl	13095400	42 42 12	114 49 20			
Unnamed Spring near Buhl	13095350	42 41 51	114 49 21			
Salmon Falls Creek near Hagerman	13108150	42 41 47	114 51 15	7/25/2002	DM	54
-	Subreach between	map numbers	L13 and L14			
Sand Springs near Hagerman	13132600	42 43 36	114 50 00			
Drain near Bickel Springs near Hagerman	13133785	42 45 28	114 50 48	7/25/2002	1800	3.2
Bickel Spring near Hagerman	13132790	42 45 29	114 51 19			
	Subreach between	map numbers	L14 and L15			
Riley Creek near Hagerman	13133800	42 45 50	114 51 40	7/24/2002		50
	Subreach between	map numbers	L15 and L16			
Billingsly Creek near Hagerman	13134600	42 46 44	114 51 22	7/24/2002		20
	Subreach between	map numbers	L16 and L17			
W Drain near Tuttle	13152895	42 51 50	114 51 58	7/26/2002	1000	1.5
Birch Creek near Hagerman	13135100	42 51 10	114 53 30	7/23/2002	1120	7.2
Malad Power Flume near Bliss	13152940	42 51 54	114 53 11	7/25/2002	DM	1080
Malad River near Bliss	13153500	42 51 48	114 54 04	7/25/2002	DM	88
	Subreach between		L17 and L18			
Fuana Gulch near Bliss		42 54 34	115 00 02	7/22/2002	1430	1
rrigation Ditch near Bliss	13152450	42 55 56	115 00 19	7/25/2002	DM	17
~	Subreach between					
	Subreach between	map numbers				
Clover Creek near Bliss	13154000	43 01 30	115 00 20	7/22/2002	1225	13
	13134000	.5 51 50	110 00 20	.,, _000		15

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Combined spring discharge and agriculture return flows; spring flow was subtraced from field measured value to obtain an approximate agriculture return flow value.

⁴ Surface flows resulting from spring discharge; not used in gain/loss calculations.





							Total gains/	Gains/ (Josses)
Map number	Gaging station name (number) ¹ /	River		Discharge			gams/ (losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
L1	Snake River near Minidoka (13081500)	673.5		600	11/6/2002	1000		
			total estimated inflow	1				
			total estimated outflow	0				
L2	Snake River at Highway 77(25) near Rupert	664.0		512	11/6/2002	1436	(89)	(6)
			total estimated inflow	10				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
L3	Snake River at Highway 27 at Burley	651.6		465	11/6/2002	1621	(57)	(5)
			total estimated inflow	16				
			total estimated outflow	0				
			estimated outflow to storage in					
			Milner Lake ²	0				
V I	Cucho Diron of Milnon (12088000)	6207		446	11/6/2002	2230	(92)	(_)
5	DHAKE INVEL AL MITHEL (LJUGGUUU)	1.000		443	11/7/2002	0330		
			total estimated inflow	0				
			total estimated outflow	0				
L5	Snake River above Murtaugh Bridge at Murtaugh	630.5		479	11/7/2002	0731	36	4
			total estimated inflow	0				
			total estimated outflow	0				
91	Snoka Divar naar Kimharlav (1300000)	617.2		758	11/7/2002	1400	279	21
F	DHARE MYEL HEAL MULTIPELIES (12070000)	7./10		713	11/6/2002	1015		
			total estimated inflow	0				
			total estimated outflow	0				
L7	Snake River above Shoshone Falls near Kimberly	615.2		704	11/6/2002	1121	(6)	(5)
			total estimated inflow	16				
			total estimated outflow	0				
L8	Snake River below Perrine Bridge at Twin Falls	611.0		864	11/7/2002	1419	144	34
			total estimated inflow	154				
			total actimated autflour	0				

Table A17. Calculations of gains and losses in specified subreaches of the Snake River during November 6-8,2002, between Minidoka Dam and

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ionmile(t^3)ar Buhl601.11160ar Buhl601.1100ar Buhl601.110011001001596.8101al estimated inflow19301595.8101al estimated inflow20401592.8101al estimated inflow26101592.8101al estimated inflow7811101261011101261011101al estimated inflow7811101al estimated inflow7811101al estimated inflow7811101al estimated inflow1011101al estimated inflow7011101al estimated inflow7811101al estimated inflow7011101al estimated inflow70111101al estimated inflow7011111111	Map number Gagi	Gaging station name (number) ¹ /	River		Discharge			Total gains/ (losses)	Gains/ (losses) per mile
Snake River above Crystal Springs near Buhl 601.1 100 100 Snake River near Buhl (1309400) 59.8 1001 estimated inflow 200 Snake River below Clear Lakes outlet near Buhl 59.8 10014 estimated outflow 200 Snake River below Clear Lakes outlet near Buhl 59.2 10014 estimated outflow 200 Snake River below Clear Lakes outlet near Buhl 59.2 10014 estimated outflow 200 Snake River below Clear Lakes outlet near Buhl 58.5 10014 estimated outflow 2600 Snake River above Bunbury Springs near Hagerman 58.5 10014 estimated outflow 2600 Snake River above Thousand Springs near Hagerman 58.5 10014 estimated outflow 2600 Snake River above Unousand Springs near Hagerman 58.5 10014 estimated outflow 2600 Snake River above Lower Salmon Falls Power Plant near Blis 576.8 10014 estimated outflow 2920 Snake River above Lower Salmon Falls Power Plant near Blis 576.8 10014 estimated inflow 2920 Snake River below Lower Salmon Falls Power Plant near Blis 576.8 10014 estimated inflow 2920 Snake River below Lower Salmon Falls Near Hagerman 572.8 10014 estimated inflow 2920 Snake River below Lower Salmon Falls Near Hagerman 572.8 10014 estimated inflow 2920 Snake River above Bliss Dan near Bliss 576.8 10014 estimated inflow 2920 Snake River above Bliss Dan near Bliss 572.5 10014 estimated inflow 2920 <th></th> <th>PADP measurement location</th> <th>mile</th> <th></th> <th>(ft³/s)</th> <th>Date</th> <th>Time</th> <th>(ft³/s)</th> <th>(ft³/s/mi)</th>		PADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
Snake River near Buhl (130)400() 50.8 1001 estimated outflow 61 Snake River Buhl (130)400() 50.8 1001 estimated outflow 230 Snake River below Clear Lakes outlet near Buhl 59.2 1001 estimated inflow 2610 Snake River above Banbury Springs near Hagerman 582.2 1001 estimated outflow 2610 Snake River above Banbury Springs near Hagerman 582.2 1001 estimated outflow 2600 Snake River above Thousand Springs near Hagerman 582.5 1001 estimated outflow 2700 Snake River above Thousand Springs near Hagerman 582.5 1001 estimated outflow 2700 Snake River above Lower Thousand Springs near Hagerman 582.5 1001 estimated outflow 2700 Snake River above Lower Salmon Falls Power Plant near Blus 576.5 1001 estimated outflow 2700 Snake River above Lower Salmon Falls Power Plant near Blus 576.5 1001 estimated outflow 2000 Snake River above Lower Salmon Falls Near Hagerman 572.5 1001 estimated outflow 2000 Snake River above Blus Near Hagerman 572.5 1001 estimated outflow 2000 Snake River above Blus Dan near Blus 572.5 1001 estimated outflow 2000 Snake River above Blus Dan near Blus 572.5 1001 estimated outflow 2000 Snake River above Blus Dan near Blus 572.5 1001 estimated outflow 20000 Snake River above Blus Dan near Blus 572.5 1001 estimated outflow 2000000 Snake River above Blus Da		e River above Crystal Springs near Buhl	601.1		1160	11/6/2002	1432	142	14
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total estimated outflow 0 estimated outflow 10 storage above Lower Salmon Falls above Lower Salmon Falls 230 power plant ³ 230 (13135000) 572.5 power plant ³ 230 5020 total estimated inflow 1122 total estimated outflow 1122 total estimated outflow 1122 total estimated outflow 1122 total estimated outflow 1122 total estimated inflow 1122 total estinated inflow 1122 total estimated inflow 11				total estimated inflow	30				
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total estimated inflow total estimated outflow Snake River above Bliss Dam near Bliss 564.9 total estimated inflow			572.5		5020	11/7/2002	1700	062	2
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Snake River above Bliss Dam near Bliss 564.9 total estimated inflow				total estimated outflow	0				
total estimated inflow 1		e River above Bliss Dam near Bliss	564.9		4		1	1	1
				total estimated inflow	1				

Map							Total gains/	Gains/ (losses)
umber Gaging st	number Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #) ADCP/AD	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
			total estimated outflow	0				
			estimated outflow to storage					
			above Bliss Dam ³	400				
I 10 Cucho Divo	Suolso Diron holow Dice Dom 1000 Dice (12152776)	550.1		6120	11/7/2002	0030	377	28
	DERIVE DUSS DAILY REAL DUSS (LOLOS) / (U)	1.600		6480	11/8/2002	1500		
			total estimated inflow	0				
			total estimated outflow	0				
L19 Snake River	Snake River above Bancroft Springs near King Hill	553.2		5	I	I	1	1
			total estimated inflow	5				
			total estimated outflow	0				
L20 Snake Rive	Snake River at King Hill (13154500)	546.6		6290	11/8/2002	2115	(195)	(16)

Table A17. Calculations of gains and losses in specified subreaches of the Snake River during November 6-8,2002, between Minidoka Dam and

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 3 Estimated based on reservoir stage data (Idaho Power Company).

 4 Measurement was made but not used in the calculations (see table X).

⁵ Unable to measure because of river or weather conditions.

Table A18. Gaging station discharge data during November 6-8, 2002, for the Snake River between
Minidoka Dam and King Hill, Idaho
[Discharge given in cubic feet per second]

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
L1	Snake River near Minidoka (13081500)	11/6/2002	1000	600
L4	Snake River at Milner (13088000)	11/6/2002 11/7/2002	2230 0330	446 443
L6	Snake River near Kimberly (13090000)	11/7/2002 11/6/2002	1400 1015	758 713
L10	Snake River near Buhl (13094000)	11/6/2002 11/7/2002	1645 0915	1930 2040
L16	Snake River below Lower Salmon Falls near Hagerman (13135000)	11/7/2002 11/6/2002	1600 1700	5140 5020
L18	Snake River below Bliss Dam near Bliss (13153776)	11/7/2002 11/8/2002	0030 1500	6120 6480
L20	Snake River at King Hill (13154500)	11/8/2002	2115	6290

Table A19. Acoustic Doppler discharge measurement data during November 6-8, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; \sigma, standard deviation; \mu, mean; ---, no data]$

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV ([°] / _µ)
L2	Snake River at Highway 77(25) near Rupert	11/6/2002	1436	512	0.04
L3	Snake River at Highway 27 at Burley	11/6/2002	1621	465	0.27
L5	Snake River above Murtaugh Bridge at Murtaugh	11/7/2002	0731	479	0.05
L7	Snake River above Shoshone Falls near Kimberly	11/6/2002	1121	704	0.10
L8	Snake River below Perrine Bride at Twin Falls	11/7/2002	1419	864	0.08
L9	Snake River above Crystal Springs near Buhl	11/6/2002	1432	1160	0.04
L11	Snake River below Clear Lakes outlet near Buhl	11/7/2002	1112	2610	0.10
L12	Snake River above Banbury Springs near Hagerman	11/7/2002	1058	2600	0.12
L13	Snake River above Thousand Springs near Hagerman	11/7/2002	1141	3770	0.02
L14	Snake River below Thousand Springs near Hagerman	11/7/2002	1212	4920	0.01
L15	Snake River above Lower Salmon Falls Power Plant near Bliss	11/7/2002	1343	5110	0.05
L17	Snake River above Bliss Dam near Bliss	11/8/2002	1211	6680	0.02
L19	Snake River above Bancroft Springs near King Hill	1			

¹ Unable to access measurement site because of unsafe water conditions.

Table A20. Discharge data for all inspected inflow sites during November 4-8, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	cation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	s L1 and L2			
F Drain near Declo	13082060	42 32 48	113 37 14	11/6/2002		0
D-3 Drain near Declo	13082032	42 36 49	113 36 10	11/4/2002	1600	1.3
	Subreach betwee	n map numbers	s L2 and L3			
D-5 Drain near Rupert	13082062	42 33 15	113 38 38	11/5/2002	1400	1
D-4 Drain near Rupert	13082064	42 34 15	113 38 25	11/4/2002	DM	3
Marsh Creek near Declo	13082320	42 31 26	113 40 02	11/5/2002	DM	³ 10.2
Spring Creek near Declo	13082330	42 31 01	113 41 03	11/5/2002	DM	³ 6.4
D-16 Drain near Heyburn	13084705	42 32 30	113 45 24	11/4/2002	DM	5.7
	Subreach betwee	n map numbers	s L3 and L4			
3 Drain near Heyburn	13084707	42 33 33	113 47 01	11/6/2002		0
D-17 Drain near Heyburn	13085060	42 32 53	113 50 51	11/5/2002	DM	1.3
Main Drain North near Heyburn	13085065	42 33 02	113 51 59	11/5/2002	DM	14.6
G Drain near Burley	13085070	42 31 56	113 53 12	11/6/2002		0
Drain near Burley	13085080	42 31 53	113 53 29	11/6/2002		0
&B Irrigation Pump near Milner	13085500	42 32 01	113 56 51	11/6/2002	DM	0
PA Lateral Pump near Milner	13085800	42 32 02	113 58 19	11/6/2002	DM	0
Ailner Irrigation Pump near Milner	13086000	42 31 10	114 00 38	11/6/2002	DM	0
Northside A Lateral near Milner	13086510	42 32 17	114 02 40	11/6/2002	DM	0
Jorthside Crosscut Canal near Milner	13086520	42 33 31	114 03 08	11/6/2002	DM	0
Ailner-Gooding Canal near Milner	13086530	42 33 39	114 02 59	11/6/2002	DM	0
Jorth Side Main Canal near Milner	13087000	42 33 37	114 01 10	11/6/2002	DM	0
Swin Falls Main Canal near Milner	13087500	42 31 40	114 01 03	11/6/2002	DM	0
	Subreach betwee			11/0/2002	DM	0
	Subreach betwee	n man numbers	L5 and L6			
Aiscellaneous agriculture return near Hansen	13089690	42 33 55	114 19 24	11/6/2002		0
Twin Falls Coulee near Hansen	13089695	42 34 11	114 20 32	11/6/2002		0
Devil's Washbowl Spring near Kimberly	13089600	42 35 18	114 20 32			3
	Subreach betwee					
Devil's Corral Springs near Kimberly	13090100	42 35 38	114 21 55			3
	Subreach betwee					
Fish Hatchery Waste O near Twin Falls	13090370	42 35 31	114 26 05	11/8/2002	1510	15
Mary Alice Lake discharge near Twin Falls	13090370	42 35 31	114 20 05 114 26 51	11/8/2002	1430	15
	 Subreach betwee			11/8/2002	1450	1
Perrine Coulee near Twin Falls		-		11/6/2002	1100	³ 1.8
Blue Lakes Outlet near Twin Falls	13090460	42 35 53	114 28 20	11/6/2002		3
Warm Creek near Twin Falls	13091500	42 36 30	114 28 34			
Rock Creek above Highway 30/93 at Twin	13091700	42 37 15	114 29 55	11/8/2002	1300	25
Falls	13092747	42 33 47	114 29 42	11/7/2002	DM	70
erome Golf Course Drain 1	13091733	42 33 47	114 20 42	11/8/2002	1345	0
Aiscellaneous agriculture return near Twin Falls		42 38 03	114 31 02 114 33 23	11/8/2002	1220	0
Sonnickson Drain near Twin Falls	13093150	42 37 21 42 38 40	114 33 25 114 33 26	11/8/2002		0
Miscellaneous agriculture return near Twin Falls					1225	
-		42 38 23	114 33 32	11/8/2002	1335	0
Miscellaneous agriculture return near Twin Falls Sucker Flat Drain near Filer		42 37 36	114 34 29	11/8/2002	1225	13.0
	13093190	42 38 25	114 35 30	11/6/2002	1430	31
Miscellaneous agriculture return near Filer		42 37 51	114 35 41	11/8/2002	1210	10
Miscellaneous agriculture return near Filer		42 38 54	114 36 58	11/8/2002	1145	5.0

Table A20: Discharge data for all inspected inflow sites during November 4-8, 2002, for the Snake River between Minidoka Dam and King Hill, Idaho--Continued

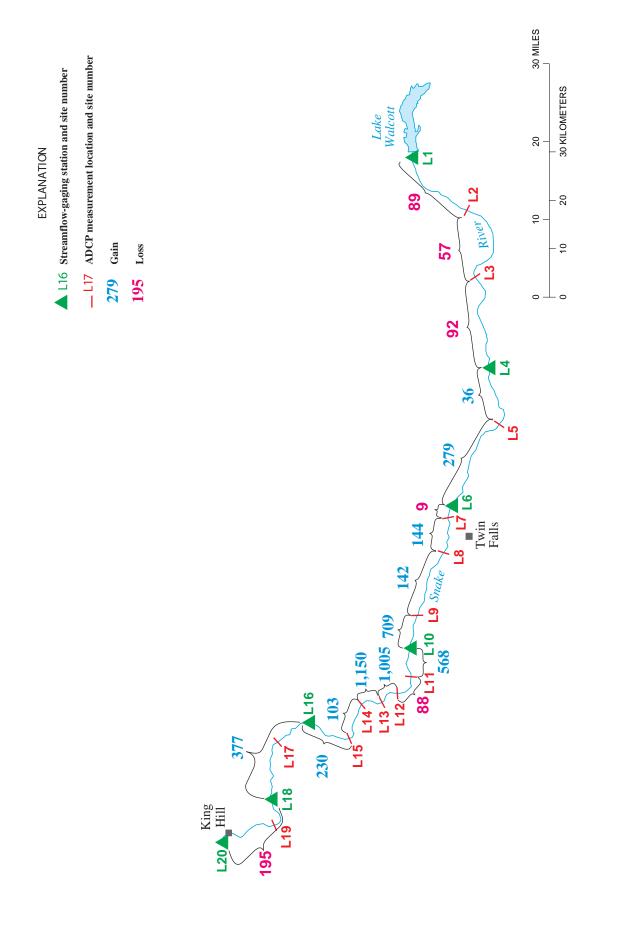
	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach between	map numbers	L9 and L10			
Miscellaneous agriculture return near Filer		42 39 17	114 38 16	11/8/2002	120	2
Crystal Springs near Filer	13093400	42 39 36	114 38 32			3
Cedar Draw near Filer	13093550	42 39 13	114 39 15	11/8/2002	1030	44
Miscellaneous agriculture return near Buhl		42 39 31	114 40 42	11/8/2002	950	1
Waste I near Buhl	13093900	42 39 33	114 41 28	11/8/2002	908	14.3
	Subreach between	map numbers l	L10 and L11			
Miscellaneous agriculture return near Buhl		42 40 03	114 43 10	11/8/2002	850	0.5
Miscellaneous agriculture return near Buhl		42 40 07	114 44 18	11/8/2002	840	2
J8 Drain near Buhl		42 40 27	114 44 27	11/8/2002	840	0
Clear Lakes Outlet near Buhl	13094500	42 40 01	114 46 45			3
	Subreach between	map numbers l	L11 and L12			
Mud Creek near Buhl ⁴	13094700	42 39 33	114 47 20	11/5/2002	1500	58
Deep Creek near Buhl ⁴		42 39 29	114 48 38	11/5/2002	1300	20
Briggs Creek Spring near Buhl	13095200	42 40 20	114 49 00			3
	Subreach between	map numbers l	L12 and L13			
Irrigation Ditch to Blind Canyon near Buhl	13095490	42 42 28	114 47 30	11/7/2002		0
South Coulee (Cedar Draw) near Buhl	13095360	42 41 46	114 48 19	11/7/2002	830	3.5
Box Canyon Springs near Wendell	13095500	42 42 29	114 48 35			3
Blind Canyon Spring near Buhl	13095400	42 42 12	114 49 20			3
Unnamed Spring near Buhl	13095350	42 41 51	114 49 21			3
Salmon Falls Creek near Hagerman	13108150	42 41 47	114 51 15	11/5/2002	1145	162
	Subreach between	map numbers l	L13 and L14			
Sand Springs near Hagerman	13132600	42 43 36	114 50 00			3
Drain near Bickel Springs near Hagerman	13133785	42 45 28	114 50 48	11/7/2002		0
Bickel Spring near Hagerman	13132790	42 45 29	114 51 19			3
	Subreach between	map numbers l	L14 and L15			
Riley Creek near Hagerman	13133800	42 45 50	114 51 40	11/5/2002	1010	87
	Subreach between	map numbers l	L15 and L16			
Billingsly Creek near Hagerman	13134600	42 46 44	114 51 22	11/4/2002	1600	29.9
	Subreach between	map numbers l	L16 and L17			
W Drain near Tuttle	13152895	42 51 50	114 51 58	11/8/2002		0
Birch Creek near Hagerman	13135100	42 51 10	114 53 30	11/4/2002	1423	11.9
Malad Power Flume near Bliss	13152940	42 51 54	114 53 11	11/4/2002	1352	1000
Malad River near Bliss	13153500	42 51 48	114 54 04	11/4/2002	1335	110
	Subreach between	map numbers l	L17 and L18			
Tuana Gulch near Bliss		42 54 34	115 00 02	11/4/2002	1230	1
Irrigation Ditch near Bliss	13152450	42 55 56	115 00 19	11/8/2002		0
	Subreach between	map numbers]	L18 and L19			
	Subreach between	map numbers]	L19 and L20			
Clover Creek near Bliss	13154000	43 01 30	115 00 20	11/4/2002	1100	5

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Combined spring discharge and agriculture return flows; spring flow was subtraced from field measured value to obtain an approximate agriculture return flow value.





Spring 2001

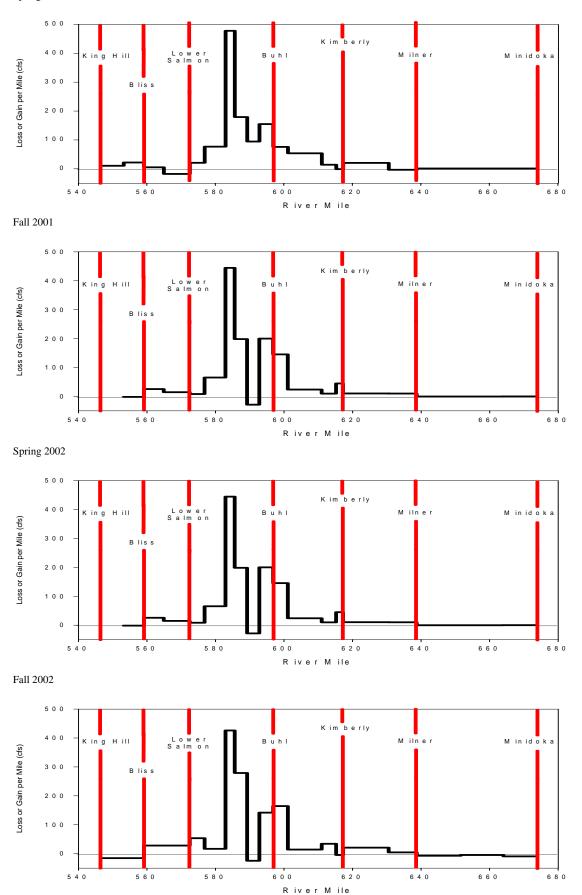


Figure A7. Summary plots of estimated gains and losses in specified subreaches of the Snake River between Minidoka Dam and King Hill, Idaho





APPENDIX B

Gain and loss calculations and relevant data for the Snake River between Shelley and Minidoka Dam, Idaho

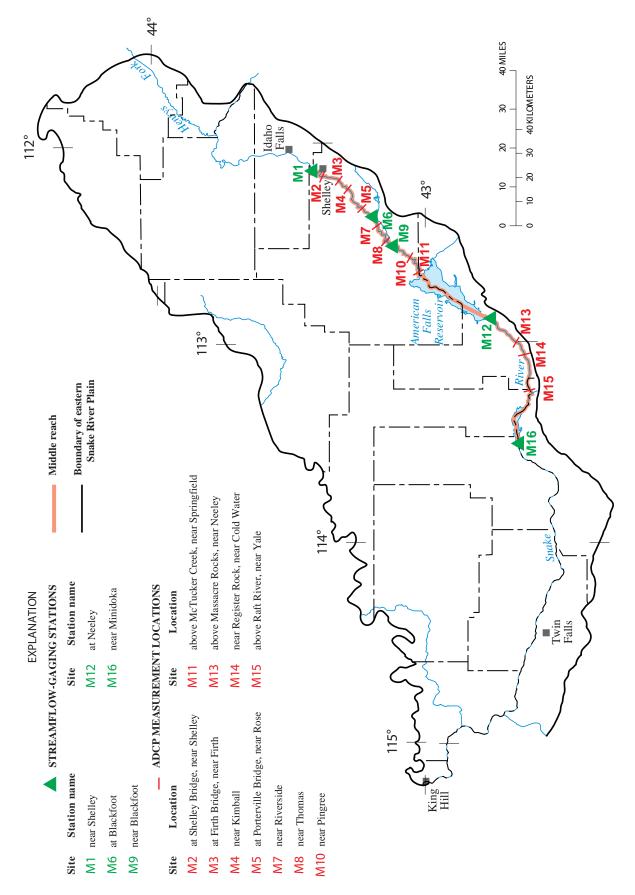


Figure B1. Locations of sites along the middle reach of the Snake River, Idaho, where streamflow was measured.

							Total	Gains/
Map	Gasins station name (number) ¹ /	River		Discharge			gains/ (losses)	(losses) per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ftt ³ /s)	(ft ³ /s/mi)
M1	Snake River near Shelley (13060000)	787.8		2940	4/3/2001	1030		
			total estimated inflow	0				
			total estimated outflow	0				
M2	Snake River at Shelley Bridge near Shelley	782.3		2790	4/3/2001	1320	(150)	(27)
			total estimated inflow	0				
			total estimated outflow	0				
M3	Snake River at Firth	777.3		2690	4/3/2001	1415	(100)	(20)
			total estimated inflow	0				
			total estimated outflow	0				
M4	Snake River at Kennedy Road near Firth	773.1		2620	4/3/2001	1520	(02)	(17)
			total estimated inflow	0				
			total estimated outflow	0				
M5	Snake River at Porterville Bridge near Blackfoot	767.5		2460	4/3/2001	1615	(160)	(29)
			total estimated inflow	0				
			total estimated outflow	0				
MG	Cucka Dirow of Blockfood (13063500)	76.4.2		2470	4/3/2001	1745	10	3
OTAT	DHAVE INVEL AL DIALWIDDL (LOUGZOU)	C:+O/		2490	4/4/2001	1245		
			total estimated inflow	0				
			total estimated outflow	0				
М7	Snake River near Riverside	760.2		2210	4/4/2001	1445	(280)	(68)
			total estimated inflow	0				
			total estimated outflow	0				
M8	Snake River near Thomas	753.5		2050	4/4/2001	1555	(160)	(24)
			total estimated inflow	109				
			total estimated outflow	0				
VIO		1 022		2290	4/4/2001	1745	131	39
6M	Shake Kiver near blackloot (12002500)	1.00/		2190	4/4/2001	0845		
			total estimated inflow	0				
			total estimated outflow	C				

;							Total	Gains/
Map number (fig. #)	Gaging station name (number) ¹ / ADCP/ADP measurement location	River mile		Discharge (ft ³ /s)	Date	Time	gains/ (losses) (ft ³ /s)	(10SSES) per mile (ft ³ /s/mi)
M10	Snake River near Pingree	743.3		2520	4/4/2001	1210	330	49
			total estimated inflow	0				
			total estimated outflow	0				
M11	Snake River above McTucker Creek near Pingree	738.0		2820	4/4/2001	1005	300	57
			total estimated inflow	588				
			total estimated outflow	0				
			estimated outflow to storage					
			above American Falls Dam ²	800				
M12	Snake River at Neeley (13077000)	714.1		3920 3920	4/5/2001 4/5/2001	0600 0600	1,312	55
			total estimated inflow	6				
			total estimated outflow	0				
M13	Snake River above Massacre Rocks near Neeley	707.7		3	I	1	1	1
			total estimated inflow	37				
			total estimated outflow	0				
M14	Snake River at Register Rock near Cold Water	702.5		3	1	1		1
			total estimated inflow	34				
			total estimated outflow	0				
M15	Snake River above Raft River near Yale	694		3	I	1	1	1
			total estimated inflow	0				
			total estimated outflow	0				
			estimated outflow to storage					
			above Minidoka Dam ²	1150				
M16	Snake River near Minidoka (13081500)	673.5		2730	4/6/2001	0145	(121)	(3)

Table B2. Gaging station discharge data during April 3-6, 2001, for the Snake River between Shelley and
Minidoka Dam, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
M1	Snake River near Shelley (13060000)	4/3/2001	1030	2940
M6	Snake River at Blackfoot (13062500)	4/3/2001 4/4/2001	1745 1245	2470 2490
M9	Snake River near Blackfoot (13069500)	4/4/2001 4/4/2001	1745 0845	2290 2190
M12	Snake River at Neeley (13077000)	4/5/2001 4/5/2001	0600 0600	3920 3920
M16	Snake River near Minidoka (13081500)	4/6/2001	0145	2730

[Discharge given in cubic feet per second]

Table B3. Acoustic Doppler discharge measurement data during April 3-6, 2001, for the Snake River between Shelley and Minidoka Dam, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV ([•] / _µ)
M2	Snake River at Shelley Bridge near Shelley	4/3/2001	1320	2790	0.03
M3	Snake River at Firth	4/3/2001	1415	2690	0.01
M4	Snake River at Kennedy Road near Firth	4/3/2001	1520	2620	0.01
M5	Snake River at Porterville Bridge near Blackfoot	4/3/2001	1615	2460	0.01
M7	Snake River near Riverside	4/4/2001	1445	2210	0.04
M8	Snake River near Thomas	4/4/2001	1555	2050	0.02
M10	Snake River near Pingree	4/4/2001	1210	2520	0.04
M11	Snake River above McTucker Creek near Pingree	4/4/2001	1005	2820	0.02
M13	Snake River above Massacre Rocks near Neeley	4/3/2001	1235	¹ 4000	0.02
M14	Snake River at Register Rock near Cold Water	4/3/2001	1155	¹ 3020	0.02
M15	Snake River above Raft River near Yale	4/3/2001	1005	¹ 4860	0.01

¹ Measurements made during unsteady flow conditions.

Table B4. Discharge data for all inspected inflow and outflow sites during April 3-4, 2001, for the Snake River between Shelley and Minidoka Dam, Idaho

in cubic feet per second, map numbers snown in fi	Station	Loca	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
		map numbers M	_			
Miscellaneous agriculture return near Woodville		43 24 38	112 09 19	4/3/2001		0
Miscellaneous agriculture return near Woodville		43 24 57	112 08 48	4/3/2001		0
Shull Lateral near Shelley		43 24 26	112 08 00	4/3/2001		0
Reservation Canal near Shelley	13060500	43 22 24	112 09 13	4/3/2001	DM	0
Miscellaneous agriculture return near Shelley		43 22 42	112 10 11	4/3/2001		0
Su	breach between	n map numbers M	A2 and M3			
Miscellaneous agriculture return near Shelley		43 22 26	112 10 11	4/3/2001		
Blackfoot Canal near Shelley	13061430	43 21 18	112 09 53	4/3/2001	DM	0
Su	breach between	n map numbers M	A3 and M4			
New Lavaside Canal near Firth	13061520	43 18 30	112 12 09	4/3/2001	DM	0
Peoples Canal near Firth	13061525	44 18 31	113 12 10	4/3/2001	DM	0
Aberdeen Springfield Canal near Firth	13061610	43 17 37	112 13 13	4/3/2001	DM	0
Su	breach between	n map numbers M	A4 and M5			
Aberdeen Springfield Waste near Kimball		43 16 49	112 15 16	4/3/2001		0
Corbett Slough Canal near Kimball	13061650	43 15 40	112 15 30	4/3/2001	DM	0
Neilson-Hanson Canal near Kimball	13061670	43 15 29	112 17 07	4/3/2001	DM	0
Miscellaneous agriculture return near Wapello		43 14 47	112 17 58	4/3/2001		0
Riverside Canal near Rose	13061705	43 15 47	112 18 07	4/3/2001	DM	0
Lavaside and Riverside return near Rose		43 14 05	112 19 31	4/3/2001		0
Su	breach between	n map numbers N	A5 and M6			
Miscellaneous agriculture return near Blackfoot		43 13 36	112 19 50	4/3/2001		0
Danskin Canal near Blackfoot	13061995	43 13 28	112 20 12	4/3/2001	DM	0
Miscellaneous agriculture return near Blackfoot		43 13 12	112 20 31	4/3/2001		0
Miscellaneous agriculture return at Blackfoot		43 12 12	112 22 12	4/3/2001		0
Su	breach between	n map numbers M	A6 and M7			
Trego Canal near Blackfoot	13062050	43 12 05	112 22 00	4/3/2001	DM	0
Wearyrick Canal near Blackfoot	13062503	43 11 51	112 22 36	4/3/2001	DM	0
Watson Slough near Blackfoot	13062506	43 11 46	112 23 44	4/3/2001	DM	0
Parsons Ditch near Blackfoot	13062507	43 11 36	112 23 45	4/3/2001	DM	0
Su	breach between	n map numbers M	47 and M8			
Riverton Ditch near Thomas		43 09 00	112 27 04	4/3/2001		0
Crawford Ditch near Thomas		43 10 04	112 27 44	4/3/2001		0
Watson Slough return near Thomas		43 09 39	112 29 13	4/3/2001		0
Su	breach between	n map numbers M	A8 and M9			
Blackfoot River near Blackfoot	13068500	43 07 50	112 28 35	4/4/2001	DM	109
Miscellaneous agriculture return near Thomas		43 08 04	112 30 54	4/3/2001		0
Su	breach between	map numbers N	19 and M10			
Mud Slough near Fort Hall		43 05 40	112 31 04	4/3/2001		3
Diggie Creek near Fort Hall		43 05 43	112 31 07	4/3/2001		³ 149
Jeff Cabin Creek near Fort Hall		43 04 05	112 33 00	4/3/2001		³ 0
Sub	reach between	map numbers M	10 and M11			
	reach between	map numbers M				2
Ross Fork near Fort Hall		42 00 21	111 29 47	4/4/2001		³ 10
Clear Creek near Fort Hall		43 02 23	112 32 33			3
Spring Creek near Fort Hall	13075983	43 02 36	112 33 15	4/4/2001	DM	³ 332
McTucker Creek Springfield		43 02 05	112 38 36	4/3/2001		³ 20
Portneuf River near Tyhee	13075910	42 56 42	112 32 38	4/4/2001	DM	536

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
Danielson Creek near Springfield		43 03 32	112 41 27	4/4/2001		³ 45
Sterling Waste near Sterling	13069548	43 01 49	112 43 40			
Unnamed Spring #1 near Sterling		43 03 37	112 43 19			
Crystal Springs near Sterling		43 02 52	112 40 53			
Unnamed Spring #2 near Sterling		42 59 39	112 45 37			
Unnamed Spring #3 near Sterling		43 02 39	112 39 09			
Bannock Creek near Michaud		42 53 12	112 38 35	4/4/2001		49
Aberdeen Waste Drain near Aberdeen	13069565	42 55 27	112 43 39	4/4/2001		1
Tarter Waster near American Falls	13076210	42 52 40	112 51 23	4/4/2001		0
Seagull Bay near American Falls		42 49 24	112 47 45	4/4/2001		0
Sunbeam near American Falls		42 47 55	112 50 53	4/4/2001		2
Spring Hallow near American Falls		42 48 39	112 53 30	4/4/2001		³ 0
Falls Irrigation Pump near American Falls	13076400	42 46 46	112 52 22	4/4/2001	DM	0
	Subreach between	map numbers M	112 and M13			
Ferry Hallow near Neeley		42 45 43	112 52 57	4/4/2001		0
Warm Creek near Neeley		42 44 01	112 54 25	4/4/2001	1105	7.0
Little Creek near Neeley		42 42 47	112 55 53	4/4/2001	1140	1.9
	Subreach between	map numbers M	113 and M14			
Rock Creek near Rockland	13077650	42 39 10	113 01 00	4/4/2001	1315	37.4
Dry Hallow Creek near Rockland		42 38 40	113 01 57	4/4/2001		0
	Subreach between	map numbers M	114 and M15			
Little Warm Creek near Cold Water		43 38 07	113 03 43	4/4/2001	1420	5.3
Fall Creek near Cold Water		43 37 36	113 05 05	4/4/2001	1515	28.9
Lanes Gulch near Cold Water		42 37 10	113 07 11	4/4/2001		0
	Subreach between	map numbers M	115 and M16			
Raft River near Yale		42 35 50	113 14 19	4/4/2001		0
Minidoka Northside Canal near Minidoka	13080000	42 40 15	113 29 00	4/4/2001	DM	105
Minidoka Southside Canal near Minidoka	13080500	42 39 45	113 29 20	4/4/2001	DM	0

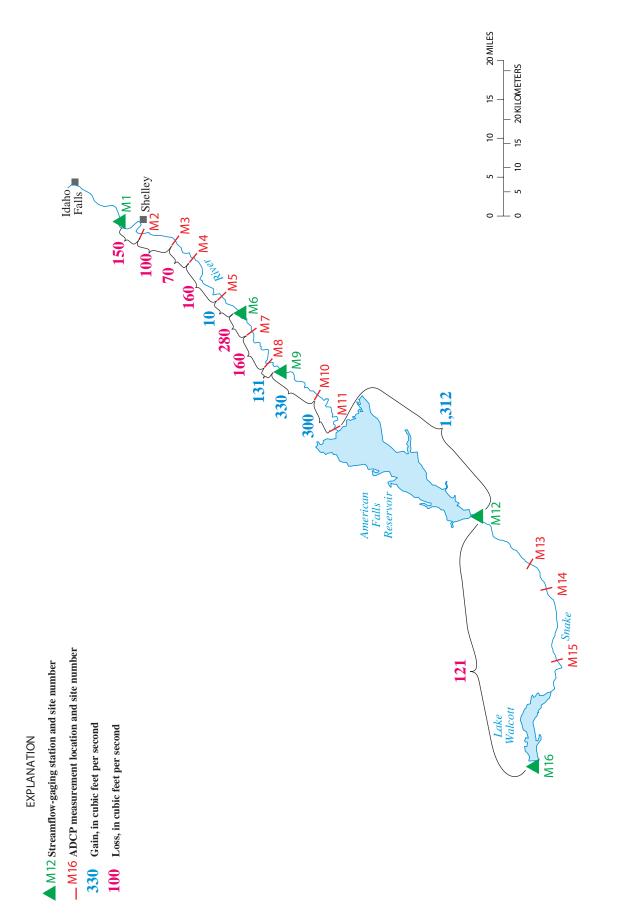
Table B4. Discharge data for all inspected inflow and outflow sites during April 3-4, 2001, for the Snake

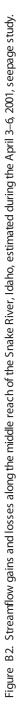
 River between Shelley and Minidoka Dam, Idaho--Continued

¹ Long-term United States Geological Survey gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.





Map							Total gains/	Gains/ (losses)
number (fig #)	Gaging station name (number) ¹ / ADCP/ADP measurement location	River		Discharge (ft ³ /s)	Date	Time	(losses) (ft ³ /s)	per mile (ft ³ /s/mi)
MI	Snake River near Shelley (1306000)	787.8		2130	10/31/2001	0745		
			total estimated inflow	0				
			total estimated outflow	0				
M2	Snake River at Shelley Bridge near Shelley	782.3		2090	10/31/2001	0630	(40)	(2)
			total estimated inflow	0				
			total estimated outflow	0				
M3	Snake River at Firth	777.3		1760	10/31/2001	1030	(330)	(99)
			total estimated inflow	0				
			total estimated outflow	0				
M4	Snake River at Kennedy Road near Firth	773.1		1840	10/31/2001	1115	80	19
			total estimated inflow	0				
			total estimated outflow	5				
M5	Snake River at Porterville Bridge near Blackfoot	767.5		1710	10/31/2001	1230	(125)	(22)
			total estimated inflow	0				
			total estimated outflow	0				
	01- N			1690	10/31/2001	1330	(20)	(9)
IMIO	DIARE MART AL DIACKIOUL (120022000)	C.+0/		1700	10/31/2001	1215		
			total estimated inflow	0				
			total estimated outflow	L				
М7	Snake River near Riverside	760.2		1520	10/31/2001	1415	(173)	(42)
			total estimated inflow	9				
			total estimated outflow	0				
M8	Snake River near Thomas	753.5		1510	10/31/2001	1600	(16)	(2)
			total estimated inflow	06				
			total estimated outflow	0				
6M	Snake River near Blackfoot (13069500)	750.1		1570	10/31/2001	1745	(30)	(6)
			total estimated inflow	0	1002/1/11	necn		
			5	c				

2							Total	Gains/
Map number	Gaging station name (number ¹ /	River		Discharge			gams/ (losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
M10	Snake River near Pingree	743.3		2410	11/1/2001	0845	600	88
			total estimated inflow	0				
			total estimated outflow	0				
M11	Snake River above McTucker Creek near Pingree	738		2	ł	-		-
			total estimated inflow	481				
			total estimated outflow	0				
			estimated outflow to storage					
			above American Falls Dam ³	4000				
M12	Snake River at Neeley (13077000)	714.1		354 377	11/2/2001 11/20/2001	0715 1130	1464	50
			total estimated inflow	4				
			total estimated outflow	0				
M13	Snake River above Massacre Rocks near Neeley	707.7		573	11/20/2001	1440	192	30
			total estimated inflow	19				
			total estimated outflow	0				
M14	Snake River at Register Rock near Cold Water	702.5		4	1	1	1	ł
			total estimated inflow	32				
			total estimated outflow	0				
M15	Snake River above Raft River near Yale	694		492	11/20/2001	1145	(131)	(10)
			total estimated inflow	0				
			total estimated outflow	0				
			estimated outflow to storage					
			above Minidoka Dam ³	0				
M16	Snake River near Minidoka (13081500)	673 5		545	11/20/2001	2145	53	ſſ

 3 Estimated based on reservoir stage data (Bureau of Reclamation).

⁴ Unable to access measurement location.

Table B6. Gaging station discharge data during October 31, November 1, and November 20, 2001, forthe Snake River between Shelley and Minidoka Dam, Idaho

Map number	Coging station name (number)	Date	Time	Discharge
(fig. #)	Gaging station name (number)	Date	Time	Discharge
M1	Snake River near Shelley (13060000)	10/31/2001	0745	2130
M6	Snake River at Blackfoot (13062500)	10/31/2001	1330	1690
WIO	Snake River at Black100t (15062500)	10/31/2001	1215	1700
M9	Snake River near Blackfoot (13069500)	10/31/2001	1745	1570
1419	Shake Kivel hear Diackiool (15009500)	11/1/2001	0530	1810
M12	Snake River at Neeley (13077000)	11/2/2001	0715	354
11112	Shake Kivel at heeley (15077000)	11/20/2001	1130	377
M16	Snake River near Minidoka (13081500)	11/20/2001	2145	545

[Discharge given in cubic feet per second]

Table B7. Acoustic Doppler discharge measurement data during October 31, November 1, and November 20, 2001, for the Snake River between Shelley and Minidoka Dam, Idaho

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; σ , standard deviation; μ , mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^۳ / _µ)
M2	Snake River at Shelley Bridge near Shelley	10/31/2001	930	2090	0.04
M3	Snake River at Firth	10/31/2001	1030	1760	0.04
M4	Snake River at Kennedy Road near Firth	10/31/2001	1115	1840	0.02
M5	Snake River at Porterville Bridge near Blackfoot	10/31/2001	1230	1710	0.04
M7	Snake River near Riverside	10/31/2001	1415	1520	0.07
M8	Snake River near Thomas	10/31/2001	1600	1510	0.05
M10	Snake River near Pingree	11/1/2001	845	2410	0.03
M11	Snake River above McTucker Creek near Pingree			1	
	12 miles above American Falls Dam, near Aberdeen	11/1/2001	1130	² 2580	0.02
M13	Snake River above Massacre Rocks near Neeley	11/20/2001	1440	573	0.11
M14	Snake River at Register Rock near Cold Water			3	
M15	Snake River above Raft River near Yale	11/20/2001	1145	492	0.04

¹ Unable to find a measurement location because of sediment build-up and braided channels.

² Main-channel measurement within American Falls Reservoir during low-water conditions (not used in the analyses).

³ Unable to access measurement location.

Table B8. Discharge data for all inspected inflow and outflow sites during October 31, November 1, and November 20, 2001, for the Snake River between Shelley and Minidoka Dam, Idaho

in cubic feet per second, map numbers shown in f	Station		ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
		n map numbers	_			8
Miscellaneous agriculture return near Woodville		43 24 38	112 09 19	10/31/2001		0
Miscellaneous agriculture return near Woodville		43 24 57	112 08 48	10/31/2001		0
Shull Lateral near Shelley		43 24 26	112 08 00	10/31/2001		0
Reservation Canal near Shelley	13060500	43 22 24	112 09 13	10/31/2001	DM	0
Miscellaneous agriculture return near Shelley		43 22 42	112 10 11	10/31/2001		0
S	ubreach betwee	n map numbers	M2 and M3			
Miscellaneous agriculture return near Shelley		43 22 26	112 10 11	10/31/2001		
Blackfoot Canal near Shelley	13061430	43 21 18	112 09 53	10/31/2001	DM	0
S	ubreach betwee	n map numbers	M3 and M4			
New Lavaside Canal near Firth	13061520	43 18 30	112 12 09	10/31/2001	DM	0
Peoples Canal near Firth	13061525	44 18 31	113 12 10	10/31/2001	DM	0
Aberdeen Springfield Canal near Firth	13061610	43 17 37	112 13 13	10/31/2001	DM	0
S	ubreach betwee	n map numbers	M4 and M5			
Aberdeen Springfield Waste near Kimball		43 16 49	112 15 16	10/31/2001		0
Corbett Slough Canal near Kimball	13061650	43 15 40	112 15 30	10/31/2001	DM	0
Neilson-Hanson Canal near Kimball	13061670	43 15 29	112 17 07	10/31/2001	DM	5
Miscellaneous agriculture return near Wapello		43 14 47	112 17 58	10/31/2001		0
Riverside Canal near Rose	13061705	43 15 47	112 18 07	10/31/2001	DM	0
Lavaside and Riverside return near Rose		43 14 05	112 19 31	10/31/2001		0
S	ubreach betwee	n map numbers	M5 and M6			
Miscellaneous agriculture return near Blackfoot		43 13 36	112 19 50	10/31/2001		0
Danskin Canal near Blackfoot	13061995	43 13 28	112 20 12	10/31/2001	DM	0
Miscellaneous agriculture return near Blackfoot		43 13 12	112 20 31	10/31/2001		0
Miscellaneous agriculture return at Blackfoot		43 12 12	112 22 12	10/31/2001		0
S	ubreach betwee	n map numbers	M6 and M7			
Trego Canal near Blackfoot	13062050	43 12 05	112 22 00	10/31/2001	DM	0
Wearyrick Canal near Blackfoot	13062503	43 11 51	112 22 36	10/31/2001	DM	0
Watson Slough near Blackfoot	13062506	43 11 46	112 23 44	10/31/2001	DM	7
Parsons Ditch near Blackfoot	13062507	43 11 36	112 23 45	10/31/2001	DM	0
S	ubreach betwee	n map numbers	M7 and M8			
Riverton Ditch near Thomas		43 09 00	112 27 04	10/31/2001		0
Crawford Ditch near Thomas		43 10 04	112 27 44	10/31/2001		2.5
Watson Slough return near Thomas		43 09 39	112 29 13	10/31/2001		3.2
S	ubreach betwee	n map numbers	M8 and M9			
Blackfoot River near Blackfoot	13068500	43 07 50	112 28 35	10/31/2001	DM	90
Miscellaneous agriculture return near Thomas		43 08 04	112 30 54	10/31/2001		0
Su	ıbreach betweei	n map numbers	M9 and M10			
Mud Slough near Fort Hall		43 05 40	112 31 04	11/1/2001		3
Diggie Creek near Fort Hall		43 05 43	112 31 07	11/1/2001		3
Jeff Cabin Creek near Fort Hall		43 04 05	112 33 00	11/1/2001		³ 0
Su	breach between	map numbers N	M10 and M11			
	breach between	map numbers N				2
Ross Fork near Fort Hall		43 00 21	111 29 47	11/1/2001		³ 44.6
Clear Creek near Fort Hall		43 02 23	112 32 33	11/1/2001		³ 21.1
Spring Creek near Fort Hall	13075983	43 02 36	112 33 15	11/1/2001	DM	³ 336
McTucker Creek Springfield		43 02 05	112 38 36	11/1/2001		³ 14.4
Portneuf River near Tyhee	13075910	42 56 42	112 32 38	11/1/2001	DM	448

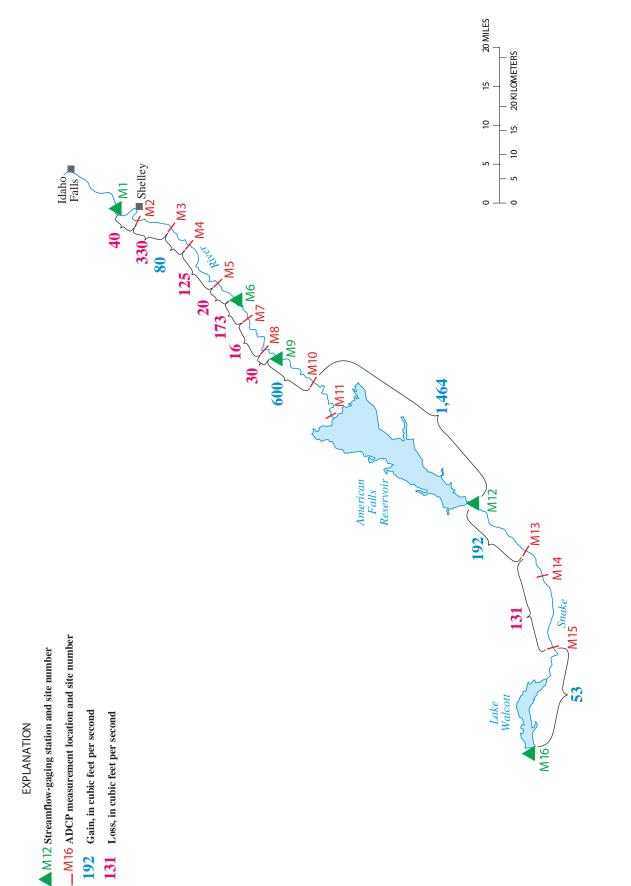
	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
Danielson Creek near Springfield		43 03 32	112 41 27	11/1/2001		³ 49.7
Sterling Waste near Sterling	13069548	43 01 49	112 43 40	11/1/2001		³ 7.5
Unnamed Spring #1 near Sterling		43 03 37	112 43 19	11/1/2002		³ 0.7
Crystal Springs near Sterling		43 02 52	112 40 53	11/1/2001		³ 45.9
Unnamed Spring #2 near Sterling		42 59 39	112 45 37	11/1/2001		³ 3
Unnamed Spring #3 near Sterling		43 02 39	112 39 09	11/1/2001		³ 16.6
Bannock Creek near Michaud		42 53 12	112 38 35	11/1/2001		30
Aberdeen Waste Drain near Aberdeen	13069565	42 55 27	112 43 39	11/1/2001		1.3
Tarter Waster near American Falls	13076210	42 52 40	112 51 23	11/1/2001		
Seagull Bay near American Falls		42 49 24	112 47 45	11/1/2001		0
Sunbeam near American Falls		42 47 55	112 50 53	11/1/2001		1
Spring Hallow near American Falls		42 48 39	112 53 30	11/1/2001		³ 2
Falls Irrigation Pump near American Falls	13076400	42 46 46	112 52 22	11/1/2001	DM	0
	Subreach between	map numbers	M12 and M13			
Ferry Hallow near Neeley		42 45 43	112 52 57	11/1/2001		0
Warm Creek near Neeley		42 44 01	112 54 25	11/1/2001		2.2
Little Creek near Neeley		42 42 47	112 55 53	11/1/2001		1.5
	Subreach between	map numbers	M13 and M14			
Rock Creek near Rockland	13077650	42 39 10	113 01 00	11/1/2001		18.6
Dry Hallow Creek near Rockland		42 38 40	113 01 57	11/1/2001		0
	Subreach between	map numbers	M14 and M15			
Little Warm Creek near Cold Water		43 38 07	113 03 43	11/1/2001		2.2
Fall Creek near Cold Water		43 37 36	113 05 05	11/1/2001		29.3
Lanes Gulch near Cold Water		42 37 10	113 07 11	11/1/2001		0
	Subreach between	map numbers	M15 and M16			
Raft River near Yale		42 35 50	113 14 19	11/1/2001		0
Minidoka Northside Canal near Minidoka	13080000	42 40 15	113 29 00	11/1/2001	DM	0
Minidoka Southside Canal near Minidoka	13080500	42 39 45	113 29 20	11/1/2001	DM	0

Table B8. Discharge data for all inspected inflow and outflow sites during October 31, November 1, and November 20, 2001, for the Snake River between Shelley and Minidoka Dam, Idaho--Continued

¹ Long-term United States Geological Survey gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.





Map number (fig. #)	Gaging station name (number) ¹ / ADCP/ADP measurement location	River mile		Discharge (ft ³ /s)	Date	Time	Total gains/ (losses) (ft ³ /s)	Gains/ (losses) per mile (ft ³ /s/mi)
M1	Snake River near Shelley (13060000)	787.8		2290	4/9/2002	0915		
			total estimated inflow	0				
			total estimated outflow	0				
M2	Snake River at Shelley Bridge near Shelley	782.3		2190	4/9/2002	1059	(100)	(18)
			total estimated inflow	0				
			total estimated outflow	0				
M3	Snake River at Firth	777.3		2290	4/9/2002	1155	100	20
			total estimated inflow	0				
			total estimated outflow	0				
M4	Snake River at Kennedy Road near Firth	773.1		2120	4/9/2002	1030	(170)	(40)
			total estimated inflow	0				
			total estimated outflow	0				
M5	Snake River at Porterville Bridge near Blackfoot	767.5		2050	4/9/2002	1130	(10)	(12)
			total estimated inflow	0				
			total estimated outflow	0				
				1980	4/9/2002	1230	(10)	(22)
MO	Shake Kiver at Blackloot (LJ002200)	C.40/		1970	4/9/2002	1200		
			total estimated inflow	0				
			total estimated outflow	0				
M7	Snake River near Riverside	760.2		1790	4/9/2002	1330	(180)	(44)
			total estimated inflow	0				
			total estimated outflow	0				
M8	Snake River near Thomas	753.5		1660	4/9/2002	1430	(130)	(19)
			total estimated inflow	110				
			total estimated outflow	0				
MQ	Snaka Rivar naar Rlackfoot (13060500)	750.1		1750	4/9/2002	1545	(20)	(9)
	DHAR MAY I HEAL DIALANU (1200/200)	1.001		1730	4/10/2002	0630		
			total estimated inflow	0				
				<				

Table B9. Calculations of gains and losses in specified subreaches of the Snake River during April 9 - 10 and May 7, 2002, between Shelley and Minidoka Dam, Idaho

							Total	Gains/
Map	-						gains/	(losses)
number (fig. #)	Gaging station name (number)'/ ADCP/ADP measurement location	River mile		Discharge (ft ³ /s)	Date	Time	(losses) (ft ³ /s)	per mile (ft ³ /s/mi)
M10	Snake River near Pingree	743.3		2	1	1	1	1
			total estimated inflow	0				
			total estimated outflow	0				
M11	Snake River above McTucker Creek near Pingree	738		2190	4/10/2002	1223	460	38
			total estimated inflow	538				
			total estimated outflow	0				
			estimated outflow to storage					
			above American Falls Dam ³	2300				
M17	Sucha Divar at Norday (12077000)	1 / 1		1660	4/11/2002	0600	1,232	52
7111	DHARE ALVEL AL L'ECTEY (LOUI / 1000)	1.4.1		8450	5/7/2002	0400		
			total estimated inflow	S				
			total estimated outflow	0				
M13	Snake River above Massacre Rocks near Neeley	707.7		8680	5/7/2002	0715	225	35
			total estimated inflow	Ś				
			total estimated outflow	0				
M14	Snake River at Register Rock near Cold Water	702.5		8310	5/7/2002	0815	(375)	(72)
			total estimated inflow	15				
			total estimated outflow	0				
M15	Snake River above Raft River near Yale	694		4	1	-	1	1
			total estimated inflow	0				
			total estimated outflow (canals)	660				
			estimated outflow to storage					
			above Minidoka Dam ³	250				
M16	Snake River near Minidoka (13081500)	673 5		6480	2/1/2000	7730	(035)	(32)

 3 Estimated based on reservoir stage data (Bureau of Reclamation). 4 Unable to measure because of unsafe measuring conditions (high winds).

Table B10. Gaging station discharge data during April 9 - 10 and May 7, 2002, for the Snake Riverbetween Shelley and Minidoka Dam, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
M1	Snake River near Shelley (13060000)	4/9/2002	0915	2290
M6	Snake River at Blackfoot (13062500)	4/9/2002 4/9/2002	1230 1200	1980 1970
M9	Snake River near Blackfoot (13069500)	4/9/2002 4/10/2002	1545 0630	1750 1730
M12	Snake River at Neeley (13077000)	4/11/2002 5/7/2002	0600 0400	1660 8450
M16	Snake River near Minidoka (13081500)	5/7/2002	2230	6480

[Discharge given in cubic feet per second]

Table B11. Acoustic Doppler discharge measurement data during April 9 - 10 and May 7, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of	
variation; σ , standard deviation; μ , mean;, no data]	

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	$COV(^{\sigma}/_{\mu})$
M2	Snake River at Shelley Bridge near Shelley	4/9/2002	1059	2190	0.04
M3	Snake River at Firth	4/9/2002	1155	2290	0.01
M4	Snake River at Kennedy Road near Firth	4/9/2002	1030	2120	0.03
M5	Snake River at Porterville Bridge near Blackfoot	4/9/2002	1130	2050	0.02
M7	Snake River near Riverside	4/9/2002	1330	1790	0.04
M8	Snake River near Thomas	4/9/2002	1430	1660	0.05
M10	Snake River near Pingree			1	
M11	Snake River above McTucker Creek near Pingree	4/10/2002	1223	2190	0.02
M13	Snake River above Massacre Rocks near Neeley	5/7/2002	715	8680	0.02
M14	Snake River at Register Rock near Cold Water	5/7/2002	815	8310	0.06
M15	Snake River above Raft River near Yale			2	

¹ Unable to access the measurement location.

³ Unable to measure because of unsafe measuring conditions (high winds).

Table B12. Discharge data for all inspected inflow and outflow sites during April 9 - 10 and May 7, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

in cubic reet per second, map numbers snown m	Station	_	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	-			0
Miscellaneous agriculture return near Woodville		43 24 38	112 09 19	4/9/2002		0
Miscellaneous agriculture return near Woodville		43 24 57	112 08 48	4/9/2002		0
Shull Lateral near Shelley		43 24 26	112 08 00	4/9/2002		0
Reservation Canal near Shelley	13060500	43 22 24	112 09 13	4/9/2002	DM	0
Miscellaneous agriculture return near Shelley		43 22 42	112 10 11	4/9/2002		0
S	Subreach betwee	n map numbers	M2 and M3			
Miscellaneous agriculture return near Shelley		43 22 26	112 10 11	4/9/2002		
Blackfoot Canal near Shelley	13061430	43 21 18	112 09 53	4/9/2002	DM	0
S	Subreach betwee	n map numbers	M3 and M4			
New Lavaside Canal near Firth	13061520	43 18 30	112 12 09	4/9/2002	DM	0
Peoples Canal near Firth	13061525	44 18 31	113 12 10	4/9/2002	DM	0
Aberdeen Springfield Canal near Firth	13061610	43 17 37	112 13 13	4/9/2002	DM	0
S	Subreach betwee	n map numbers	M4 and M5			
Aberdeen Springfield Waste near Kimball		43 16 49	112 15 16	4/9/2002		0
Corbett Slough Canal near Kimball	13061650	43 15 40	112 15 30	4/9/2002	DM	0
Neilson-Hanson Canal near Kimball	13061670	43 15 29	112 17 07	4/9/2002	DM	0
Miscellaneous agriculture return near Wapello		43 14 47	112 17 58	4/9/2002		0
Riverside Canal near Rose	13061705	43 15 47	112 18 07	4/9/2002	DM	0
Lavaside and Riverside return near Rose		43 14 05	112 19 31	4/9/2002		0
S	Subreach betwee	n map numbers	M5 and M6			
Miscellaneous agriculture return near Blackfoot		43 13 36	112 19 50	4/9/2002		0
Danskin Canal near Blackfoot	13061995	43 13 28	112 20 12	4/9/2002	DM	0
Miscellaneous agriculture return near Blackfoot		43 13 12	112 20 31	4/9/2002		0
Miscellaneous agriculture return at Blackfoot		43 12 12	112 22 12	4/9/2002		0
S	Subreach betwee	n map numbers	M6 and M7			
Trego Canal near Blackfoot	13062050	43 12 05	112 22 00	4/9/2002	DM	0
Wearyrick Canal near Blackfoot	13062503	43 11 51	112 22 36	4/9/2002	DM	0
Watson Slough near Blackfoot	13062506	43 11 46	112 23 44	4/9/2002	DM	0
Parsons Ditch near Blackfoot	13062507	43 11 36	112 23 45	4/9/2002	DM	0
	Subreach betwee	-				
Riverton Ditch near Thomas		43 09 00	112 27 04	4/9/2002		0
Crawford Ditch near Thomas		43 10 04	112 27 44	4/9/2002		0
Watson Slough return near Thomas		43 09 39	112 29 13	4/9/2002		0
	Subreach betwee	-				
Blackfoot River near Blackfoot	13068500	43 07 50	112 28 35	4/9/2002	DM	110
Miscellaneous agriculture return near Thomas		43 08 04	112 30 54	4/9/2002		0
	ubreach between	-				3
Mud Slough near Fort Hall		43 05 40	112 31 04	4/10/2002		3
Diggie Creek near Fort Hall		43 05 43	112 31 07	4/10/2002		³ 0
Jeff Cabin Creek near Fort Hall		43 04 05	112 33 00	4/10/2002		0
	ubreach between	map numbers I				
	ubreach between	-		4/10/2002		3
Ross Fork near Fort Hall		43 00 21	111 29 47	4/10/2002		3
Clear Creek near Fort Hall		43 02 23	112 32 33	4/10/2002	 DM	³ 311
Spring Creek near Fort Hall	13075983	43 02 36	112 33 15	4/10/2002	DM	³
McTucker Creek Springfield	 12075010	43 02 05	112 38 36	4/10/2002	 DM	
Portneuf River near Tyhee	13075910	42 56 42	112 32 38	4/10/2002	DM	518

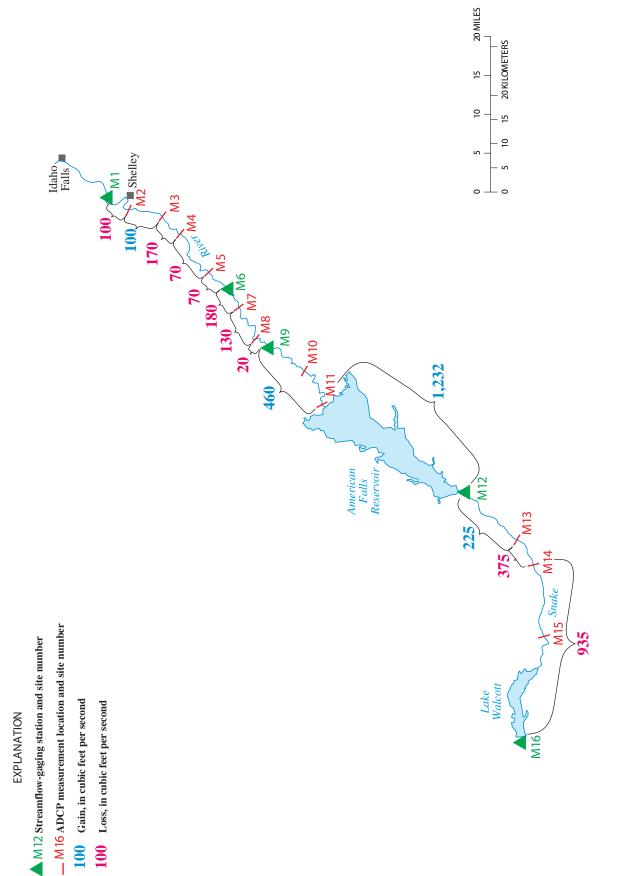
	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
Danielson Creek near Springfield		43 03 32	112 41 27	4/10/2002		3
Sterling Waste near Sterling	13069548	43 01 49	112 43 40	4/10/2002		3
Unnamed Spring #1 near Sterling		43 03 37	112 43 19	4/10/2002		3
Crystal Springs near Sterling		43 02 52	112 40 53	4/10/2002		3
Unnamed Spring #2 near Sterling		42 59 39	112 45 37	4/10/2002		3
Unnamed Spring #3 near Sterling		43 02 39	112 39 09	4/10/2002		3
Bannock Creek near Michaud		42 53 12	112 38 35	4/10/2002		20
Aberdeen Waste Drain near Aberdeen	13069565	42 55 27	112 43 39	4/10/2002		0
Tarter Waster near American Falls	13076210	42 52 40	112 51 23	4/10/2002		
Seagull Bay near American Falls		42 49 24	112 47 45	4/10/2002		0
Sunbeam near American Falls		42 47 55	112 50 53	4/10/2002		0
Spring Hallow near American Falls		42 48 39	112 53 30	4/10/2002		3
Falls Irrigation Pump near American Falls	13076400	42 46 46	112 52 22	4/10/2002	DM	0
	Subreach between	map numbers	M12 and M13			
Ferry Hallow near Neeley		42 45 43	112 52 57	5/7/2002		0
Warm Creek near Neeley		42 44 01	112 54 25	5/7/2002		5.0
Little Creek near Neeley		42 42 47	112 55 53	5/7/2002		
	Subreach between	map numbers	M13 and M14			
Rock Creek near Rockland	13077650	42 39 10	113 01 00	5/7/2002		4.5
Dry Hallow Creek near Rockland		42 38 40	113 01 57	5/7/2002		0
	Subreach between	map numbers	M14 and M15			
Little Warm Creek near Cold Water		43 38 07	113 03 43	5/7/2002		
Fall Creek near Cold Water		43 37 36	113 05 05	5/7/2002		15
Lanes Gulch near Cold Water		42 37 10	113 07 11	5/7/2002		
	Subreach between	map numbers	M15 and M16			
Raft River near Yale		42 35 50	113 14 19	5/7/2002		0
Minidoka Northside Canal near Minidoka	13080000	42 40 15	113 29 00	5/7/2002	DM	946
Minidoka Southside Canal near Minidoka	13080500	42 39 45	113 29 20	5/7/2002	DM	660

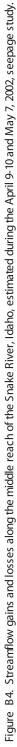
Table B12. Discharge data for all inspected inflow and outflow sites during April 9 - 10 and May 7, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho--Continued

¹ Long-term United States Geological Survey gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.





Map number	Gaging station name (number) ¹ /	River		Discharge		i	Total gains/ (losses)	Gains/ (losses) per mile
(IIG.#) M1	ADCF/ADF measurement location Snake River near Shellev (13060000)	787 8		(II /S) 7330	Date	1215	(S/ 11)	(IIII/S/ III)
			total estimated inflow	o œ				
			total estimated ontflow	360				
M2	Snake River at Shelley Bridge near Shelley	782.3		6730	7/23/2002	1407	(248)	(45)
			total estimated inflow	2				
			total estimated outflow	348				
M3	Snake River at Firth	777.3		6640	7/23/2002	1527	257	51
			total estimated inflow	0				
			total estimated outflow	1337				
M4	Snake River at Kennedy Road near Firth	773.1		4690	7/23/2002	1030	(613)	(146)
			total estimated inflow	92				
			total estimated outflow	249				
M5	Snake River at Porterville Bridge near Blackfoot	767.5		4660	7/23/2002	1145	127	23
			total estimated inflow	62				
			total estimated outflow	185				
2MC	Curity Dirow of Dired foot (13063500)	C 17L		4460	7/23/2002	1245	(<i>LL</i>)	(24)
0IVI	DHAKE MAVEF AL DIACKIOUL (LOUOZOUU)	C:+0/		4480	7/23/2002	1230		
			total estimated inflow	0				
			total estimated outflow	189				
M7	Snake River near Riverside	760.2		4460	7/23/2002	1400	169	41
			total estimated inflow	46				
			total estimated outflow	0				
M8	Snake River near Thomas	753.5		4060	7/23/2002	1515	(446)	(67)
			total estimated inflow	41				
			total estimated outflow	0				
NIO.	Charles Discourses Disclificate (120000000)	1 022		3980	7/23/2002	1630	(121)	(36)
(MI)	DHAKE MYEL HEAL DIACKIOUL (LOUDOUCOU)	1.001		3960	7/23/2002	0400		
			total estimated inflow	0				
			total actimated antiflam	0				

							Total øaine/	Gains/ (losses)
Iviap number (fig. #)	Gaging station name (number) ¹ / ADCP/ADP measurement location	River mile		Discharge (ft ³ /s)	Date	Time	(losses) (ft ³ /s)	per mile (ft ³ /s/mi)
M10	Snake River near Pingree	743.3		2	ł	-	Ì	
			total estimated inflow	0				
			total estimated outflow	0				
M11	Snake River above McTucker Creek near Pingree	738		3	ł	1	1	I
			total estimated inflow	506				
			total estimated outflow	96				
			estimated outflow to storage					
			above American Falls Dam ⁴	(4900)				
				10400	7/24/2002	0090	1.131	31
M12	Snake Kiver at Neeley (13077000)	714.1		10400	7/24/2002	0090		
			total estimated inflow	ю				
			total estimated outflow	0				
M13	Snake River above Massacre Rocks near Neeley	7.707.7		10300	7/24/2002	0845	(103)	(16)
			total estimated inflow	20				
			total estimated outflow	0				
M14	Snake River at Register Rock near Cold Water	702.5		10300	7/24/2002	0745	(20)	(4)
			total estimated inflow	27				
			total estimated outflow	0				
M15	Snake River above Raft River near Yale	694		10400	7/24/2002	1030	74	6
			total estimated inflow	0				
			total estimated outflow	1811				
			estimated outflow to storage					
			above Minidoka Dam ⁴	165				
M16	Cuche Diverneed Minidales (12001200)	3 613		0220			201	r

93

² Unable to access measurement location.

 3 Unable to find a measurement location because of sediment build-up and braided channels. 4 Estimated based on reservoir stage data (US Bureau of Reclamation).

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
M1	Snake River near Shelley (13060000)	7/23/2002	1215	7330
M6	Snake River at Blackfoot (13062500)	7/23/2002	1245	4460
WIO	Shake Kivel at Diackiool (15002500)	7/23/2002	1230	4480
M9	Snake River near Blackfoot (13069500)	7/23/2002	1630	3980
1019	Shake Kiver hear Diackiool (15009500)	7/23/2002	1215 7330 1245 4460 1230 4480	
M12	Snake River at Neeley (13077000)	7/24/2002	0600	10400
10112	Shake River at receivy (15077000)	7/24/2002	0600	10400
M16	Snake River near Minidoka (13081500)	7/24/2002	2030	8560

Table B14. Gaging station discharge data during July 23-24, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

Table B15. Acoustic Doppler discharge measurement data during July 23-24, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number		Dete	T1	Distance	
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	$\text{COV}(^{\sigma}/_{\mu})$
M2	Snake River at Shelley Bridge near Shelley	7/23/2002	1407	6730	0.08
M3	Snake River at Firth	7/23/2002	1527	6640	0.01
M4	Snake River at Kennedy Road near Firth	7/23/2002	1030	4690	0.05
M5	Snake River at Porterville Bridge near Blackfoot	7/23/2002	1145	4660	0.05
M7	Snake River near Riverside	7/23/2002	1400	4460	0.04
M8	Snake River near Thomas	7/23/2002	1515	4060	0.03
M10	Snake River near Pingree			1	
M11	Snake River above McTucker Creek near Pingree			2	
M13	Snake River above Massacre Rocks near Neeley	7/24/2002	845	10300	0.01
M14	Snake River at Register Rock near Cold Water	7/24/2002	745	10300	0.01
M15	Snake River above Raft River near Yale	7/24/2002	1030	10400	0.03

¹ Unable to access measurement location.

² Unable to find a measurement location because of sediment build-up and braided channels.

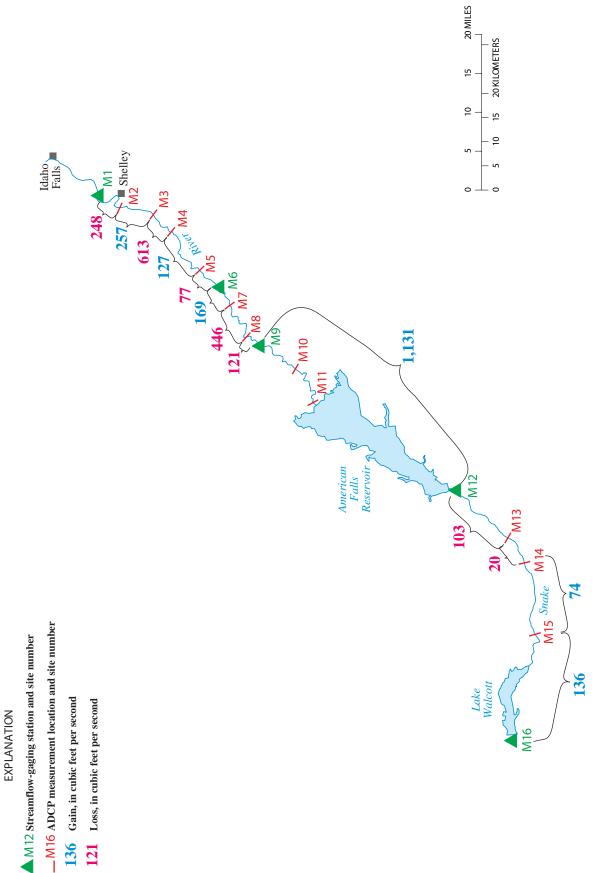
Table B16. Discharge data for all inspected inflow and outflow sites during July 23-24, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

Inspection site¹number³LatitudeLongitudeDateTimeDischarge²Subreach betweer may numbers > 11 and M2Miscellaneous agriculture return near Woodville43 24 37112 09 19724/200216453Miscellaneous agriculture return near Woodville43 24 24112 09 10724/200216201Reservation Canal near Shelley1306050043 22 24112 09 11724/20021620360Miscellaneous agriculture return near Shelley43 22 25112 10 11724/200216301.5Blackfoot Canal near Shelley43 22 26112 10 11724/200216301.5Blackfoot Canal near Shelley43 22 20112 10 11724/20021601.5Blackfoot Canal near Shelley130613043 13 21 18112 10 93723/2002DM94Peoples Canal near Firth130615043 18 30112 12 09723/2002DM94Peoples Canal near Firth1306165043 15 43112 15 30723/2002DM90Cobert Slogit Canal near Kimball1306167043 15 43112 18 07723/2002DM102Neitsen Armone Right1306167043 15 43112 18 07723/2002DM102Lavasid Canal near Kimball1306167043 15 43112 18 07723/2002DM102Neitsen Stringfield Waste near Kimball1306167043 15 43112 18 10723/2002DM102N	in cubic reet per second, map numbers shown in h	Station	1	ation			
Subreach between map numbers M1 and M2 Miscellaneous agriculture return near Woodville	Inspection site ¹		Latitude	Longitude	Date	Time	Discharge ²
Miscellancous agriculture return near Woodville 43 24 37 112 08 48 724 2002 1655 1 Miscellancous agriculture return near Woodville 43 24 57 112 08 00 724 2002 1620 1 Reservation Canal near Shelley 13060500 43 22 42 112 10 11 724 2002 1630 3 Miscellancous agriculture return near Shelley 43 22 45 112 10 11 724 2002 1630 5 Miscellancous agriculture return near Shelley 43 22 26 112 10 11 724 2002 1630 5 Blackfoot Canal near Shelley 43 22 31 18 112 10 93 723 2002 DM 94 Peoples Canal near Firth 1306150 43 18 30 113 12 10 723 2002 DM 94 Aberdeen Springfield Waste near Kimball 43 16 49 112 15 10 723 2002 90 Cobert Slooff Canal near Kimball 43 16 49 112 15 10 723 2002 90 Neilson Harson Canal near Kimball 43 16 47 112 18 07 723 2002 17				_			8-
Miscellaneous agriculture return near Woodville43 24 27112 08 80774/200216551Shull Lateral near Shelley1300650043 22 24112 09 13774/200216003Miscellaneous agriculture return near Shelley43 22 26112 1011774/200216001.5Blackford Canal near Shelley130613043 21 18112 09 13772/2002DM940Miscellaneous agriculture return near Shelley43 22 26112 1011774/200216001.5Blackford Canal near Shelley1306152043 18 30112 12 09772/2002DM940Peoples Canal near Firth130615043 17 37112 13 13723/2002DM962Aberdeen Springfield Canal near Firth1306161043 17 37112 15 167/23/2002DM900Corbert Slough Canal near Kimball43 16 49112 15 167/23/2002DM901Corbert Slough Canal near Kimball1306167043 15 47112 17 077/23/2002DM100Neilson-Hanson Canal near Kimball1306167043 15 47112 18 107/23/2002DM102Lavaside ad Riverside return near Blackfoot43 14 47112 17 877/23/2002DM102Lavaside ad Riverside return mear Blackfoot43 14 35112 20 107/23/2002DM102Miscellaneous agriculture return near Blackfoot43 13 28112 20 127/23/2002DM102Miscel			-		7/24/2002	1645	3
Shall Lateral near	•		43 24 57	112 08 48	7/24/2002	1655	1
Reservation Canal near Shelley 13060500 43 22 24 112 01 31 7232002 DM 360 Miscellaneous agriculture return near Shelley	•		43 24 26	112 08 00	7/24/2002	1620	1
Miscellaneous agriculture return near Shelley 43 22 42 112 1011 724/2002 1630 3 Miscellaneous agriculture return near Shelley 1306140 43 21 18 112 00 11 7/3/2002 DM 348 New Lavaside Canal near Firth 13061520 43 18 30 112 12 10 7/3/2002 DM 94 Peoples Canal near Firth 13061525 44 18 30 112 12 10 7/3/2002 DM 96 Aberdeen Springfield Canal near Firth 13061610 43 17 37 112 15 10 7/23/2002 DM 90 Corbert Stoogh Canal near Kimball 13061670 43 15 49 112 15 10 7/23/2002 CM 90 Netsoenhamson Canal near Kimball 13061670 43 15 47 112 178 7/23/2002 CM 102 Lavaside Canal near Rose 13061705 43 15 47 112 178 7/23/2002 CM 102 Lavaside and Rose agriculture return near Blackfoot 43 1432 112 950 7/23/2002 CM 102 Lavaside and Rose agriculture return near Blackfoot 13061905 43 152 112 950 7/23/2002 CM 185	-	13060500	43 22 24	112 09 13	7/23/2002	DM	360
Miscellaneous agriculture return near Shelley 43 32 22 112 112 112 172 DA 348 Blackrot Canal near Shelley 13061520 43 18.30 112 120 7.23/2002 DM 94 Peoples Canal near Firth 13061525 44 18.31 113 12 10 7.23/2002 DM 92 Aberdeen Springfield Canal near Firth 13061670 43 13 13 12 15 7.23/2002 CM 90 Corbett Slough Canal near Kimball 43 164 12 15 7.23/2002 90 Corbett Slough Canal near Kimball 13061670 43 15 9 12 17 7.23/2002 2.4 Miscellaneous agriculture return near Mapello 43 14 12 15 7.23/2002 2.4 Miscellaneous agriculture return near Blackfoot 43 13 12 19 7.23/2002 3.3 Miscellaneous agriculture return near Blackfoot 43 13<	-		43 22 42	112 10 11	7/24/2002	1630	3
Blackfoot Canal near Shelley 13061430 43 21 18 112 09 53 7.232002 DM 3488 Subreach between map numbers M3 and M4 Valuation of the subreach between map numbers M3 and M4 Peoples Canal near Firth 13061525 44 18 31 113 12 10 7.232002 DM 962 Aberdeen Springfield Waste near Kimball 43 16 49 112 15 30 7.232002 90 Content Springfield Waste near Kimball 43 16 49 112 15 30 7.232002 90 Content Simigfield Waste near Kimball 43 16 49 112 15 30 7.232002 7.23 Attributer return near Mapello 43 14 47 112 17 7 7.232002 2.4 Riverside colspan="4">Riverside return near Blackfoot 43 14 47 112 17 7 7.232002 2.4 Numbers M4 aud M5 Misellaneous agriculture return near Blackfoot 43 13 12 112 12 30 7.232002 DM		breach betweer	n map numbers	M2 and M3			
Subreach between map numbers M3 and M4 New Lavaside Canal near Firth 13061520 43 18 30 112 12 09 7/23/2002 DM 94 Aberdeen Springfield Canal near Firth 13061610 43 17 37 112 13 13 7/23/2002 DM 982 Aberdeen Springfield Waste near Kimball	Miscellaneous agriculture return near Shelley		43 22 26	112 10 11	7/24/2002	1630	1.5
New Lavaside Canal near Firth 13061520 43 18 30 112 12 09 723/2002 DM 94 Peoples Canal near Firth 13061610 43 1 73 112 13 13 723/2002 DM 982 Subreach between mar numbers M4 and M5 Aderdeen Springfield Waste near Kimball 43 16 49 112 15 16 7/23/2002 90 Corbert Slough Canal near Kimball 13061670 43 15 49 112 17 07 7/23/2002 17 Miscellaneous agriculture return near Wapello 43 14 47 112 18 70 7/23/2002 2.4 Riverside Canal near Kimball 13061670 43 15 49 112 19 50 7/23/2002 2.4 Riverside Canal near Rose 43 14 05 112 19 51 7/23/2002 3.3 Danskin Canal near Blackfoot 1306199 43 13 26 112 20 12 7/23/2002 18 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 12 7/23/2002 DM 61 Miscellaneous agriculture return at Blackfoot 13062505 43 1 16	Blackfoot Canal near Shelley	13061430	43 21 18	112 09 53	7/23/2002	DM	348
Peoples Canal near Firth 13061525 44 18 31 113 12 10 723/202 DM 261 Aberdeen Springfield Canal near Firth 13061610 43 17 37 112 13 13 7/23/202 DM 982 Aberdeen Springfield Waste near Kimball 43 16 49 112 15 16 7/23/2002 DM 130 Neilson-Hanson Canal near Kimball 13061650 43 15 47 112 17 58 7/23/2002 DM 130 Milson-Hanson Canal near Kimball 13061670 43 15 47 112 18 07 7/23/2002 DM 102 Lavaside and Riverside return near Rose 43 14 37 112 19 50 7/23/2002 DM 102 Jawasin Canal near Blackfoot 43 13 36 112 19 50 7/23/2002 DM 185 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 31 7/23/2002 DM 185 Miscellaneous agriculture return at Blackfoot 13062506 43 11 45 112 22 03 7/23/2002 DM 61 Miscellaneous agriculture return at Blackfoot 13	Su	breach betweer	map numbers	M3 and M4			
Aberdeen Springfield Canal near Firth 13061610 43 17 37 112 13 13 723/2002 DM 982 Surfaceh between map numbers M4 and M5 Aberdeen Springfield Waste near Kimball 13061650 43 15 40 112 15 16 7.23/2002 90 Corbett Slough Canal near Kimball 13061650 43 15 40 112 17 07 7.23/2002 DM 130 Miscellaneous agriculture return near Wapello 43 14 47 112 17 07 7.23/2002 2.4 Riverside Canal near Rose 13061705 43 15 47 112 18 07 7.23/2002 2.4 Miscellaneous agriculture return near Blackfoot 43 13 36 112 19 50 7.23/2002 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7.23/2002 DM 185 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 12 7.23/2002 DM 61 Miscellaneous agriculture return at Blackfoot 1306250 43 11 51 112 22 36 7.23/2002 DM 61 Mearycic Canal near Blackfoot 13062506 4	New Lavaside Canal near Firth	13061520	43 18 30	112 12 09	7/23/2002	DM	94
Subreach between map numbers M4 and M5 Aberdeen Springfield Waste near Kimball	Peoples Canal near Firth	13061525	44 18 31	113 12 10	7/23/2002	DM	261
Aberdeen Springfield Waste near Kimball 43 16 49 112 15 16 7/23/2002 90 Corbert Slough Canal near Kimball 13061670 43 15 40 112 15 78 7/23/2002 71 Miscellaneous agriculture return near Wapello 43 14 47 112 17 78 7/23/2002 2.4 Riverside Canal near Rose 13061670 43 15 47 112 19 31 7/23/2002 DM 102 Lavaside and Riverside return near Rose 43 13 405 112 19 31 7/23/2002 3.3 Danskin Canal near Blackfoot 43 13 26 112 20 31 7/23/2002 1.85 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 31 7/23/2002 1.85 Miscellaneous agriculture return and Blackfoot 43 12 12 112 22 03 7/23/2002 1.85 Miscellaneous agriculture return near Blackfoot 13062506 43 11 25 112 22 34 7/23/2002 DM 61 Miscellaneous agriculture return near Blackfoot 13062506 43 11 45 112 23 45 7/23/2002 <td>Aberdeen Springfield Canal near Firth</td> <td>13061610</td> <td>43 17 37</td> <td>112 13 13</td> <td>7/23/2002</td> <td>DM</td> <td>982</td>	Aberdeen Springfield Canal near Firth	13061610	43 17 37	112 13 13	7/23/2002	DM	982
Corbett Slogh Canal near Kimball 13061650 43 15 40 112 15 30 7/23/2002 17 Miscellaneous agriculture return near Wapello 43 14 47 112 17 58 7/23/2002 2.4 Kiverside Canal near Rose 13061705 43 15 47 112 19 50 7/23/2002 0 Lavaside and Riverside return near Rose 43 14 05 112 19 50 7/23/2002 0 Miscellaneous agriculture return near Blackfoot 43 13 26 112 12 00 12 7/23/2002 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7/23/2002 1 Miscellaneous agriculture return aet Blackfoot 43 13 12 112 20 12 7/23/2002 1 Miscellaneous agriculture return aet Blackfoot 43 13 12 112 22 01 7/23/2002 DM 61 Watson Slough near Blackfoot 13062506 43 11 25 112 22 30 7/23/2002 DM 61 Parsons Dich near Blackfoot 13062507 43 11 36 112 27 44 7/23/2002 DM 61 <td>Su</td> <td>breach betweer</td> <td>map numbers</td> <td>M4 and M5</td> <td></td> <td></td> <td></td>	Su	breach betweer	map numbers	M4 and M5			
Neilson-Hanson Canal near Kimball 13061670 43 15 29 112 17 07 723/2002 2.4 Miscellaneous agriculture return near Wapello 43 14 47 112 17 38 7/23/2002 2.4 Riverside Canal near Rose 13061705 43 15 47 112 19 31 7/23/2002 0 Lavaside Canal near Rose 43 13 46 112 19 31 7/23/2002 0.3 Miscellaneous agriculture return near Blackfoot 43 13 28 112 20 31 7/23/2002 1.4 Miscellaneous agriculture return aer Blackfoot 43 12 12 112 20 31 7/23/2002 1.4 Miscellaneous agriculture return aer Blackfoot 43 12 12 112 20 31 7/23/2002 1.4 Miscellaneous agriculture return aer Blackfoot 43 12 15 112 22 34 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062505 43 11 46 112 23 44 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062507 43 11 26 12 27 44 7/23/2002 DM 61	Aberdeen Springfield Waste near Kimball		43 16 49	112 15 16	7/23/2002		90
Miscellaneous agriculture return near Wapello 43 14 47 112 17 58 7/23/2002 2.4 Riverside Canal near Rose 13061705 43 15 47 112 18 07 7/23/2002 DM 102 Lavaside and Riverside return near Rose 43 14 05 112 19 31 7/23/2002 0 Miscellaneous agriculture return near Blackfoot 43 13 36 112 19 50 7/23/2002 3.3 Danskin Canal near Blackfoot 13061995 43 13 12 112 20 11 7/23/2002 58 Miscellaneous agriculture return at Blackfoot 43 13 12 112 22 03 7/23/2002 DM 185 Miscellaneous agriculture return at Blackfoot 13062050 43 12 12 112 22 03 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062505 43 11 45 112 22 36 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062505 43 11 46 112 23 45 7/23/2002 DM 61 Watson Slough near Blackfoot 13062507 43 11 36 112 27 44 7/23/2002 DM 61 <td>Corbett Slough Canal near Kimball</td> <td>13061650</td> <td>43 15 40</td> <td>112 15 30</td> <td>7/23/2002</td> <td>DM</td> <td>130</td>	Corbett Slough Canal near Kimball	13061650	43 15 40	112 15 30	7/23/2002	DM	130
Riverside Canal near Rose 13061705 43 15 47 112 18 07 7/23/2002 DM 102 Lavaside and Riverside return near Rose 43 14 05 112 19 31 7/23/2002 0 Miscellaneous agriculture return near Blackfoot 13061995 43 13 36 112 19 50 7/23/2002 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7/23/2002 1 Miscellaneous agriculture return near Blackfoot 43 12 12 112 20 31 7/23/2002 1 Miscellaneous agriculture return near Blackfoot 43 12 15 112 22 031 7/23/2002 DM 61 Miscellaneous agriculture return at Blackfoot 13062503 43 11 51 112 22 36 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 27 44 7/23/2002 DM 60 Vatson Slough near Blackfoot 13065203 43 01 04 112 27 44 7/24/2002 2.4	Neilson-Hanson Canal near Kimball	13061670	43 15 29	112 17 07	7/23/2002		17
Lavaside and Riverside return near Rose 43 14 05 112 19 31 7/23/202 0 Miscellaneous agriculture return near Blackfoot 43 13 36 112 19 50 7/23/202 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7/23/202 1 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 31 7/23/202 58 Subreach between map numbers M6 and M7 43 12 12 112 22 00 7/23/202 DM 61 Wearyrick Canal near Blackfoot 13062503 43 11 25 112 22 34 7/23/202 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 44 7/23/202 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 44 7/23/202 DM 60 Parsons Ditch near Thomas 43 09 00 112 27 44 7/24/2002 2.4 Riverton Ditch near Thomas 43 09 39 112 29 13 7/24/2002 21 Watson Slough return	Miscellaneous agriculture return near Wapello		43 14 47	112 17 58	7/23/2002		2.4
Subrexb between neurones Network Miscellaneous agriculture return near Blackfoot 43 13 36 112 19 50 7/23/200 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7/23/2002 CM 185 Miscellaneous agriculture return at Blackfoot 43 13 12 112 20 12 7/23/2002 1 Miscellaneous agriculture return at Blackfoot 43 13 12 112 22 10 7/23/2002 CM 61 Waten Shough near Blackfoot 13062505 43 12 12 112 23 44 7/23/2002 DM 61 Waten Shough near Blackfoot 13062505 43 11 45 112 23 44 7/23/2002 DM 61 Waten Shough near Blackfoot 13062507 43 11 36 112 23 44 7/23/2002 DM 61 Waten Shough near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 61 Waten Shough near Blackfoot 13062507 43 11 36 112 27 44 7/23/2002 CM 2.4 Waten Shough near Blackfoot 13062506 43 07 50 112 27 43 7/24/2002 </td <td>Riverside Canal near Rose</td> <td>13061705</td> <td>43 15 47</td> <td>112 18 07</td> <td>7/23/2002</td> <td>DM</td> <td>102</td>	Riverside Canal near Rose	13061705	43 15 47	112 18 07	7/23/2002	DM	102
Miscellaneous agriculture return near Blackfoot 43 13 36 112 19 50 7/23/2002 3.3 Danskin Canal near Blackfoot 13061995 43 13 28 112 20 13 7/23/2002 DM 185 Miscellaneous agriculture return near Blackfoot 43 15 12 112 20 31 7/23/2002 1 Miscellaneous agriculture return near Blackfoot 43 15 12 112 20 17 7/23/2002 DM 61 Miscellaneous agriculture return near Blackfoot 13062050 43 12 05 112 22 30 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062506 43 11 46 112 23 45 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 27 34 7/23/2002 DM 60 Parsons Ditch near Thomas 43 09 00 112 27 74 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 39 112 29 13 7/24/2002 2.4 Miscellaneous agriculture return near Thomas 43 08 04 112 30 4 7/24/2002 1	Lavaside and Riverside return near Rose		43 14 05	112 19 31	7/23/2002		0
Danskin Canal near Blackfoot 13061995 43 13 28 112 20 12 7/23/2002 DM 185 Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 31 7/23/2002 1 Miscellaneous agriculture return at Blackfoot 43 12 12 112 22 12 7/23/2002 58 Subreach between map numbers M6 and M7 Trego Canal near Blackfoot 13062503 43 11 51 112 22 36 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062506 43 11 46 112 23 45 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 60 Subreach between map numbers M7 and M8 Euteron Ditch near Thomas 43 09 00 112 27 44 7/24/2002 2.4 Carawford Ditch near Thomas 43 09 39 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 06 40	Su	breach betweer	map numbers	M5 and M6			
Miscellaneous agriculture return near Blackfoot 43 13 12 112 20 31 7/23/2002 58 Subreach between map numbers M6 and M7 Trego Canal near Blackfoot 13062050 43 12 05 112 22 34 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062503 43 11 51 112 22 34 7/23/2002 DM 60 Watson Slough near Blackfoot 13062507 43 11 36 112 23 44 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 60 Parsons Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 00 112 29 13 7/24/2002 2.4 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 2.4 Miscellaneous agriculture return near Thomas 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 40 112 30 67 7/25/2002 <td>Miscellaneous agriculture return near Blackfoot</td> <td></td> <td>43 13 36</td> <td>112 19 50</td> <td>7/23/2002</td> <td></td> <td>3.3</td>	Miscellaneous agriculture return near Blackfoot		43 13 36	112 19 50	7/23/2002		3.3
Miscellaneous agriculture return at Blackfoot 43 12 12 112 22 12 7/23/2002 58 Subreach between numbers M and M7 Trego Canal near Blackfoot 13062503 43 11 205 112 22 00 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062505 43 11 51 112 22 36 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062506 43 11 36 112 23 44 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 27 44 7/23/2002 DM 61 Riverton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 39 112 29 13 7/24/2002 2.1 Watson Slough return near Thomas 43 09 39 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 09 40 112 28 35 7/23/2002 DM 40 Mustolugh near Fort Hall 43 05 40 112 31 04 7/24/2002	Danskin Canal near Blackfoot	13061995	43 13 28	112 20 12	7/23/2002	DM	185
Subreach betwe= numbers Jet US Trego Canal near Blackfoot 13062050 43 1 2 05 112 22 36 7/23/202 DM 61 Wearyrick Canal near Blackfoot 1306250 43 1 1 51 112 22 36 7/23/202 DM 63 Watson Slough near Blackfoot 1306250 43 11 36 112 23 44 7/23/202 DM 63 Parson Slich near Blackfoot 1306250 43 11 36 112 27 44 7/23/202 DM 63 Riverton Ditch near Thomas 43 09 00 112 27 44 7/23/202 2.4 Crawford Ditch near Thomas 43 09 00 112 27 44 7/23/202 2.4 Watson Slough return near Thomas 43 09 09 112 29 13 7/24/202 2.4 Matson Slough return near Thomas 43 07 50 112 28 35 7/24/202 2.4 Mud Slough near Fort Hall 43 07 50 112 31 04 7/25/2002 3 ³ 50 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 3 ³ 50	Miscellaneous agriculture return near Blackfoot		43 13 12	112 20 31	7/23/2002		1
Trego Canal near Blackfoot 13062050 43 12 05 112 22 00 7/23/2002 DM 61 Wearyrick Canal near Blackfoot 13062503 43 11 51 112 22 36 7/23/2002 DM 37 Watson Slough near Blackfoot 13062506 43 11 46 112 23 44 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 31 Subreach between map numbers WT and MS Everton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 39 112 29 13 7/24/2002 2.1 Watson Slough reurn near Thomas 43 09 39 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ⁵ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 31 07 7/25/2002	Miscellaneous agriculture return at Blackfoot		43 12 12	112 22 12	7/23/2002		58
Wearyrick Canal near Blackfoot 13062503 43 11 51 112 22 36 7/23/2002 DM 37 Watson Slough near Blackfoot 13062506 43 11 46 112 23 44 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 60 Subreach between may numbers W7 and M8 Riverton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 00 112 29 13 7/24/2002 2.4 Watson Slough return near Thomas 43 09 50 112 28 55 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ⁵ 500 Jiggie Creek near Fort Ha	Su	breach betweer	map numbers	M6 and M7			
Watson Slough near Blackfoot 13062506 43 11 46 112 23 44 7/23/2002 DM 60 Parsons Ditch near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 31 Subreach between numbers MT 310 40 112 27 44 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 00 112 27 14 7/23/2002 2.4 Crawford Ditch near Thomas 43 09 39 112 29 13 7/24/2002 2.4 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 2.4 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/25/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ³ 20 Jeff Cabin Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 3 ³ 20 Crear Creek near Fort Hall <td< td=""><td>Trego Canal near Blackfoot</td><td>13062050</td><td>43 12 05</td><td>112 22 00</td><td>7/23/2002</td><td>DM</td><td>61</td></td<>	Trego Canal near Blackfoot	13062050	43 12 05	112 22 00	7/23/2002	DM	61
Parsons Dick near Blackfoot 13062507 43 11 36 112 23 45 7/23/2002 DM 31 Subreach between numbers MT and MS Riverton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 09 09 112 27 44 7/23/2002 2.1 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 2.3 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ³ 500 Jegig Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 3 ³ 13 Subreach between mar tumbers MIU Subreach between mar tumbers MIU Colspan="4">Colspan="4">Colspan="4">Colspan="4">Colspan="4">Colspan="4">Colspan="4">Colspan="4">Colspan= 4" Colspan= 4 </td <td>Wearyrick Canal near Blackfoot</td> <td>13062503</td> <td>43 11 51</td> <td>112 22 36</td> <td>7/23/2002</td> <td>DM</td> <td>37</td>	Wearyrick Canal near Blackfoot	13062503	43 11 51	112 22 36	7/23/2002	DM	37
Subreach between numbers N7 and M8 Riverton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 10 04 112 27 44 7/23/2002 21 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 23 Subreach between numbers NB and M9 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ³ 500 Jumeach between numbers M1 43 05 40 112 31 07 7/25/2002 3 ³ 500 Jumeach between numbers M1 43 04 05 112 33 00 7/25/2002 3 ³ 500 Jumeach between numbers M1 3 ³ 20 Subreach between numbers M1 <th< td=""><td>Watson Slough near Blackfoot</td><td>13062506</td><td>43 11 46</td><td>112 23 44</td><td>7/23/2002</td><td>DM</td><td>60</td></th<>	Watson Slough near Blackfoot	13062506	43 11 46	112 23 44	7/23/2002	DM	60
Riverton Ditch near Thomas 43 09 00 112 27 04 7/24/2002 2.4 Crawford Ditch near Thomas 43 10 04 112 27 44 7/23/2002 21 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 23 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ³ 500 Jeff Cabin Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 3 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 3 ³ 13 Creact Detweet	Parsons Ditch near Blackfoot	13062507	43 11 36	112 23 45	7/23/2002	DM	31
Crawford Ditch near Thomas 43 10 04 112 27 44 7/23/2002 21 Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 23 Subreach between numbers WB Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 40 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 375 Diggie Creek near Fort Hall 43 04 05 112 31 07 7/25/2002 313 Lutreach between numbers MU Subreach between numbers MU Greek near Fort Hall 43 04 05 112 31 07 7/25/2002 3500 If Cabin Creek near Fort Hall 375 Subreach between numbers MU 375 3500 If Cabin Creek near Fort Hall <td>Su</td> <td>breach betweer</td> <td>n map numbers</td> <td>M7 and M8</td> <td></td> <td></td> <td></td>	Su	breach betweer	n map numbers	M7 and M8			
Watson Slough return near Thomas 43 09 39 112 29 13 7/24/2002 23 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 3 ⁷ 5 Diggie Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 3 ⁷ 50 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 3 ³ 13 Furthers Furthers Furthers Furthers Mus Sough near Fort Hall 42 00 21 111 29 47 7/25/2002 3 ³ 20 Order Creek near Fort Hall 42 00 21 111 29 47 7/25/2002 3 ³ 20 Clear Creek near Fort Hall 43 02 23 112 32 33 7/25/2002 3 ³ 20 Subreact- Between 43 02 23 112 32 33 7/25/2002	Riverton Ditch near Thomas		43 09 00	112 27 04	7/24/2002		2.4
Subreach between pumbers W and M9 Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thoma 43 08 04 112 30 54 7/24/2002 1 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 ³ 75 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Comment Tothe The The The The The The The The The T	Crawford Ditch near Thomas		43 10 04	112 27 44	7/23/2002		21
Blackfoot River near Blackfoot 13068500 43 07 50 112 28 35 7/23/2002 DM 40 Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Subreach between numbers M9 and M10 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 ³ 75 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Corr 43 04 05 112 33 00 7/25/2002 ³ 13 Miscellaneous near Fort Hall Miscellaneous agriculture return near Tort Hall -	Watson Slough return near Thomas		43 09 39	112 29 13	7/24/2002		23
Miscellaneous agriculture return near Thomas 43 08 04 112 30 54 7/24/2002 1 Subreach between map numbers M9 and M10 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 375 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 3500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 3500 Jubreach between map numbers M10 Subreach between map numbers M10 C Subreach between map numbers M10 C C 310 Subreach between map numbers M10 C C C Colspan="4">C C C C 3500 Subreach between map numbers M10 C C C C C C C C C	Su	breach betweer	n map numbers	M8 and M9			
Subreach between numbers M9 and M10 Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 ³ 75 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Subreach between numbers M10 43 04 05 112 33 00 7/25/2002 ³ 13 Subreach between numbers M10 320	Blackfoot River near Blackfoot	13068500	43 07 50	112 28 35	7/23/2002	DM	40
Mud Slough near Fort Hall 43 05 40 112 31 04 7/25/2002 ³ 75 Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Subreach between map numbers M10 and M11 Subreach between map numbers M10 and M11	Miscellaneous agriculture return near Thomas		43 08 04	112 30 54	7/24/2002		1
Diggie Creek near Fort Hall 43 05 43 112 31 07 7/25/2002 ³ 500 Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Subreach between map numbers M10 and M11 ³ 13 Subreach between map numbers M10 and M11 Subreach between map numbers M11 and M12 Ross Fork near Fort Hall 42 00 21 111 29 47 7/25/2002 ³ 20 Clear Creek near Fort Hall 43 02 23 112 32 33 7/25/2002 ³ 28 Spring Creek near Fort Hall 13075983 43 02 36 112 33 15 7/24/2002 DM ³ 272 McTucker Creek Springfield 43 02 05 112 38 36 7/24/2002 250	Sul	breach between	map numbers N	M9 and M10			
Jeff Cabin Creek near Fort Hall 43 04 05 112 33 00 7/25/2002 ³ 13 Subreach between map numbers M10 and M11 3 ³ 13 Subreach between map numbers M10 and M11							

Table B16. Discharge data for all inspected inflow and outflow sites during July 23-24, 2002, for the
Snake River between Shelley and Minidoka Dam, IdahoContinued

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
Danielson Creek near Springfield		43 03 32	112 41 27	7/24/2002		10
Sterling Waste near Sterling	13069548	43 01 49	112 43 40	7/24/2002		³ 1
Unnamed Spring near Sterling		43 03 37	112 43 19	7/24/2002		³ 2
Crystal Springs near Sterling		43 02 52	112 40 53	7/24/2002		³ 37
Unnamed Spring near Sterling		42 59 39	112 45 37	7/24/2002		³ 1
Unnamed Spring near Sterling		43 02 39	112 39 09	7/24/2002		³ 12
Bannock Creek near Michaud		42 53 12	112 38 35	7/25/2002		30
Aberdeen Waste Drain near Aberdeen	13069565	42 55 27	112 43 39	7/24/2002		41
Tarter Waster near American Falls	13076210	42 52 40	112 51 23	7/24/2002		3
Seagull Bay near American Falls		42 49 24	112 47 45	7/25/2002		3
Sunbeam near American Falls		42 47 55	112 50 53	7/25/2002		3
Spring Hallow near American Falls		42 48 39	112 53 30	7/25/2002		³ 1
Falls Irrigation Pump near American Falls	13076400	42 46 46	112 52 22	7/24/2002	DM	96
	Subreach between	map numbers N	412 and M13			
Ferry Hallow near Neeley		42 45 43	112 52 57	7/24/2002		0
Warm Creek near Neeley		42 44 01	112 54 25	7/24/2002		1.5
Little Creek near Neeley		42 42 47	112 55 53	7/24/2002		1.0
	Subreach between	map numbers N	413 and M14			
Rock Creek near Rockland	13077650	42 39 10	113 01 00	7/24/2002		20
Dry Hallow Creek near Rockland		42 38 40	113 01 57	7/24/2002		0
	Subreach between	map numbers N	414 and M15			
Little Warm Creek near Cold Water		43 38 07	113 03 43	7/24/2002		2.5
Fall Creek near Cold Water		43 37 36	113 05 05	7/24/2002		24
Lanes Gulch near Cold Water		42 37 10	113 07 11	7/24/2002		0
	Subreach between	map numbers N	415 and M16			
Raft River near Yale		42 35 50	113 14 19	7/24/2002		0
Minidoka Northside Canal near Minidoka	13080000	42 40 15	113 29 00	7/24/2002	DM	942
Minidoka Southside Canal near Minidoka	13080500	42 39 45	113 29 20	7/24/2002	DM	869

¹ Long-term United States Geological Survey gaging stations are in bold. ² Values in shaded areas indicate canal withdrawals. ³ Surface flows resulting from spring discharge; not used in gain/loss calculations.





Mon							Total	Gains/
number	Gaging station name (number) ¹ /	River 		Discharge	ļ	i	gams/ (losses)	per mile
(IIG. #)	ADCP/ADP measurement location Snoth Diron unon Shollon (13060000)	107 0		(II /S)	11 /5 /2007	1 IIIIe	(II /S)	(III /S/III)
III	SHAKE MACT HEAT SHELLEY (ISUUUUUU)	0.101		0007	7007/0/11	C100		
			total estimated inflow	0				
			total estimated outflow	9				
M2	Snake River at Shelley Bridge near Shelley	782.3		2200	11/5/2002	1001	(424)	(11)
			total estimated inflow	0				
			total estimated outflow	16				
M3	Snake River at Firth	777.3		2440	11/5/2002	1258	256	51
			total estimated inflow	0				
			total estimated outflow	8				
M4	Snake River at Kennedy Road near Firth	773.1		2310	11/5/2002	1130	(122)	(29)
			total estimated inflow	38				
			total estimated outflow	18				
M5	Snake River at Porterville Bridge near Blackfoot	767.5		2280	11/5/2002	1219	(50)	(6)
			total estimated inflow	0				
			total estimated outflow	0				
MG	Cardro Divon of Diadefood (12063500)	7643		2140	11/5/2002	1330	(140)	(44)
0IVI	SHAKE KIVEF AL DIACKLOOL (LJUUZJUU)	C.+0/		2100	11/5/2002	1230		
			total estimated inflow	0				
			total estimated outflow	S				
М7	Snake River near Riverside	760.2		2060	11/5/2002	1406	(35)	(6)
			total estimated inflow	1				
			total estimated outflow	0				
M8	Snake River near Thomas	753.5		2060	11/5/2002	1456	(1)	0
			total estimated inflow	73				
			total estimated outflow	0				
MO	Canka Divor noor Blockfoot (13060500)	750.1		1900	11/5/2002	1615	(233)	(69)
	DHARE MIYEL HEAL DIACKNOUL (12007200)	1.001		2060	11/6/2002	0630		
			total estimated inflow	0				
			5 	c				

Map number	Gaging station name (number) ¹ /	River		Discharge			Total gains/ (losses)	Gains/ (losses) per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
M10	Snake River near Pingree	743.3		2430	11/6/2002	1355	370	54
			total estimated inflow	0				
			total estimated outflow	0				
M11	Snake River above McTucker Creek near Pingree	738		2550	11/6/2002	1224	120	23
			total estimated inflow	421				
			total estimated outflow	0				
			estimated outflow to storage					
			above American Falls Dam ²	4300				
M17	Snake River of Neeley (13077000)	1 117		367	11/7/2002	0830	2186	61
7114	DIAKE MAYET AL INCERCY (LOUV)	/14.1		415	11/6/2002	0545		
			total estimated inflow	1				
			total estimated outflow	0				
M13	Snake River above Massacre Rocks near Neeley	7.707		538	11/6/2002	0855	122	19
			total estimated inflow	20				
			total estimated outflow	0				
M14	Snake River at Register Rock near Cold Water	702.5		509	11/6/2002	0720	(49)	(6)
			total estimated inflow	24				
			total estimated outflow	0				
M15	Snake River above Raft River near Yale	694		1110	11/6/2002	1046	577	68
			total estimated inflow	0				
			total estimated outflow	0				
			estimated outflow to storage above Minidoka Dam ²	C				
				0				
M16	Snake River near Minidoka (13081500)	673.5		585	11/6/2002	2045	(525)	(26)

Table B18. Gaging station discharge data during November 5-6, 2002, for the Snake River betweenShelley and Minidoka Dam, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
M1	Snake River near Shelley (13060000)	11/5/2002	0815	2630
M6	Snake River at Blackfoot (13062500)	11/5/2002 11/5/2002	1330 1230	2140 2100
M9	Snake River near Blackfoot (13069500)	11/5/2002 11/6/2002	1615 0630	1900 2060
M12	Snake River at Neeley (13077000)	11/7/2002 11/6/2002	0830 0545	367 415
M16	Snake River near Minidoka (13081500)	11/6/2002	2045	585

[Discharge given in cubic feet per second]

Table B19. Acoustic Doppler discharge measurement data during November 5-6, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; σ , standard deviation; μ , mean; ---, no data]

Map number					_
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^σ / _μ)
M2	Snake River at Shelley Bridge near Shelley	11/5/2002	1001	2200	0.09
M3	Snake River at Firth	11/5/2002	1258	2440	0.10
M4	Snake River at Kennedy Road near Firth	11/5/2002	1130	2310	0.03
M5	Snake River at Porterville Bridge near Blackfoot	11/5/2002	1219	2280	0.01
M7	Snake River near Riverside	11/5/2002	1406	2060	0.02
M8	Snake River near Thomas	11/5/2002	1456	2060	0.03
M10	Snake River near Pingree	11/6/2002	1355	2430	0.01
M11	Snake River above McTucker Creek near Pingree	11/6/2002	1224	2550	0.03
M13	Snake River above Massacre Rocks near Neeley	11/6/2002	855	538	0.08
M14	Snake River at Register Rock near Cold Water	11/6/2002	720	509	0.12
M15	Snake River above Raft River near Yale	11/6/2002	1046	1110	0.18

Table B20. Discharge data for all inspected inflow and outflow sites during November 4-7, 2002, for the Snake River between Shelley and Minidoka Dam, Idaho

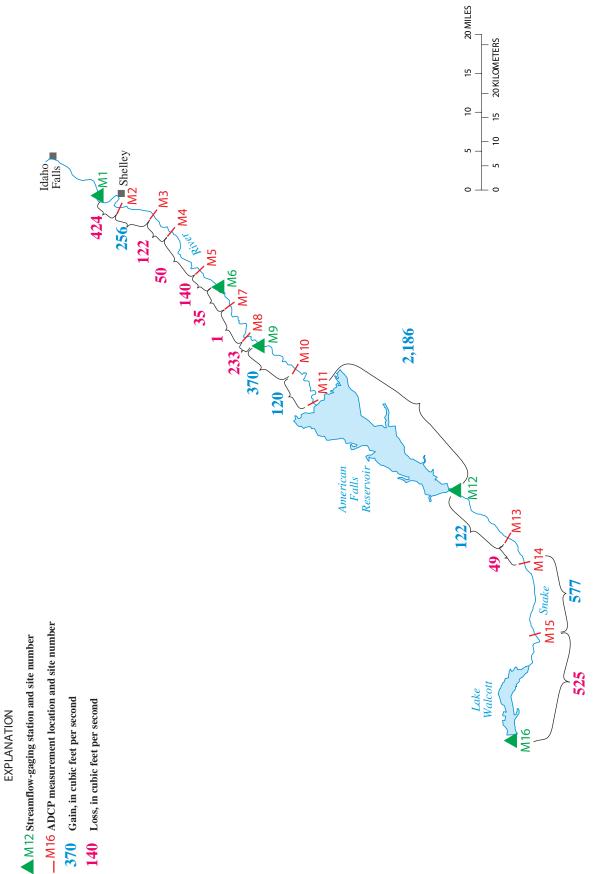
in cubic reet per second, map numbers shown in r	Station		ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	ubreach between	map numbers	-			8
Miscellaneous agriculture return near Woodville		43 24 38	112 09 19	11/6/2002	1240	0
Miscellaneous agriculture return near Woodville		43 24 57	112 08 48	11/6/2002	1245	0
Shull Lateral near Shelley		43 24 26	112 08 00	11/6/2002	1205	0
Reservation Canal near Shelley	13060500	43 22 24	112 09 13	11/6/2002	1225	6
Miscellaneous agriculture return near Shelley		43 22 42	112 10 11	11/6/2002	1235	0
S	ubreach between	map numbers	M2 and M3			
Miscellaneous agriculture return near Shelley		43 22 26	112 10 11	11/6/2002	1230	0
Blackfoot Canal near Shelley	13061430	43 21 18	112 09 53	11/5/2002	DM	16
S	ubreach between	map numbers	M3 and M4			
New Lavaside Canal near Firth	13061520	43 18 30	112 12 09	11/5/2002	DM	8
Peoples Canal near Firth	13061525	44 18 31	113 12 10	11/5/2002	DM	0
Aberdeen Springfield Canal near Firth	13061610	43 17 37	112 13 13	11/6/2002	DM	0
S	ubreach between	map numbers	M4 and M5			
Aberdeen Springfield Waste near Kimball		43 16 49	112 15 16	11/5/2002		33
Corbett Slough Canal near Kimball	13061650	43 15 40	112 15 30	11/6/2002	DM	0
Neilson-Hanson Canal near Kimball	13061670	43 15 29	112 17 07	11/5/2002		17
Miscellaneous agriculture return near Wapello		43 14 47	112 17 58	11/6/2002		5
Riverside Canal near Rose	13061705	43 15 47	112 18 07	11/5/2002	DM	1
Lavaside and Riverside return near Rose		43 14 05	112 19 31	11/5/2002		0
S	ubreach between	map numbers	M5 and M6			
Miscellaneous agriculture return near Blackfoot		43 13 36	112 19 50	11/6/2002		0
Danskin Canal near Blackfoot	13061995	43 13 28	112 20 12	11/6/2002	DM	0
Miscellaneous agriculture return near Blackfoot		43 13 12	112 20 31	11/6/2002		0
Miscellaneous agriculture return at Blackfoot		43 12 12	112 22 12	11/5/2002		0
S	ubreach between	map numbers	M6 and M7			
Trego Canal near Blackfoot	13062050	43 12 05	112 22 00	11/6/2002	DM	0
Wearyrick Canal near Blackfoot	13062503	43 11 51	112 22 36	11/6/2002	DM	1
Watson Slough near Blackfoot	13062506	43 11 46	112 23 44	11/6/2002	DM	3
Parsons Ditch near Blackfoot	13062507	43 11 36	112 23 45	11/6/2002	DM	1
S	ubreach between	map numbers				
Riverton Ditch near Thomas		43 09 00	112 27 04	11/6/2002		0
Crawford Ditch near Thomas		43 10 04	112 27 44	11/6/2002		0
Watson Slough return near Thomas		43 09 39	112 29 13	11/6/2002		1
	ubreach between					
Blackfoot River near Blackfoot	13068500	43 07 50	112 28 35	11/5/2002	DM	73
Miscellaneous agriculture return near Thomas		43 08 04	112 30 54	11/6/2002		0
	breach between	-				350
Mud Slough near Fort Hall		43 05 40	112 31 04	11/5/2002		³ 50
Diggie Creek near Fort Hall		43 05 43	112 31 07	11/5/2002	1605	³ 175
Jeff Cabin Creek near Fort Hall		43 04 05	112 33 00	11/7/2002		³ 18
	breach between	-				
	breach between	map numbers N 42 00 21		11/7/2002		³ 9
Ross Fork near Fort Hall			111 29 47	11/7/2002		³ 24
Clear Creek near Fort Hall		43 02 23	112 32 33	11/7/2002	 DM	²⁴ ³ 308
Spring Creek near Fort Hall	13075983	43 02 36	112 33 15	11/6/2002	DM	³ 08
McTucker Creek Springfield		43 02 05	112 38 36	11/6/2002	 DM	
Portneuf River near Tyhee	13075910	42 56 42	112 32 38	11/6/2002	DM	397

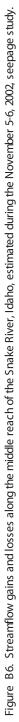
Table B20. Discharge data for all inspected inflow and outflow sites during November 4-7, 2002, for the
Snake River between Shelley and Minidoka Dam, IdahoContinued

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
Danielson Creek near Springfield		43 03 32	112 41 27	11/6/2002		³ 48
Sterling Waste near Sterling	13069548	43 01 49	112 43 40	11/6/2002		³ 5
Unnamed Spring near Sterling		43 03 37	112 43 19	11/6/2002		³ 1
Crystal Springs near Sterling		43 02 52	112 40 53	11/6/2002		³ 62
Unnamed Spring near Sterling		42 59 39	112 45 37	11/6/2002		³ 0
Unnamed Spring near Sterling		43 02 39	112 39 09	11/6/2002		³ 12
Bannock Creek near Michaud		42 53 12	112 38 35	11/7/2002		21
Aberdeen Waste Drain near Aberdeen	13069565	42 55 27	112 43 39	11/6/2002		2
Tarter Waster near American Falls	13076210	42 52 40	112 51 23	11/6/2002		0
Seagull Bay near American Falls		42 49 24	112 47 45	11/7/2002		1
Sunbeam near American Falls		42 47 55	112 50 53	11/7/2002		0
Spring Hallow near American Falls		42 48 39	112 53 30	11/7/2002		³ 1
Falls Irrigation Pump near American Falls	13076400	42 46 46	112 52 22	11/7/2002	DM	0
	Subreach between	map numbers N	412 and M13			
Ferry Hallow near Neeley		42 45 43	112 52 57	11/4/2002		0
Warm Creek near Neeley		42 44 01	112 54 25	11/4/2002		1.0
Little Creek near Neeley		42 42 47	112 55 53	11/4/2002		.5
	Subreach between	map numbers N	413 and M14			
Rock Creek near Rockland	13077650	42 39 10	113 01 00	11/4/2002		20
Dry Hallow Creek near Rockland		42 38 40	113 01 57	11/4/2002		0
	Subreach between	map numbers N	414 and M15			
Little Warm Creek near Cold Water		43 38 07	113 03 43	11/4/2002		.8
Fall Creek near Cold Water		43 37 36	113 05 05	11/4/2002		24
Lanes Gulch near Cold Water		42 37 10	113 07 11	11/4/2002		0
	Subreach between	map numbers N	415 and M16			
Raft River near Yale		42 35 50	113 14 19	11/4/2002		0
Minidoka Northside Canal near Minidoka	13080000	42 40 15	113 29 00	11/6/2002	DM	0
Minidoka Southside Canal near Minidoka	13080500	42 39 45	113 29 20	11/6/2002	DM	0

¹ Long-term United States Geological Survey gaging stations are in bold. ² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.





Spring 2001

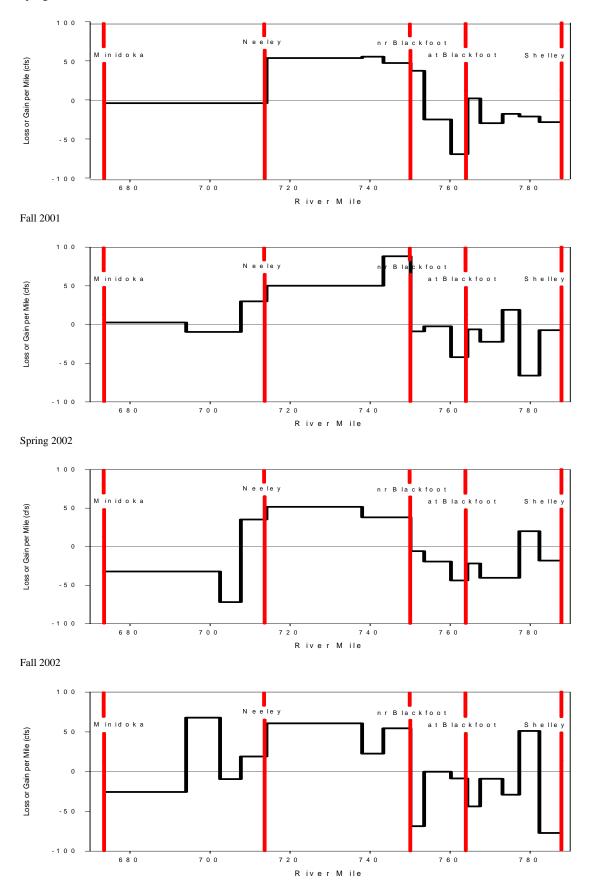


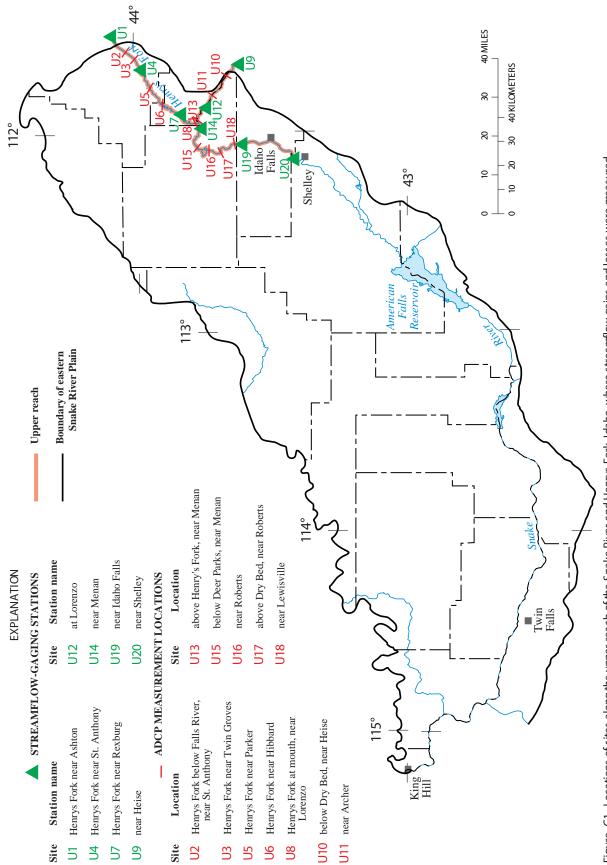
Figure B7. Summary plots of estimated gains and losses in specified subreaches of the Snake River between Shelley and Minidoka Dam, Idaho

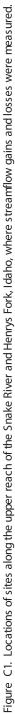




APPENDIX C

Gain and loss calculations and relevant data for the Henrys Fork and Snake River between Ashton and the mouth and Heise and Shelley, Idaho





numberGaging station name (number) ¹ / (fig. #)River mileU1Henrys Fork near Ashton (13046000)44.2U2Henrys Fork near Ashton (13046000)38.5U3Henrys Fork near Ashton (13046000)33.5U3Henrys Fork near Twin Groves35.6U4Henrys Fork near Twin Groves32.4U5Henrys Fork near St Anthony (13050500)32.4U5Henrys Fork near Parker25.6U5Henrys Fork near Parker25.6U6Henrys Fork near Parker25.6U7Henrys Fork near Resburg (13056500)9.2		Map			Total gains/	Gains/ (losses)
ADCP/ADP measurement location Henrys Fork near Ashton (13046000) Henrys Fork near Twin Groves Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)		Discharge			(losses)	per mile
Henrys Fork near Ashton (13046000) Henrys Fork below Falls River, near Ashton Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	mile	(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
Henrys Fork below Falls River, near Ashton Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Parker Henrys Fork near Rexburg (13056500)	44.2	787	10/29/2001	0645		
Henrys Fork below Falls River, near Ashton Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Parker Henrys Fork near Rexburg (13056500)	total estimated inflow	391				
Henrys Fork below Falls River, near Ashton Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated outflow	9				
Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	38.5	1240	10/29/2001	0630	68	12
Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated inflow	0				
Henrys Fork near Twin Groves Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated outflow	4				
Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	35.6	1190	10/29/2001	1200	(9)	(2)
Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated inflow	0				
Henrys Fork near St Anthony (13050500) Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated outflow	8				
Henrys Fork near 51 Antiony (120202000) Henrys Fork near Hibbard Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)		1120	10/29/2001	1330	14	4
Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	1.70	1120	10/29/2001	1045		
Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated inflow	0				
Henrys Fork near Parker Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated outflow	80				
Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	25.6	1000	10/29/2001	1400	(40)	(9)
Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated inflow	113				
Henrys Fork near Hibbard Henrys Fork near Rexburg (13056500)	total estimated outflow	0				
Henrys Fork near Rexburg (13056500)	19.0	1020	10/29/2001	1530	(93)	(14)
Henrys Fork near Rexburg (13056500)	total estimated inflow	35				
Henrys Fork near Rexburg (13056500)	total estimated outflow	0				
DEBLYS FOR READING (LOUSOSOO)	ç	1000	10/29/2001	2015	(55)	(9)
	7.6	985	10/30/2001	0430		
	total estimated inflow	89				
	total estimated outflow	0				
U8 Henrys Fork at mouth, near Lorenzo 0.2	0.2	2	!	1	1	1

Map				-			Total gains/	Gains/ (losses)
number (fig. #)	Gaging station name (number) ¹ / ADCP/ADP measurement location	River mile		Discharge (ft ³ /s)	Date	Time	(losses) (ft ³ /s)	per mile (ft ³ /s/mi)
60	Snake near Heise (13037500)	853.6		1400	10/30/2001	0630		
			total estimated inflow	2				
			total estimated outflow	363				
U10	Snake River below Dry Bed, near Heise	849.5		1050	10/30/2001	0830	11	ω
			total estimated inflow	0				
			total estimated outflow	5				
UII	Snake River near Archer	842.8		787	10/30/2001	1015	(258)	(39)
			total estimated inflow	0				
			total estimated outflow	0				
	(0020C0C1)	0 200		641	10/30/2001	1245	(146)	(30)
710	CINAKE KUVEF AL LOFENZO (LJUZOZUVU)	6.100		641	10/30/2001	0545		
			total estimated inflow	0				
			total estimated outflow	0				
U13	Snake River above Henrys Fork, near Menan	832.5		2	1	1	ł	1
			Henrys Fork estimated inflow	1074				
			total estimated inflow	17				
			total estimated outflow	0				
1114	Snake River near Menan (13057000)	830.0		2050	10/30/2001	0945	³ 319	19
-				2050	10/30/2001	0945		
			total estimated inflow	0				
			total estimated outflow	0				
U15	Snake River below Deer Parks, near Menan	822.5		2000	10/30/2001	1330	(50)	(2)
			total estimated inflow	32				
			total estimated outflow	0				
U16	Snake River near Roberts	815.3		2020	10/30/2001	1145	(12)	(2)
			total estimated inflow	0				
			total estimated outflow	0				
U17	Snake River above Dry Bed, near Roberts	811.9		2050	10/30/2001	1515	30	6
			total estimated inflow	135				
				4				

Table C1. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during October 29-31, 2001, between Heise and Shelley and Ashton and the mouth, Idaho--Continued

r Gaging station name (number) ¹ / ADCP/ADP measurement location				gains/	Gains/ (losses)
uc	Discharge	rge		(losses)	per mile
	(ft ³ /s)) Date	Time	(ft ³ /s)	(ft ³ /s/mi)
UIS Shake Kiver near Lewisville	2210	10/30/2001	1615	30	5
total es	total estimated inflow (
total est	total estimated outflow (
	2070	10/30/2001	1645	(140)	(108)
U19 Snake River near Idaho Falls (13057155) 805.0	2380	10/16 - 11/14/2001	30-day average		
total ex	total estimated inflow (
total est	total estimated outflow				
U20 Snake River near Shelley (13060000) 787.8	2410	10/16 - 11/14/2001	30-day average	30	5

Table C1. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during October 29-31, 2001, between

 3 Includes gain/loss between Henrys Fork near Rexburg and Henrys Fork at mouth.

Table C2. Gaging station discharge data during October 29-31, 2001, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
U1	Henrys Fork near Ashton (13046000)	10/29/2001	0645	787
U4	Henrys Fork near St Anthony (13050500)	10/29/2001 10/29/2001	1330 1045	1120 1120
U7	Henrys Fork near Rexburg (13056500)	10/29/2001 10/30/2001	2015 0430	1000 985
U9	Snake near Heise (13037500)	10/30/2001	0630	1400
U12	Snake River at Lorenzo (13038500)	10/30/2001 10/30/2001	1245 0545	641 641
U14	Snake River near Menan (13057000)	10/30/2001 10/30/2001	0945 0945	2050 2050
U19	Snake River near Idaho Falls (13057155)	10/30/2001 10/16 - 11/14/2001	1645 30-day average	2070 2380
U20	Snake River near Shelley (13060000)	10/16 - 11/14/2001	30-day average	2410

[Discharge given in cubic feet per second]

Table C3. Acoustic Doppler discharge measurement data during October 29-31, 2001, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

 $[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; <math>\sigma$, standard deviation; μ , mean; ---, no data]

Map number					COT (III)
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV ([•] / _µ)
U2	Henrys Fork below Falls River, near Ashton	10/29/2001	0930	1240	0.10
U3	Henrys Fork near Twin Groves	10/29/2001	1200	1190	0.02
U5	Henrys Fork near Parker	10/29/2001	1400	1000	0.04
U6	Henrys Fork near Hibbard	10/29/2001	1530	1020	0.04
U8	Henrys Fork at mouth, near Lorenzo	1			
U10	Snake River below Dry Bed, near Heise	10/30/2001	0830	1050	0.07
U11	Snake River near Archer	10/30/2001	1015	787	0.04
U13	Snake River above Henrys Fork, near Menan	1			
U15	Snake River below Deer Parks, near Menan	10/30/2001	1330	2000	0.07
U16	Snake River near Roberts	10/30/2001	1145	2020	0.05
U17	Snake River above Dry Bed, near Roberts	10/30/2001	1515	2050	0.03
U18	Snake River near Lewisville	10/30/2001	1615	2210	0.05

¹ Did not measure, measured during subsequent seepage runs.

Table C4. Discharge data for all inspected inflow and outflow sites during October 29-31, 2001, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwe	en map number	rs U1 and U2			
Arcadia Canal return near Ashton				10/29/2001		0
Snow Creek near Ashton		44 04 17	111 31 33	10/29/2001		4.5
Black Spring near Ashton		44 02 59	111 32 20	10/29/2001		³ 10.1
Sand Creek near Ashton				10/29/2001		0
Farmers Own return near Ashton		44 02 32	111 32 20	10/29/2001		0
Unnamed tributary near Ashton		44 01 40	111 32 57	10/29/2001		1.4
Falls River Diversion return near Ashton		44 01 40	111 33 20	10/29/2001		2.2
Falls River near Chester	13049500	44 01 06	111 33 57	10/29/2001	DM	383
Dewey Canal near Chester	13046310	44 01 12	111 34 56	10/29/2001	DM	6
	Subreach betwe	en map number	s U2 and U3			
Last Chance Canal near Chester	13049550	44 01 01	111 35 10	10/29/2001	DM	0
Cross Cut Canal near Chester	13049560	44 00 58	111 34 57	10/29/2001	DM	44
	Subreach betwe	en map number				
Farmers Friend Canal near Twin Groves	13049705	43 58 29	111 39 02	10/29/2001	DM	20
Twin Groves Canal near Twin Groves	13049710	43 57 21	111 40 05	10/29/2001	DM	0
St Anthony Union Canal near Twin Groves	13049725	43 58 19	111 38 27	10/29/2001	DM	0
Salem Union Canal near St. Anthony	13049805	43 58 20	111 39 01	10/29/2001	DM	64
	Subreach betwe	en map number	rs U4 and U5			
Egin Canal near St. Anthony	13050525	43 57 56	111 41 23	10/29/2001	DM	3
St Anthony Union Feeder near St. Anthony	13050530	43 57 38	111 41 59	10/29/2001	DM	0
ndependent Canal near St. Anthony	13050535	43 57 29	111 42 21	10/29/2001	DM	4
Consolidated Farmers Canal near Parker	13050545	43 53 54	111 46 47	10/29/2001		73
Unnamed tributary near Parker				10/29/2001		0
	Subreach betwe	en map number	s U5 and U6			
Roxana Canal return near Teton		43 53 55	111 48 31	10/29/2001		5.2
North Fork Teton River at Teton	13055198	43 53 53	111 40 38	10/29/2001	DM	108
	Subreach betwe	en map number	s U6 and U7			
Feton Island Canal return near Teton		43 50 31	111 49 05	10/29/2001		0
Unnamed tributary near Teton		43 51 31	111 51 29	10/29/2001		0
Island Ward Canal return near Rexburg		43 51 18	111 51 28	10/29/2001		0
Clements Spori Ditch near Rexburg		43 50 26	111 51 11	10/29/2001		0
South Fork Teton River near Rexburg	13055340	43 50 07	111 46 38	10/29/2001	DM	35
St Anthony / Independent return near Rexburg				10/29/2001		0
	Subreach betwe	en map number	s U7 and U8			
Rexburg Canal return near Rexburg		43 48 55	111 53 15	10/30/2001		29.3
Fexas Slough Canal return near Rexburg		43 48 00	111 54 48	10/30/2001		0
Fexas Slough near Rexburg		43 47 17	111 53 45	10/30/2001		52.5
Liberty Parks Canal return near Rexburg		43 47 24	111 55 27	10/30/2001		0
Bannock Jim Slough near Rexburg		43 46 30	111 56 11	10/30/2001		6.8
	Subreach betwee	en map numbers	s U9 and U10			
Anderson Canal near Heise	13037505	43 36 54	111 39 37	10/30/2001	DM	0
Eagle Rock Canal near Heise	13037975	43 37 48	111 40 48	10/30/2001	DM	0
Farmers Friend Canal near Heise	13037980	43 37 47	111 41 29	10/30/2001	DM	0
Enterprise Canal near Heise	13037985	43 37 49	111 41 29	10/30/2001	DM	0
Dry Bed near Ririe	13038000	43 38 21	111 42 55	10/30/2001	DM	363
Kelly Canyon near Heise		43 37 44	111 39 40	10/30/2001		2.0
Hawley Warm Spring near Heise		43 38 56	111 42 15	10/30/2001		³ .5
Sunnydell Canal near Sunnydell ⁴	13038392	43 38 56	111 42 17	10/30/2001	DM	0

	Station	Loc	cation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	5 U10 and U11			
Lenroot Canal near Archer	13038426	43 41 18	111 46 40	10/30/2001	DM	5
Reid Canal near Archer	13038431	43 42 04	111 48 05	10/30/2001	DM	0
	Subreach betwee	n map numbers	5 U11 and U12			
Texas & Liberty Canal near Lorenzo	13038434	43 43 06	111 49 37	10/30/2001	DM	0
Bannock Jim Slough near Lorenzo	13038435	43 43 16	111 50 09	10/30/2001	DM	0
	Subreach betwee	n map numbers	5 U12 and U13			
	Subreach betwee	n map numbers	5 U13 and U14			
Annis Slough near Menan		43 44 46	111 56 37	10/30/2001		6.4
Scotts Slough near Menan		43 44 32	111 58 20	10/30/2001		10.1
	Subreach betwee	n map numbers	5 U14 and U15			
Butte & Market Lake Canal	13057025	43 45 13	111 58 51	10/30/2001	DM	0
	Subreach betwee	n map numbers	5 U15 and U16			
Big Six Canal return near Roberts		43 44 21	112 04 43	10/30/2001		0
Spring Creek near Roberts		43 43 15	112 04 21	10/30/2001		32.1
	Subreach betwee	n map numbers	5 U16 and U17			
	Subreach betwee	n map numbers	5 U17 and U18			
Dry Bed near Roberts		43 42 11	112 04 13	10/30/2001		135
South Parks Canal return near Roberts		43 41 19	112 03 47	10/30/2001		0
Butte Market Lake Canal return near Roberts		43 39 20	112 05 27	10/30/2001		0
Great Western Canal near Lewisville ⁴	13057135	43 34 48	112 04 12	10/30/2001	DM	5
Idaho Canal near Lewisville	13057145	43 46 48	112 03 00	10/30/2001	DM	0
	Subreach betwee	n map numbers	5 U18 and U19			
Burgess Canal Drain near Idaho Falls	13057100	43 37 00	112 03 03	10/30/2001	DM	0
	Subreach betwee	n map numbers	s U19 and U20			
North Willow Creek near Idaho Falls		43 30 42	112 03 04	10/30/2001		0
Porter Canal near Idaho Falls ⁴	13057250	43 30 00	112 03 00	10/30/2001	DM	0
South Willow Creek near Idaho Falls		43 30 04	112 02 35	10/30/2001		0
Woodville Canal near Idaho Falls	13059505	43 25 48	112 06 00	10/30/2001	DM	0
Snake River Valley Canal near Idaho Falls	13059525	43 27 00	112 04 48	10/30/2001	DM	0

Table C4. Discharge data for all inspected inflow and outflow sites during October 29-31, 2001, for the

 Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho--Continued

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Actual canal discharge; spillback portion was accounted for.

EXPLANATION

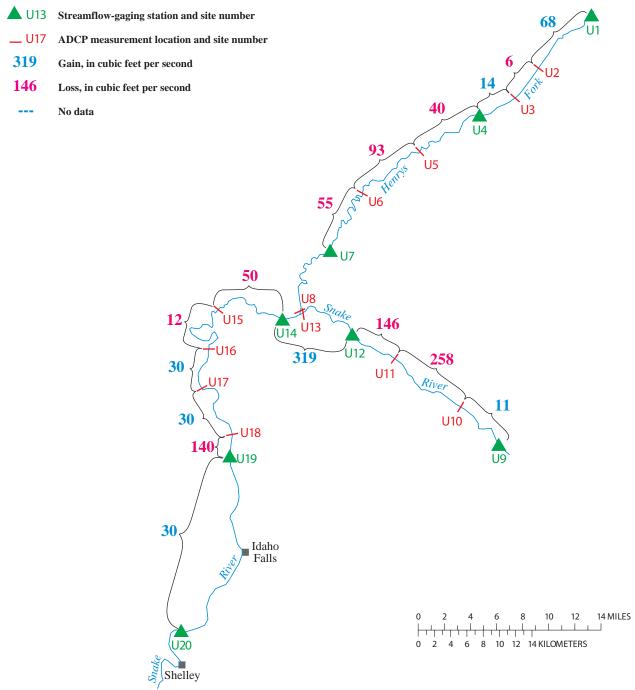


Figure C2. Streamflow gains and losses along the upper reach of the Snake River and Henrys Fork, Idaho, estimated during the October 29–31, 2001, seepage study.

Gapting station rank (number)1River mileDisplay $Pare(T^3 s)$ $ParePare(T^3 s)Pare(T^3 s)Pare$								Total	
\overrightarrow{OCP} (ADP measurement locationmile(T_3^{1})DateTime(T_3^{1})Henrys Fork mear Ashton (1304600)442100483100483100Henrys Fork mear Ashton (1304600)4420tal estimated inflow683074720Henrys Fork helow Falls River, near Ashton38.5total estimated inflow22074720Henrys Fork helow Falls River, near Ashton38.5total estimated inflow22074720Henrys Fork helow Falls River, near Ashton35.6total estimated inflow22074720Henrys Fork mear St Anthony (130500)32.4total estimated inflow3614.8200203021Henrys Fork mear St Anthony (130500)32.4total estimated inflow3614.8200203021Henrys Fork mear St Anthony (130500)32.4total estimated inflow4.8200203021Henrys Fork mear Parker25.6total estimated inflow1104.82002103021Henrys Fork mear Hithburd190total estimated inflow1104.82002171520Henrys Fork mear Rechurg (13056300)92total estimated inflow1304.82002171520Henrys Fork mear Rechurg (13056300)92total estimated inflow1304.820021715217Henrys Fork mear Rechurg (13056300)92total estimated inflow1304.820021715217Henrys Fork mear Rechurg (13056300)92total estimated inflo	Map number	Gaging station name (number) ¹ /	River		Discharge			gains/ (losses)	Gains/ (losses) per mile
Hearys Fork near Ashton (1304600) 4.2 1.00 4.8.2002 650 Identys Fork near Ashton 38.5 total estimated inflow 3 $(142, 2002, 0.747)$ 20 Henrys Fork below Falls River, near Ashton 38.5 total estimated inflow 0 $(48, 2002, 0.747)$ 20 Henrys Fork below Falls River, near Ashton 38.5 total estimated inflow 0 $(48, 2002, 0.747)$ 20 Henrys Fork near Twin Groves 35.6 total estimated outflow 0 $(48, 2002, 0.856)$ (38) Henrys Fork near Twin Groves 35.6 total estimated outflow 0 $(48, 2002, 0.806)$ (30) Henrys Fork near Farlet $(31, 0.65600)$ $(32, 0.74)$ $(32, 0.74)$ (38) (38) Henrys Fork near Parket $(32, 0.74)$ $(33, 0.74)$ $(48, 2002, 0.800)$ (30) $(310, 0.74)$ Henrys Fork near Parket $(32, 0.74)$ $(33, 0.74)$ $(48, 2002, 0.74)$ (38) (38) Henrys Fork near Parket $(31, 0.76, 0.74)$ $(31, 0.76)$ $(48, 2002, 0.76)$ (36) (36) Henrys Fork near Rechurg (13065600) 926 $(148, 2002, 0.76)$ <th>(fig. #)</th> <th>ADCP/ADP measurement location</th> <th>mile</th> <th></th> <th>(ft³/s)</th> <th>Date</th> <th>Time</th> <th>(ft³/s)</th> <th>(ft³/s/mi)</th>	(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	UI	Henrys Fork near Ashton (13046000)	44.2		1100	4/8/2002	0200		
$ \begin{array}{llllllllllllllllllllllllllllllllllll$				total estimated inflow	683				
$ \begin{array}{llllllllllllllllllllllllllllllllllll$				total estimated outflow	ω				
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	U2	Henrys Fork below Falls River, near Ashton	38.5		1800	4/8/2002	0747	20	4
$\label{eq:heatTwinGroves} 35.6 \mbox{ coal estimated outflow} 22 \mbox{ coal estimated inflow} 0 \mbox{ coal estimated inflow} 0 \mbox{ coal estimated inflow} 36.1 \mbox{ coal estimated inflow} 0 co$				total estimated inflow	0				
$\label{eq:hearTwin Groves} 3.56 & 1740 & 48/2002 & 0856 & (38) \\ \mbox{tenrys Fork near St Anthony (13050500)} 3.24 & (cal estimated inflow 361 & 1.2 \\ \mbox{tenrys Fork near St Anthony (13050500)} 3.24 & (cal estimated inflow 361 & 1.2 \\ \mbox{tenrys Fork near St Anthony (13050500)} 3.24 & (cal estimated inflow 361 & 1.2 \\ \mbox{tenrys Fork near Parker} & 2.56 & (cal estimated inflow 362 & 1.2 \\ \mbox{tenrys Fork near Parker} & 2.56 & (cal estimated inflow 362 & 1.2 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.1 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.1 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.2 & 1.2 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.2 & 1.2 & 1.2 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.2 & 1.2 & 1.2 & 1.2 \\ \mbox{tenrys Fork near Hibbard} & 1.2 & (1.2 & 1.2 $				total estimated outflow	22				
$\label{eq:handle} \mbox{Henrys Fork near St Anthony (13050500)} 32.4 \mbox{tear Parker} 25.6 tear St Anthony (13010000000000000000000000000000000000$	U3	Henrys Fork near Twin Groves	35.6		1740	4/8/2002	0856	(38)	(13)
Henrys Fork near St Anthony (13050500) $3c_1$ 100 482002 1030 21 Henrys Fork near St Anthony (13050500) $3c_4$ 1400 482002 1030 21 Henrys Fork near St Anthony (13050500) $3c_4$ 1400 482002 1030 21 Henrys Fork near Barker 25.6 total estimated outflow $3c_2$ 1140 482002 1102 Henrys Fork near Hibbard 190 total estimated outflow 166 482002 112 Henrys Fork near Hibbard 190 total estimated outflow 0 482002 1228 (156) Henrys Fork near Hibbard 190 total estimated outflow 0 482002 1208 (156) Henrys Fork near Hibbard 190 total estimated outflow 0 482002 1030 (156) Henrys Fork near Rexburg (1305600) 9.2 total estimated outflow 0 482002 1030 (156) Henrys Fork an outh, near Lorenzo 0.2 1300 482002 1030 (27) Henrys Fork at nouth, near Lorenzo 0.2 1800 482002 1030 (27) Henrys Fork at nouth, near Lorenzo 0.2 1800 482002 1050 (75) Henrys Fork at nouth, near Lorenzo 0.2 1800 482002 1050 (77) Henrys Fork at nouth, near Lorenzo 0.2 1800 482002 1050 (75) Henrys Fork at nouth, near Lorenzo 0.2 1800 18200 1050 1715 <td></td> <td></td> <td></td> <td>total estimated inflow</td> <td>0</td> <td></td> <td></td> <td></td> <td></td>				total estimated inflow	0				
Henrys Fork near St Anthony (13050500) 32.4 482002 1030 4872002 1030 21 Henrys Fork near Parker 1390 4872002 1030 21 Henrys Fork near Parker 25.6 total estimated outflow 362 1110 112 Henrys Fork near Parker 25.6 total estimated outflow 362 1118 112 Henrys Fork near Hibbard 190 total estimated outflow 166 4872002 112 Henrys Fork near Hibbard 190 total estimated outflow 00 4872002 112 Henrys Fork near Reburg (13056500) 9.2 total estimated outflow 237 1150 4872002 1030 Henrys Fork near Near Lorenzo 9.2 total estimated outflow 25 1030 1150 1030 Henrys Fork an outh, near Lorenzo 02 1300 4872002 1030 1030 1030				total estimated outflow	361				
Tentrys Fork near St Antony (13056500) 2.4 1390 $4.8/2002$ 0800 Henrys Fork near Parker 25.6 total estimated outflow 362 112 Henrys Fork near Parker 25.6 total estimated inflow 166 $4.8/2002$ 1118 Henrys Fork near Hibbard 19.0 total estimated inflow 166 $4.8/2002$ 1118 112 Henrys Fork near Hibbard 19.0 total estimated inflow 0 $4.8/2002$ 1238 (156) Henrys Fork near Hibbard 19.0 total estimated inflow 0 237 $4.8/2002$ 1715 Henrys Fork near Rexburg (13056500) 9.2 total estimated inflow 0 $4.8/2002$ 1715 (27) Henrys Fork near Rexburg (13056500) 9.2 total estimated inflow 0 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1300 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1715 (27)	114	TT	, (1400	4/8/2002	1030	21	7
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	4	rentys fork near St Annouly (EDUSUSOU)	4.7C		1390	4/8/2002	0800		
Henrys Fork near Parkertotal estimated outflow 362 Henrys Fork near Parker 25.6 total estimated inflow 166 henrys Fork near Hibbard 19.0 total estimated inflow 166 Henrys Fork near Hibbard 19.0 total estimated inflow 237 Henrys Fork near Hibbard 19.0 total estimated inflow 237 Henrys Fork near Rexburg (13056300) 9.2 total estimated outflow 0 Henrys Fork near Rexburg (13056400) 9.2 total estimated outflow 1360 $4.8/2002$ 1715 Henrys Fork and thear Rexburg (13056400) 9.2 total estimated outflow 0 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1715 (27) Henrys Fork at mouth, near Lorenzo 0.2 1800 $4.8/2002$ 1656 (56)				total estimated inflow	0				
$ \begin{array}{llllllllllllllllllllllllllllllllllll$				total estimated outflow	362				
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	U5	Henrys Fork near Parker	25.6		1140	4/8/2002	1118	112	16
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$				total estimated inflow	166				
$ \begin{array}{ccccccc} \mbox{Henrys Fork near Hibbard} & 19.0 & 1150 & 4/8/2002 & 1228 & (156) \\ & total estimated inflow & 237 & & & & \\ & total estimated outflow & 0 & & & & & \\ & total estimated outflow & 0 & & & & & & & \\ & 1300 & 4/8/2002 & 1715 & & & & & \\ & total estimated inflow & & & & & & & & & \\ & total estimated outflow & & & & & & & & & & \\ & total estimated outflow & & & & & & & & & & & \\ & total estimated outflow & & & & & & & & & & & & & & & & & & \\ & total estimated outflow & & & & & & & & & & & & & & & & & & &$				total estimated outflow	0				
total estimated inflow237total estimated outflow0Henrys Fork near Rexburg (13056500)9.21360 $4/8/2002$ 1300 $4/8/2002$ 1715total estimated inflow25total estimated outflow0Henrys Fork at mouth, near Lorenzo0.20.213904/8/20021715total estimated outflow25total estimated outflow0total estimated outflow0total estimated outflow0total estimated outflow56	U6	Henrys Fork near Hibbard	19.0		1150	4/8/2002	1228	(156)	(24)
Henrys Fork near Rexburg (13056500) 9.2 total estimated outflow0Henrys Fork near Rexburg (13056500) 9.2 1360 $4/8/2002$ 1715 (27) total estimated inflow 25 1300 $4/8/2002$ 1030 Henrys Fork at mouth, near Lorenzo 0.2 0.2 1390 $4/8/2002$ 1456 65				total estimated inflow	237				
Henrys Fork near Rexburg (13056500) 9.2 1360 4/8/2002 1715 (27) Henrys Fork ar mouth, near Lorenzo 0.2 1300 4/8/2002 1030 Kenrys Fork at mouth, near Lorenzo 0.2 1300 4/8/2002 1456 65				total estimated outflow	0				
Henrys Fork at mouth, near Lorenzo 0.2 130 4/8/2002 1030 total estimated inflow 25 total estimated outflow 0 1390 4/8/2002 1456 65	<i>L</i> 11	Понтке Болі/ поот Вохінна (13056500)	0		1360	4/8/2002	1715	(27)	(3)
total estimated inflow 25 total estimated outflow 0 Henrys Fork at mouth, near Lorenzo 0.2 0.2 1456 65	5	(nocococi) Singy near the field of the field	7.6		1300	4/8/2002	1030		
total estimated outflow 0 Henrys Fork at mouth, near Lorenzo 0.2 0.2 1456 65				total estimated inflow	25				
Henrys Fork at mouth, near Lorenzo 0.2 0.2 1456 65				total estimated outflow	0				
	U8	Henrys Fork at mouth, near Lorenzo	0.2		1390	4/8/2002	1456	65	7

Table C5. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during April 8-9, 2002, between Heise and Shelley and Ashton and the mouth. Idaho

							Total	
Map				-			gains/	Gains/ (losses)
number	 Gaging station name (number)¹/ ADCD/ADD moscumment location 	River		Discharge	Data	Timo	(losses)	per mue (# ^{3/c/mi)}
60		853.6		1490	4/8/2002	0830	(6/ 11)	
			total estimated inflow	0				
			total estimated outflow	0				
U10	Snake River below Dry Bed, near Heise	849.5		1450	4/8/2002	1030	(40)	(10)
			total estimated inflow	0				
			total estimated outflow	0				
UII	Snake River near Archer	842.8		1160	4/8/2002	1144	(290)	(43)
			total estimated inflow	0				
			total estimated outflow	0				
0111		0 100		884	4/8/2002	1400	(276)	(56)
710	Snake Kiver at Lorenzo (13038500)	6.100		852	4/8/2002	1300		
			total estimated inflow	0				
			total estimated outflow	0				
U13	Snake River above Henrys Fork, near Menan	832.5		2	I	ł	I	1
			Henrys Fork estimated inflow	1390				
			total estimated inflow	0				
			total estimated outflow	0				
111		0000		2670	4/8/2002	1645	428	25
01 4	SHAKE MIVEF HEAF INFLIAN (1202/000)	0.000		2730	4/9/2002	0445		
			total estimated inflow	0				
			total estimated outflow	0				
U15	Snake River below Deer Parks, near Menan	822.5		2280	4/9/2002	0820	(450)	(09)
			total estimated inflow	30				
			total estimated outflow	0				
U16	Snake River near Roberts	815.3		2300	4/9/2002	0842	(10)	(1)
			total estimated inflow	0				
			total estimated outflow	0				
U17	Snake River above Dry Bed, near Roberts	811.9		2280	4/9/2002	0700	(20)	(9)
			total estimated inflow	2				
			total estimated outflow	0				

Table C5. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during April 8-9, 2002, between <u>Heise and Shelley and Ashton and the mouth</u>, Idaho--Continued

Heise ar	Heise and Shelley and Ashton and the mouth, IdahoC	IdahoContinued)			
							Total	
Map							gains/	Gains/ (losses)
number	number Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
U18	Snake River near Lewisville	806.3		2320	4/9/2002	0951	38	7
			total estimated inflow	0				
			total estimated outflow	0				
				2410	4/9/2002	1030	06	69
019	Snake River near Idaho Falls (13057155)	805.0		2390	3/26 - 4/24/2002	30-day average		
			total estimated inflow	0				
			total estimated outflow	5				
U20	Snake River near Shelley (13060000)	787.8		2180	3/26 - 4/24/2002	30-day average	(205)	(12)
¹ Long-tern: ² Measurem	1 Long-term United States Geological Survey gaging stations are in bold. 2 Measurement was made but not used in the calculations (see table C15).							

Table C5. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during April 8-9, 2002, between

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Table C6. Gaging station discharge data during April 8-9, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
U1	Henrys Fork near Ashton (13046000)	4/8/2002	0500	1100
U4	Henrys Fork near St Anthony (13050500)	4/8/2002 4/8/2002	1030 0800	1400 1390
U7	Henrys Fork near Rexburg (13056500)	4/8/2002 4/8/2002	1715 1030	1360 1300
U9	Snake near Heise (13037500)	4/8/2002	0830	1490
U12	Snake River at Lorenzo (13038500)	4/8/2002 4/8/2002	1400 1300	884 852
U14	Snake River near Menan (13057000)	4/8/2002 4/9/2002	1645 0445	2670 2730
U19	Snake River near Idaho Falls (13057155)	4/9/2002 3/26 - 4/24/2002	1030 30-day average	2410 2390
U20	Snake River near Shelley (13060000)	3/26 - 4/24/2002	30-day average	2180

[Discharge given in cubic feet per second]

Table C7. Acoustic Doppler discharge measurement data during April 8-9, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of	
variation; σ , standard deviation; μ , mean;, no data]	

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^o / _µ)
U2	Henrys Fork below Falls River, near Ashton	4/8/2002	0747	1800	0.03
U3	Henrys Fork near Twin Groves	4/8/2002	0856	1740	0.01
U5	Henrys Fork near Parker	4/8/2002	1118	1140	0.03
U6	Henrys Fork near Hibbard	4/8/2002	1228	1150	0.01
U8	Henrys Fork at mouth, near Lorenzo	4/8/2002	1456	1390	0.02
U10	Snake River below Dry Bed, near Heise	4/8/2002	1030	1450	0.03
U11	Snake River near Archer	4/8/2002	1144	1160	0.04
U13	Snake River above Henrys Fork, near Menan	4/8/2002	1531	960	0.09
U15	Snake River below Deer Parks, near Menan	4/9/2002	0820	2280	0.04
U16	Snake River near Roberts	4/9/2002	0842	2300	0.03
U17	Snake River above Dry Bed, near Roberts	4/9/2002	0700	2280	0.03
U18	Snake River near Lewisville	4/9/2002	0951	2320	0.03

Table C8. Discharge data for all inspected inflow and outflow sites during April 8-9, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Lo	cation			-
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betw	veen map numbe	ers U1 and U2			
Arcadia Canal return near Ashton						
Snow Creek near Ashton		44 04 17	111 31 33	4/8/2002		8.7
Black Spring near Ashton		44 02 59	111 32 20	4/8/2002		³ 13.0
Sand Creek near Ashton						
Farmers Own return near Ashton		44 02 32	111 32 20	4/8/2002		0
Unnamed tributary near Ashton		44 01 40	111 32 57	4/8/2002		
Falls River Diversion return near Ashton		44 01 40	111 33 20	4/8/2002		
Falls River near Chester	13049500	44 01 06	111 33 57	4/8/2002	DM	674
Dewey Canal near Chester	13046310	44 01 12	111 34 56	4/8/2002	DM	3.0
	Subreach betw	veen map numbe	ers U2 and U3			
Last Chance Canal near Chester	13049550	44 01 01	111 35 10	4/8/2002	DM	7
Cross Cut Canal near Chester	13049560	44 00 58	111 34 57	4/8/2002		15.0
	Subreach betw	veen map numbe	ers U3 and U4			
Farmers Friend Canal near Twin Groves	13049705	43 58 29	111 39 02	4/8/2002		71.7
Twin Groves Canal near Twin Groves	13049710	43 57 21	111 40 05	4/8/2002		43.5
St Anthony Union Canal near Twin Groves	13049725	43 58 19	111 38 27	4/8/2002	DM	190
Salem Union Canal near St. Anthony	13049805	43 58 20	111 39 01	4/8/2002		55.6
	Subreach betw	veen map numbe	ers U4 and U5			
Egin Canal near St. Anthony	13050525	43 57 56	111 41 23	4/8/2002	DM	132
St Anthony Union Feeder near St. Anthony	13050530	43 57 38	111 41 59	4/9/2002		69.5
Independent Canal near St. Anthony	13050535	43 57 29	111 42 21	4/9/2002	DM	128
Consolidated Farmers Canal near Parker	13050545	43 53 54	111 46 47	4/9/2002		32.3
Unnamed tributary near Parker						
	Subreach betw	veen map numbe	ers U5 and U6			
Roxana Canal return near Teton		43 53 55	111 48 31	4/9/2002		3.6
North Fork Teton River at Teton	13055198	43 53 53	111 40 38	4/8/2002	DM	162
	Subreach betw	veen map numbe	ers U6 and U7			
Teton Island Canal return near Teton		43 50 31	111 49 05	4/9/2002		0
Unnamed tributary near Teton		43 51 31	111 51 29	4/9/2002		0
Island Ward Canal return near Rexburg		43 51 18	111 51 28	4/9/2002		0
Clements Spori Ditch near Rexburg		43 50 26	111 51 11	4/9/2002		0
South Fork Teton River near Rexburg	13055340	43 50 07	111 46 38	4/8/2002	DM	188
St Anthony / Independent return near Rexburg				4/10/2002		49.2
	Subreach betw	veen map numbe	ers U7 and U8			
Rexburg Canal return near Rexburg		43 48 55	111 53 15	4/30/2002		0
Texas Slough Canal return near Rexburg		43 48 00	111 54 48	4/8/2002		0
Texas Slough near Rexburg		43 47 17	111 53 45	4/2/2002		22.0
Liberty Parks Canal return near Rexburg		43 47 24	111 55 27	4/3/2002		1
Bannock Jim Slough near Rexburg		43 46 30	111 56 11	4/1/2002		1.7
	Subreach betw	een map numbe				,
Anderson Canal near Heise	13037505	43 36 54	111 39 37	4/8/2002	DM	0
Eagle Rock Canal near Heise	13037905	43 37 48	111 40 48	4/9/2002	DM	0
Farmers Friend Canal near Heise	13037980	43 37 47	111 40 40	4/10/2002	DM	0
Enterprise Canal near Heise	13037985	43 37 47	111 41 29	4/8/2002	DM	0
Dry Bed near Ririe	13037985 13038000	43 37 49	111 41 29	4/8/2002	DM	0
Kelly Canyon near Heise	13030000	43 38 21 43 37 44	111 42 55 111 39 40			
Hawley Warm Spring near Heise						3
Sunnydell Canal near Sunnydell ⁴	12029202	43 38 56	111 42 15			
Sunnyuen Canai near Sunnyuen	13038392	43 38 56	111 42 17	4/8/2002		0

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	U10 and U11			
Lenroot Canal near Archer	13038426	43 41 18	111 46 40	4/8/2002		0
Reid Canal near Archer	13038431	43 42 04	111 48 05	4/8/2002		0
	Subreach betwee	n map numbers	U11 and U12			
Texas & Liberty Canal near Lorenzo	13038434	43 43 06	111 49 37	4/8/2002	DM	0
Bannock Jim Slough near Lorenzo	13038435	43 43 16	111 50 09	4/8/2002	DM	0
	Subreach betwee	n map numbers	U12 and U13			
	Subreach betwee	n map numbers	U13 and U14			
Annis Slough near Menan		43 44 46	111 56 37			
Scotts Slough near Menan		43 44 32	111 58 20	4/8/2002		0
	Subreach betwee	n map numbers	U14 and U15			
Butte & Market Lake Canal	13057025	43 45 13	111 58 51	4/9/2002	DM	0
	Subreach betwee	n map numbers	U15 and U16			
Big Six Canal return near Roberts		43 44 21	112 04 43			
Spring Creek near Roberts		43 43 15	112 04 21	4/9/2002		30
	Subreach betwee	n map numbers	U16 and U17			
	Subreach betwee	n map numbers	: U17 and U18			
Dry Bed near Roberts		43 42 11	112 04 13	4/9/2002		0
South Parks Canal return near Roberts		43 41 19	112 03 47	4/9/2002		0
Butte Market Lake Canal return near Roberts		43 39 20	112 05 27	4/9/2002		2.2
Great Western Canal near Lewisville ⁴	13057135	43 34 48	112 04 12	4/9/2002	DM	0
Idaho Canal near Lewisville	13057145	43 46 48	112 03 00	4/9/2002	DM	0
	Subreach betwee	n map numbers	U18 and U19			
Burgess Canal Drain near Idaho Falls	13057100	43 37 00	112 03 03	4/9/2002		0
	Subreach betwee	n map numbers	: U19 and U20			
North Willow Creek near Idaho Falls		43 30 42	112 03 04			
Porter Canal near Idaho Falls ⁴	13057250	43 30 00	112 03 00	4/9/2002	DM	5
South Willow Creek near Idaho Falls		43 30 04	112 02 35			
Woodville Canal near Idaho Falls	13059505	43 25 48	112 06 00	4/9/2002	DM	0
Snake River Valley Canal near Idaho Falls	13059525	43 27 00	112 04 48	4/9/2002	DM	0

Table C8. Discharge data for all inspected inflow and outflow sites during April 8-9, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho--Continued

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Actual canal discharge; spillback portion was accounted for.

EXPLANATION

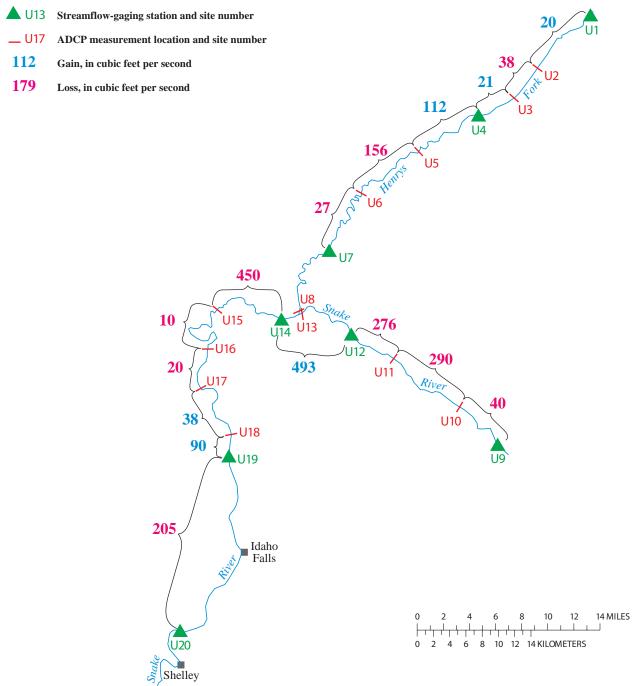


Figure C3. Streamflow gains and losses along the upper reach of the Snake River and Henrys Fork, Idaho, estimated during the April 8-9, 2002, seepage study.

Map							Total gains/	Gains/ (losses)
number	Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
UI	Henrys Fork near Ashton (13046000)	44.2		1980	7/22/2002	0815		
			total estimated inflow	243				
			total estimated outflow	2				
U2	Henrys Fork below Falls River, near Ashton	38.5		2130	7/22/2002	1100	(91)	(16)
			total estimated inflow	0				
			total estimated outflow	537				
U3	Henrys Fork near Twin Groves	35.6		1670	7/22/2002	1145	LL	27
			total estimated inflow	0				
			total estimated outflow	499				
114	Honse Bark and St Authous (13050500)	7 00		1420	7/22/2002	1315	249	78
5 4	HEILLYS FULK HEAF 31 AMUNUM (LJUDSU2000)	4.70		1360	7/22/2002	1145		
			total estimated inflow	0				
			total estimated outflow	618				
U5	Henrys Fork near Parker	25.6		837	7/22/2002	1500	95	14
			total estimated inflow	255				
			total estimated outflow	0				
U6	Henrys Fork near Hibbard	19.0		896	7/22/2002	1540	(196)	(30)
			total estimated inflow	124				
			total estimated outflow	0				
IJ	Henrys Fork near Rexburg (13056500)	9.2		1020 1030	7/22/2002 7/22/2002	2030 1645	0	0
			total estimated inflow	254				
			total estimated outflow	0				
				ç				

Map							Total rains/	Gaine/ (Jossee)
number	· Gaging station name (number) ¹ /	River		Discharge			gams/ (losses)	per mile
(fig. #)		mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
6N		853.6		13700	7/22/2002	1500		
			total estimated inflow	1				
			total estimated outflow	4998				
U10	Snake River below Dry Bed, near Heise	849.5		8440	7/22/2002	1700	(263)	(64)
			total estimated inflow	0				
			total estimated outflow	528				
U11	Snake River near Archer	842.8		7580	7/22/2002	1545	(332)	(50)
			total estimated inflow	0				
			total estimated outflow	307				
1		0 60		7860	7/22/2002	1815	587	120
E12	Shake Kiver at Lorenzo (LJUSOSUU)	6.100		7860	7/22/2002	1815		
			total estimated inflow	0				
			total estimated outflow	0				
U13	Snake River above Henrys Fork, near Menan	832.5		2		1	1	1
			Henrys Fork estimated inflow	1284				
			total estimated inflow	6				
			total estimated outflow	0				
1114		030.0		9380	7/22/2002	2215	³ 228	13
11	SHARE NIVEL HEAL PLENAL (1303/000)	0.000		9380	7/23/2002	0515		
			total estimated inflow	0				
			total estimated outflow	392				
U15	Snake River below Deer Parks, near Menan	822.5		8350	7/23/2002	0060	(638)	(85)
			total estimated inflow	0				
			total estimated outflow	0				
U16	Snake River near Roberts	815.3		8540	7/23/2002	0745	190	26
			total estimated inflow	0				
			total estimated outflow	0				
U17	Snake River above Dry Bed, near Roberts	811.9		8470	7/23/2002	1750	(10)	(21)
			total estimated inflow	665				

Table C9. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during July 22-23, 2002, between Heise and Shelley and Ashton and the mouth, Idaho--Continued

Heise ar	Heise and Shelley and Ashton and the mouth, IdahoContinued	ntinued			>	`		
							Total	
Map							gains/	Gains/ (losses)
number	number Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	$(\mathbf{ft}^3/\mathbf{s})$	(ft ³ /s/mi)
U18	Snake River near Lewisville	806.3		4	-	-	-	-
			total estimated inflow	1				
			total estimated outflow	0				
				8230	7/23/2002	1300	218	32
U19	Snake River near Idaho Falls (13057155)	805.0		7150	7/9 - 8/7/2002	30-day average		
			total estimated inflow	1				
			total estimated outflow	665				
U20	Snake River near Shelley (13060000)	787.8		6480	7/9 - 8/7/2002	30-day average	(9)	(0)
¹ Long-term ² No measur	¹ Long-term United States Geological Survey gaging stations are in bold. ² No measurement was made because of equipment problems.							

Table C9. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during July 22-23, 2002, between

 3 Includes gain/loss between Henrys Fork near Rexburg and Henrys Fork at mouth. 4 Measurement was made but not used in the calculations (see table C12).

Table C10. Gaging station discharge data during July 22-23, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

Map number (fig. #)	Gaging station name (number)	Date	Time	Discharge
U1	Henrys Fork near Ashton (13046000)	7/22/2002	0815	1980
U4	Henrys Fork near St Anthony (13050500)	7/22/2002 7/22/2002	1315 1145	1420 1360
U7	Henrys Fork near Rexburg (13056500)	7/22/2002 7/22/2002	2030 1645	1020 1030
U9	Snake near Heise (13037500)	7/22/2002	1500	13,700
U12	Snake River at Lorenzo (13038500)	7/22/2002 7/22/2002	1815 1815	7860 7860
U14	Snake River near Menan (13057000)	7/22/2002 7/23/2002	2215 0515	9380 9380
U19	Snake River near Idaho Falls (13057155)	7/23/2002 7/9 - 8/7/2002	1300 30-day average	8230 7150
U20	Snake River near Shelley (13060000)	7/9 - 8/7/2002	30-day average	6480

[Discharge given in cubic feet per second]

Table C11. Acoustic Doppler discharge measurement data during July 22-23, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	$COV(^{\sigma}/_{\mu})$
U2	Henrys Fork below Falls River, near Ashton	7/22/2002	1100	2130	0.03
U3	Henrys Fork near Twin Groves	7/22/2002	1145	1670	0.05
U5	Henrys Fork near Parker	7/22/2002	1500	837	0.03
U6	Henrys Fork near Hibbard	7/22/2002	1540	896	0.04
U8	Henrys Fork at mouth, near Lorenzo	1			
U10	Snake River below Dry Bed, near Heise	7/22/2002	1700	8440	0.01
U11	Snake River near Archer	7/22/2002	1545	7580	0.03
U13	Snake River above Henrys Fork, near Menan	1			
U15	Snake River below Deer Parks, near Menan	7/23/2002	0900	8350	0.03
U16	Snake River near Roberts	7/23/2002	0745	8540	0.04
U17	Snake River above Dry Bed, near Roberts	7/23/2002	1750	8470	0.03

7/23/2002

1224

7420

0.02

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; σ, standard deviation; μ, mean; ---, no data]

¹ No measurement was made because of equipment problems.

Snake River near Lewisville

U18

Table C12. Discharge data for all inspected inflow and outflow sites during July 22-23, 2002, for theSnake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwe	en map number	s U1 and U2			
Arcadia Canal return near Ashton						
Snow Creek near Ashton		44 04 17	111 31 33	7/22/2002		0
Black Spring near Ashton		44 02 59	111 32 20	7/22/2002		³ 8.6
Sand Creek near Ashton						
Farmers Own return near Ashton		44 02 32	111 32 20	7/22/2002		2
Unnamed tributary near Ashton		44 01 40	111 32 57	7/22/2002		4.0
Falls River Diversion return near Ashton		44 01 40	111 33 20	7/22/2002		3.5
Falls River near Chester	13049500	44 01 06	111 33 57	7/22/2002	DM	233
Dewey Canal near Chester	13046310	44 01 12	111 34 56	7/22/2002	DM	2
	Subreach betwe	-		7/22/2002	DV	50
Last Chance Canal near Chester	13049550	44 01 01	111 35 10	7/22/2002	DM	52
Cross Cut Canal near Chester	13049560	44 00 58	111 34 57	7/22/2002	DM	485
Francisco I Crart and Train Correspondence	Subreach betwe	-		7/22/2002		29.2
Farmers Friend Canal near Twin Groves	13049705	43 58 29	111 39 02	7/22/2002		28.3
Twin Groves Canal near Twin Groves	13049710	43 57 21	111 40 05	7/22/2002	 DM	48.5
St Anthony Union Canal near Twin Groves	13049725	43 58 19 43 58 20	111 38 27	7/22/2002	DM	279
Salem Union Canal near St. Anthony	13049805		111 39 01	7/22/2002	DM	143
Eain Canal page St. Anthony	Subreach betwe	-		7/22/2002	DM	333
Egin Canal near St. Anthony	13050525	43 57 56	111 41 23	7/22/2002	DM DM	555 103
St Anthony Union Feeder near St. Anthony Independent Canal near St. Anthony	13050530	43 57 38 43 57 29	111 41 59 111 42 21	7/22/2002 7/22/2002		86
Consolidated Farmers Canal near Parker	13050535 13050545	43 57 29	111 42 21 111 46 47	7/22/2002	DM 	80 95.6
Unnamed tributary near Parker		45 55 54				0
eminined tributily near Funct	Subreach betwe					0
Roxana Canal return near Teton		43 53 55	111 48 31	7/22/2002		6.0
North Fork Teton River at Teton	13055198	43 53 53	111 40 38	7/22/2002	DM	249
	Subreach betwe				2001	2.0
Teton Island Canal return near Teton		43 50 31	111 49 05	7/22/2002		14.1
Unnamed tributary near Teton		43 51 31	111 51 29	7/22/2002		0
Island Ward Canal return near Rexburg		43 51 18	111 51 28	7/22/2002		0
Clements Spori Ditch near Rexburg		43 50 26	111 51 11	7/22/2002		0
South Fork Teton River near Rexburg	13055340	43 50 07	111 46 38	7/22/2002	DM	92
St Anthony / Independent return near Rexburg				7/22/2002		17.5
	Subreach betwe	en map number	s U7 and U8			
Rexburg Canal return near Rexburg		43 48 55	111 53 15	7/22/2002		11.5
Texas Slough Canal return near Rexburg		43 48 00	111 54 48	7/22/2002		16.5
Texas Slough near Rexburg		43 47 17	111 53 45	7/22/2002		176
Liberty Parks Canal return near Rexburg		43 47 24	111 55 27	7/22/2002		17.9
Bannock Jim Slough near Rexburg		43 46 30	111 56 11	7/22/2002		31.9
	Subreach betwee	en map numbers	s U9 and U10			
Anderson Canal near Heise	13037505	43 36 54	111 39 37	7/22/2002	DM	334
Eagle Rock Canal near Heise	13037975	43 37 48	111 40 48	7/22/2002	DM	635
Farmers Friend Canal near Heise	13037980	43 37 47	111 41 29	7/22/2002	DM	329
Enterprise Canal near Heise	13037985	43 37 49	111 41 29	7/22/2002	DM	211
Dry Bed near Ririe	13038000	43 38 21	111 42 55	7/22/2002	DM	3470
Kelly Canyon near Heise		43 37 44	111 39 40	7/22/2002		.8
Hawley Warm Spring near Heise		43 38 56	111 42 15	7/22/2002		³ 0
Sunnydell Canal near Sunnydell ⁴	13038392	43 38 56	111 42 17	7/22/2002	DM	19

	Station	Loc	cation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	s U10 and U11			
Lenroot Canal near Archer	13038426	43 41 18	111 46 40	7/22/2002		379
Reid Canal near Archer	13038431	43 42 04	111 48 05	7/22/2002	DM	149
	Subreach betwee	n map numbers	s U11 and U12			
Texas & Liberty Canal near Lorenzo	13038434	43 43 06	111 49 37	7/22/2002	DM	263
Bannock Jim Slough near Lorenzo	13038435	43 43 16	111 50 09	7/22/2002	DM	44
	Subreach betwee	n map numbers	s U12 and U13			
	Subreach betwee	n map numbers	s U13 and U14			
Annis Slough near Menan		43 44 46	111 56 37			
Scotts Slough near Menan		43 44 32	111 58 20	7/22/2002		8.6
	Subreach betwee	n map numbers	s U14 and U15			
Butte & Market Lake Canal	13057025	43 45 13	111 58 51	7/23/2002	DM	392
	Subreach betwee	n map numbers	s U15 and U16			
Big Six Canal return near Roberts		43 44 21	112 04 43			
Spring Creek near Roberts		43 43 15	112 04 21			
	Subreach betwee	n map numbers	s U16 and U17			
	Subreach betwee	n map numbers	s U17 and U18			
Dry Bed near Roberts		43 42 11	112 04 13	7/23/2002		620
South Parks Canal return near Roberts		43 41 19	112 03 47	7/23/2002		44.9
Butte Market Lake Canal return near Roberts		43 39 20	112 05 27	7/23/2002		.4
Great Western Canal near Lewisville ⁴	13057135	43 34 48	112 04 12	7/23/2002	DM	214
Idaho Canal near Lewisville	13057145	43 46 48	112 03 00	7/23/2002	DM	910
	Subreach betwee	n map numbers	s U18 and U19			
Burgess Canal Drain near Idaho Falls	13057100	43 37 00	112 03 03	7/23/2002		.8
	Subreach betwee	n map numbers	s U19 and U20			
North Willow Creek near Idaho Falls		43 30 42	112 03 04	7/23/2002		1
Porter Canal near Idaho Falls ⁴	13057250	43 30 00	112 03 00	7/23/2002	DM	251
South Willow Creek near Idaho Falls		43 30 04	112 02 35	7/23/2002		0
Woodville Canal near Idaho Falls	13059505	43 25 48	112 06 00	7/23/2002	DM	43
Snake River Valley Canal near Idaho Falls	13059525	43 27 00	112 04 48	7/23/2002	DM	371

Table C12. Discharge data for all inspected inflow and outflow sites during July 22-23, 2002, for the

 Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho--Continued

¹Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Actual canal discharge; spillback portion was accounted for.

EXPLANATION

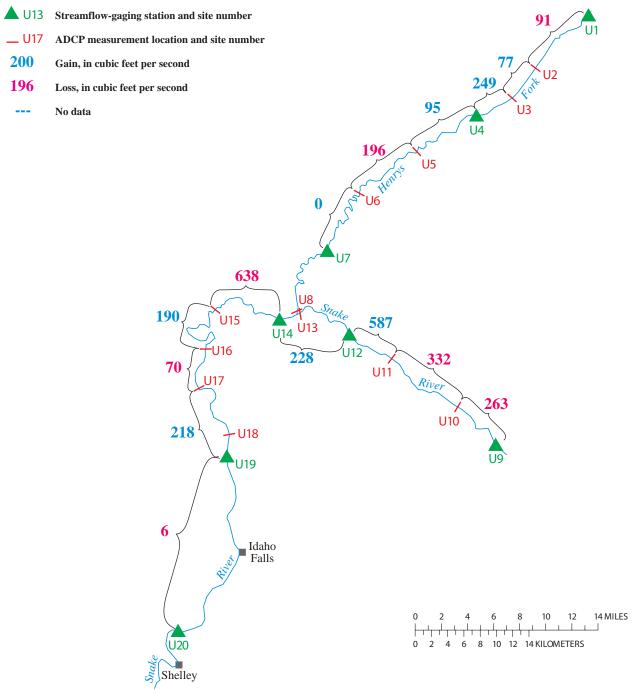


Figure C4. Streamflow gains and losses along the upper reach of the Snake River and Henrys Fork, Idaho, estimated during the J uly 22–23, 2002, seepage study.

Map							Total gains/	Gains/ (losses)
number	Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		$(\mathbf{ft}^3/\mathbf{s})$	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
UI	Henrys Fork near Ashton (13046000)	44.2		929	11/5/2002	0445		
			total estimated inflow	425				
			total estimated outflow	0				
U2	Henrys Fork below Falls River, near Ashton	38.5		1220	11/5/2002	0739	(134)	(24)
			total estimated inflow	0				
			total estimated outflow	75				
U3	Henrys Fork near Twin Groves	35.6		1		ł	ł	
			total estimated inflow	0				
			total estimated outflow	40				
VI I	Homme Body need & Anthony (13050500)	20.4		1450	11/5/2002	1045	344	56
t 0	(menenet) kunning ie iear an kunni	1.7C		1200	11/4/2002	1415		
			total estimated inflow	0				
			total estimated outflow	26				
U5	Henrys Fork near Parker	25.6		1130	11/4/2002	1732	(44)	(9)
			total estimated inflow	210				
			total estimated outflow	0				
U6	Henrys Fork near Hibbard	19.0		1280	11/4/2002	1650	(09)	(6)
			total estimated inflow	118				
			total estimated outflow	0				
211	Henrys Fork near Rexhiirg (13056500)	2.6		1380	11/4/2002	2130	(18)	(2)
5		į		1370	11/4/2002	1100		
			total estimated inflow	64				
			total estimated outflow	0				
110		0.0		1370	11/4/2002	1573	(64)	6

Man							Total gains/	Gains/ (losses)
number	Gaging station name (number) ¹ /	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
00	Snake near Heise (13037500)	853.6		1550	11/4/2002	1130		
			total estimated inflow	2				
			total estimated outflow	520				
U10	Snake River below Dry Bed, near Heise	849.5		856	11/4/2002	1331	(176)	(43)
			total estimated inflow	0				
			total estimated outflow	36				
U11	Snake River near Archer	842.8		641	11/4/2002	1240	(179)	(27)
			total estimated inflow	0				
			total estimated outflow	2				
C E I	(002060667)	0 200		570	11/4/2002	1500	(69)	(14)
710	SHAKE KIVEF AL LOFENZO (LJUDOSOUU)	6.100		558	11/4/2002	1230		
			total estimated inflow	0				
			total estimated outflow	0				
U13	Snake River above Henrys Fork, near Menan	832.5		2		ł	ł	-
			Henrys Fork estimated inflow	1370				
			total estimated inflow	5				
			total estimated outflow	0				
1114	Snaka Bivar naar Manan (13057000)	830.0		2450	11/4/2002	1615	517	30
		0.000		2280	11/5/2002	0090		
			total estimated inflow	0				
			total estimated outflow	9				
U15	Snake River below Deer Parks, near Menan	822.5		1980	11/5/2002	0937	(294)	(39)
			total estimated inflow	31				
			total estimated outflow	0				
U16	Snake River near Roberts	815.3		2030	11/5/2002	1524	19	ŝ
			total estimated inflow	0				
			total estimated outflow	0				
U17	Snake River above Dry Bed, near Roberts	811.9		1		1	ł	-
			total estimated inflow	231				

 Table C13. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during November 4-5, 2002, between

 Heise and Shelley and Ashton and the mouth, Idaho--Continued

							Total	
Map							gains/	Gains/ (losses)
number	number	River		Discharge			(losses)	per mile
(fig. #)	ADCP/ADP measurement location	mile		(ft ³ /s)	Date	Time	(ft ³ /s)	(ft ³ /s/mi)
U18	Snake River near Lewisville	806.3		2430	11/5/2002	1428	169	19
			total estimated inflow	0				
			total estimated outflow	0				
				2540	11/5/2002	1515	110	85
019	Snake River near Idaho Falls (13057155)	805.0		2610	10/22 - 11/20/2002	30-day average		
			total estimated inflow	0				
			total estimated outflow	11				
U20	Snake River near Shelley (13060000)	787.8		2450	10/22 - 11/20/2002	30-day average	(149)	(6)
Long-term Measurem	¹ Long-term United States Geological Survey gaging stations are in bold. ² Measurement was made but not used in the calculations (see table C15).							

Table C13. Calculations of gains and losses in specified subreaches of the Snake River and Henrys Fork during November 4-5, 2002, between

Table C14. Gaging station discharge data during November 4-5, 2002, for the Snake River and HenrysFork between Heise and Shelley and Ashton and the mouth, Idaho

Map number				
(fig. #)	Gaging station name (number)	Date	Time	Discharge
U1	Henry's Fork near Ashton (13046000)	11/5/2002	0445	929
U4	Henry's Fork near St Anthony (13050500)	11/5/2002	1045	1450
04	relity's Pork hear St Anthony (15050500)	11/4/2002	1415	1200
U7	Henry's Fork near Rexburg (13056500)	11/4/2002	2130	1380
07	nemy's Fork near Rexburg (15050500)	11/4/2002	1100	1370
U9	Snake near Heise (13037500)	11/4/2002	1130	1550
U12	Snake River at Lorenzo (13038500)	11/4/2002	1500	570
012	Shake Kivel at Lotenzo (13038300)	11/4/2002	1230	558
U14	Snake River near Menan (13057000)	11/4/2002	1615	2450
014	Shake Kivel heat Wehan (15057000)	11/5/2002	0600	2280
		11/5/2002	1515	2540
U19	Snake River near Idaho Falls (13057155)	10/22 - 11/20/2002	30-day average	2610
U20	Snake River near Shelley (13060000)	10/22 - 11/20/2002	30-day average	2450

[Discharge given in cubic feet per second]

Table C15. Acoustic Doppler discharge measurement data during November 4-5, 2002, for the SnakeRiver and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[ADCP, Acoustic Doppler Current Profiler; ADP, Acoustic Doppler Profiler; discharge given in cubic feet per second; COV, coefficient of variation; σ, standard deviation; μ, mean; ---, no data]

Map number					
(fig. #)	ADCP/ADP measurement location	Date	Time	Discharge	COV (^۳ / _µ)
U2	Henrys Fork below Falls River, near Ashton	11/5/2002	0739	1220	0.02
U3	Henrys Fork near Twin Groves	1			
U5	Henrys Fork near Parker	11/4/2002	1732	1130	0.02
U6	Henrys Fork near Hibbard	11/4/2002	1650	1280	0.02
U8	Henrys Fork at mouth, near Lorenzo	11/4/2002	1523	1370	0.02
U10	Snake River below Dry Bed, near Heise	11/4/2002	1331	856	0.02
U11	Snake River near Archer	11/4/2002	1240	641	0.03
U13	Snake River above Henrys Fork, near Menan	11/4/2002	1507	614	0.02
U15	Snake River below Deer Parks, near Menan	11/5/2002	0937	1980	0.03
U16	Snake River near Roberts	11/5/2002	1524	2030	0.02
U17	Snake River above Dry Bed, near Roberts	1			
U18	Snake River near Lewisville	11/5/2002	1428	2430	0.09

¹ No measurement made because of ice on the river.

Table C16. Discharge data for all inspected inflow and outflow sites during November 4-5, 2002, for the Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho

[Latitude and longitude in degrees, minutes, seconds in North American Datum of 1983 (NAD83); DM, daily mean discharge; discharge given in cubic feet per second; map numbers shown in figure X; ---, no data]

in cubic reet per second, map numbers shown in	Station	Loc	ation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwe	en map number	s U1 and U2			
Arcadia Canal return near Ashton						
Snow Creek near Ashton		44 04 17	111 31 33	11/4/2002		2.4
Black Spring near Ashton		44 02 59	111 32 20	11/4/2002		³ 10.3
Sand Creek near Ashton						
Farmers Own return near Ashton		44 02 32	111 32 20	11/4/2002		0
Unnamed tributary near Ashton		44 01 40	111 32 57	11/4/2002		1
Falls River Diversion return near Ashton		44 01 40	111 33 20	11/4/2002		2
Falls River near Chester	13049500	44 01 06	111 33 57	11/5/2002	DM	420
Dewey Canal near Chester	13046310	44 01 12	111 34 56	11/4/2002	DM	0
	Subreach betwe	en map number	s U2 and U3			
Last Chance Canal near Chester	13049550	44 01 01	111 35 10	11/4/2002	DM	15
Cross Cut Canal near Chester	13049560	44 00 58	111 34 57	11/4/2002	DM	60
	Subreach betwe	en map number	s U3 and U4			
Farmers Friend Canal near Twin Groves	13049705	43 58 29	111 39 02	11/4/2002		.5
Twin Groves Canal near Twin Groves	13049710	43 57 21	111 40 05	11/4/2002		37.8
St Anthony Union Canal near Twin Groves	13049725	43 58 19	111 38 27	11/4/2002	DM	0
Salem Union Canal near St. Anthony	13049805	43 58 20	111 39 01	11/4/2002		1.5
	Subreach betwe	en map number	s U4 and U5			
Egin Canal near St. Anthony	13050525	43 57 56	111 41 23	11/4/2002	DM	0
St Anthony Union Feeder near St. Anthony	13050530	43 57 38	111 41 59	11/4/2002		2.5
Independent Canal near St. Anthony	13050535	43 57 29	111 42 21	11/4/2002		.2
Consolidated Farmers Canal near Parker	13050545	43 53 54	111 46 47	11/4/2002		23.6
Unnamed tributary near Parker				11/4/2002		0
	Subreach betwe	en map number	s U5 and U6			
Roxana Canal return near Teton		43 53 55	111 48 31	11/4/2002		3.0
North Fork Teton River at Teton	13055198	43 53 53	111 40 38	11/4/2002	DM	207
	Subreach betwe	en map number	s U6 and U7			
Teton Island Canal return near Teton		43 50 31	111 49 05	11/4/2002		4.5
Unnamed tributary near Teton		43 51 31	111 51 29	11/5/2002		0
Island Ward Canal return near Rexburg		43 51 18	111 51 28	11/5/2002		0
Clements Spori Ditch near Rexburg		43 50 26	111 51 11	11/5/2002		0
South Fork Teton River near Rexburg	13055340	43 50 07	111 46 38	11/5/2002	DM	113
St Anthony / Independent return near Rexburg				11/4/2002		0
	Subreach betwe	en map number	rs U7 and U8			
Rexburg Canal return near Rexburg		43 48 55	111 53 15	11/4/2002	DM	0
Texas Slough Canal return near Rexburg		43 48 00	111 54 48	11/4/2002	DM	0
Texas Slough near Rexburg		43 47 17	111 53 45	11/4/2002		49.5
Liberty Parks Canal return near Rexburg		43 47 24	111 55 27	11/4/2002		2.4
Bannock Jim Slough near Rexburg		43 46 30	111 56 11	11/4/2002		12.3
	Subreach betwee	en map number:	s U9 and U10			
Anderson Canal near Heise	13037505	43 36 54	111 39 37	11/4/2002	DM	0
Eagle Rock Canal near Heise	13037975	43 37 48	111 40 48	11/4/2002	DM	0
Farmers Friend Canal near Heise	13037980	43 37 47	111 41 29	11/4/2002	DM	0
Enterprise Canal near Heise	13037985	43 37 49	111 41 29	11/4/2002	DM	0
Dry Bed near Ririe	13038000	43 38 21	111 42 55	11/4/2002	DM	517
Kelly Canyon near Heise		43 37 44	111 39 40	11/5/2002		1.5
Hawley Warm Spring near Heise		43 38 56	111 42 15	11/5/2002		³ 2.4
Sunnydell Canal near Sunnydell ⁴	13038392	43 38 56	111 42 17	11/5/2002		2.5

	Station	Loc	cation			
Inspection site ¹	number ¹	Latitude	Longitude	Date	Time	Discharge ²
	Subreach betwee	n map numbers	U10 and U11			
Lenroot Canal near Archer	13038426	43 41 18	111 46 40	11/5/2002		0
Reid Canal near Archer	13038431	43 42 04	111 48 05	11/5/2002		35.8
	Subreach betwee	n map numbers	U11 and U12			
Texas & Liberty Canal near Lorenzo	13038434	43 43 06	111 49 37	11/5/2002	DM	2
Bannock Jim Slough near Lorenzo	13038435	43 43 16	111 50 09	11/5/2002	DM	0
	Subreach betwee	n map numbers	U12 and U13			
	Subreach betwee	n map numbers	U13 and U14			
Annis Slough near Menan		43 44 46	111 56 37			
Scotts Slough near Menan		43 44 32	111 58 20	11/5/2002		4.6
	Subreach betwee	n map numbers	U14 and U15			
Butte & Market Lake Canal	13057025	43 45 13	111 58 51	11/5/2002		5.9
	Subreach betwee	n map numbers	U15 and U16			
Big Six Canal return near Roberts		43 44 21	112 04 43	11/5/2002		4.5
Spring Creek near Roberts		43 43 15	112 04 21	11/5/2002		26.8
	Subreach betwee	n map numbers	U16 and U17			
	Subreach betwee	n map numbers	U17 and U18			
Dry Bed near Roberts		43 42 11	112 04 13	11/4/2002	DM	231
South Parks Canal return near Roberts		43 41 19	112 03 47	11/5/2002	DM	0
Butte Market Lake Canal return near Roberts		43 39 20	112 05 27	11/5/2002	DM	0
Great Western Canal near Lewisville ⁴	13057135	43 34 48	112 04 12	11/5/2002	DM	0
Idaho Canal near Lewisville	13057145	43 46 48	112 03 00	11/5/2002	DM	0
	Subreach betwee	n map numbers	U18 and U19			
Burgess Canal Drain near Idaho Falls	13057100	43 37 00	112 03 03	11/5/2002		0
	Subreach betwee	n map numbers	U19 and U20			
North Willow Creek near Idaho Falls		43 30 42	112 03 04	11/6/2002		0
Porter Canal near Idaho Falls ⁴	13057250	43 30 00	112 03 00	11/6/2002	DM	10
South Willow Creek near Idaho Falls		43 30 04	112 02 35	11/6/2002		0
Woodville Canal near Idaho Falls	13059505	43 25 48	112 06 00	11/6/2002	DM	1
Snake River Valley Canal near Idaho Falls	13059525	43 27 00	112 04 48	11/5/2002	DM	0

Table C16. Discharge data for all inspected inflow and outflow sites during November 4-5, 2002, for the

 Snake River and Henrys Fork between Heise and Shelley and Ashton and the mouth, Idaho--Continued

¹ Long-term United States Geological Survey or Idaho Power Company gaging stations are in bold.

² Values in shaded areas indicate canal withdrawals.

³ Surface flows resulting from spring discharge; not used in gain/loss calculations.

⁴ Actual canal discharge; spillback portion was accounted for.

EXPLANATION

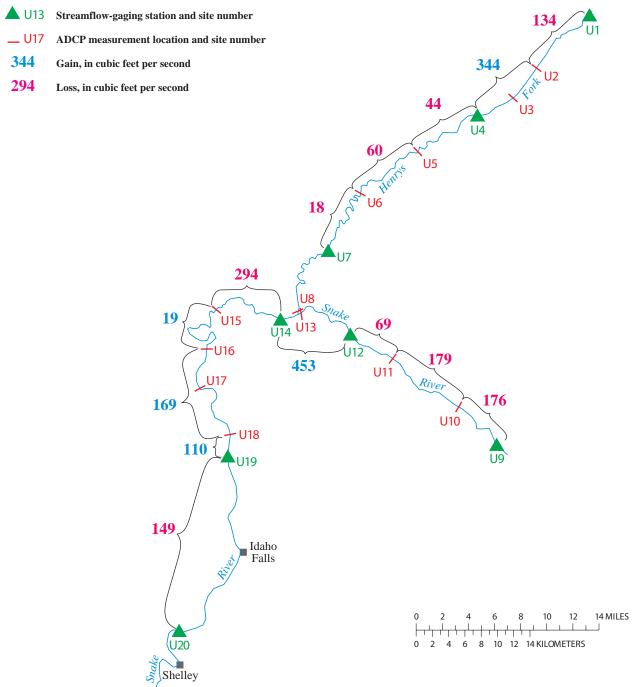


Figure C5. Streamflow gains and losses along the upper reach of the Snake River and Henrys Fork, Idaho, estimated during the November 4-5, 2002, seepage study.



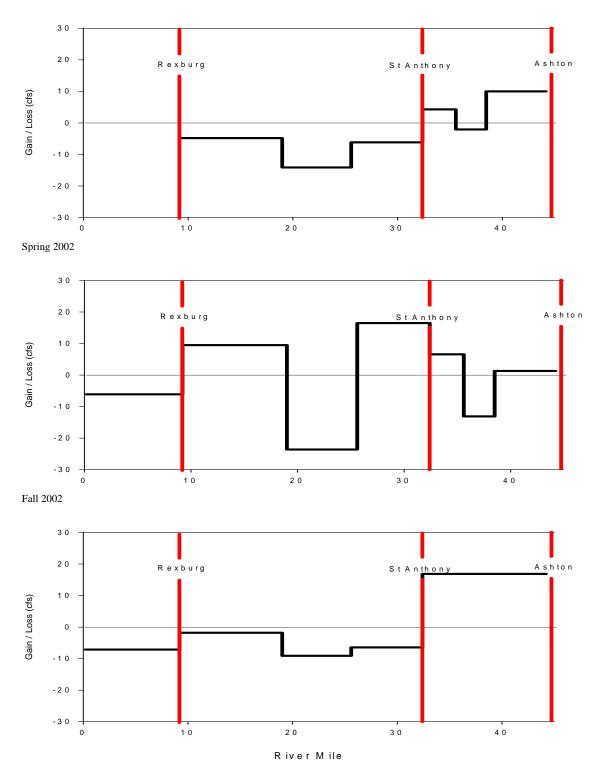
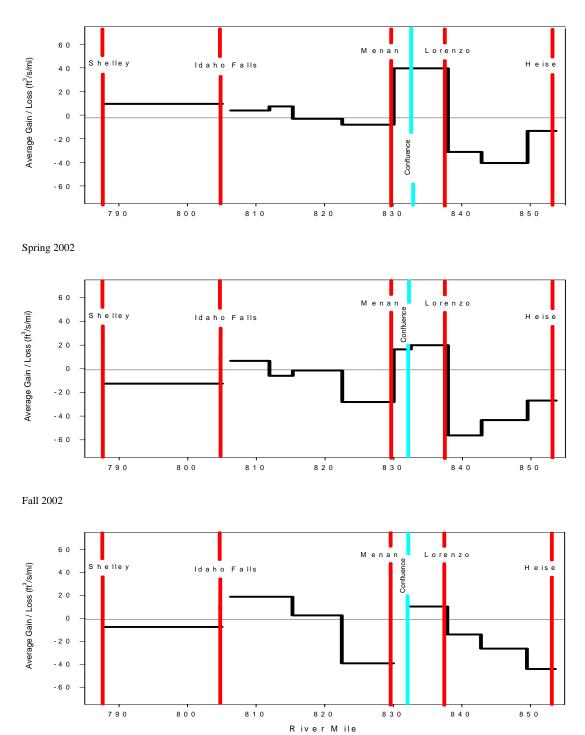
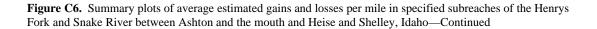


Figure C6. Summary plots of estimated gains and losses in specified subreaches of the Henrys Fork and Snake River between Ashton and the mouth and Heise and Shelley, Idaho





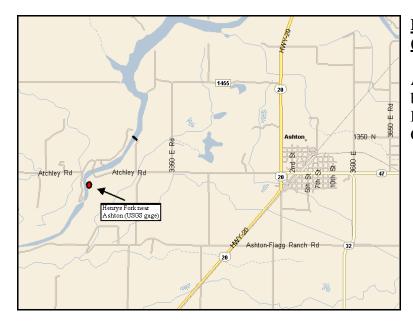






APPENDIX D

Descriptions and relevant information for the acoustic Doppler measurements sites used in this study

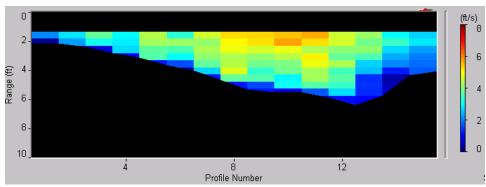


Henrys Fork near Ashton (USGS gage)

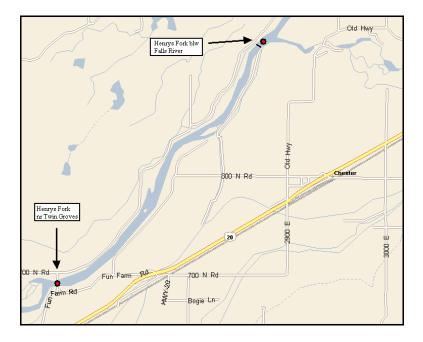
Access: Dirt road on left bank downstream of Henry's Fork Bridge Crossing.

Ashton (USGS gage)	
July 2002	

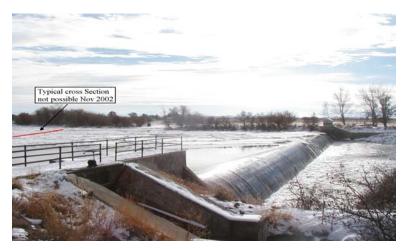
···)	
Latitude	44º04'11"
Longitude	111º30'38"
Discharge	1,960 cfs
Channel Width	105 feet
Max Depth	6.4 feet
Max Velocity	4.7 feet/sec



Henrys Fork near Ashton (USGS gage) July 2002.



Henrys Fork below Falls River

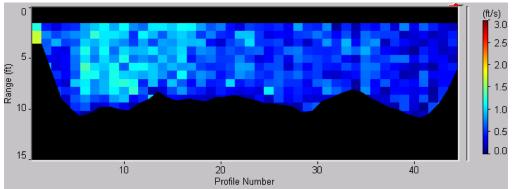


Access: Travel upstream along the river on either the left bank or right bank.

HF below Falls River April 2002

44º01'08"
111º34'57"
1,940 cfs
450 feet
10.8 feet
1.1 feet/sec

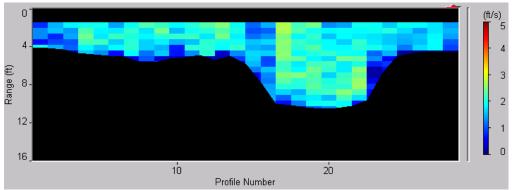
Henrys Fork below Falls River November 2002.



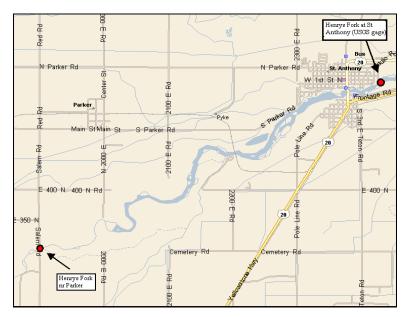
Henrys Fork below Falls River above diversion dam April 2002.

Henrys Fork near Twin Groves

HF near Twin Groves	Latitude	43º58'59"	Channel Width	140 feet
April 2002	Longitude	111º37'25"	Max Depth	10.6 feet
	Discharge	1,140 cfs	Max Velocity	3.4 feet/sec



Henrys Fork near Twin Groves April 2002.

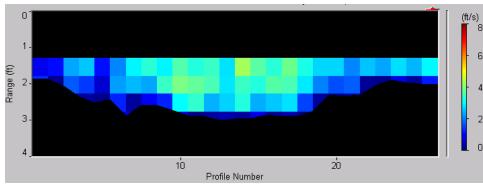


Henrys Fork at St Anthony (USGS gage)

Access: Walk down through clearing to cable way on the right bank in St Anthony.

St Anthony (USGS gage) July 2002

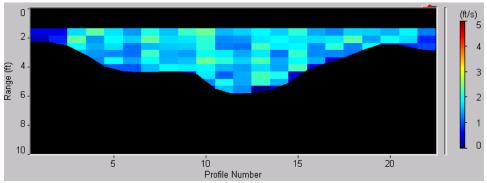
Latitude	43º58'01"
Longitude	111º40'21"
Discharge	1,570 cfs
Channel Width	210 feet
Max Depth	3.0 feet
Max Velocity	3.9 feet/sec



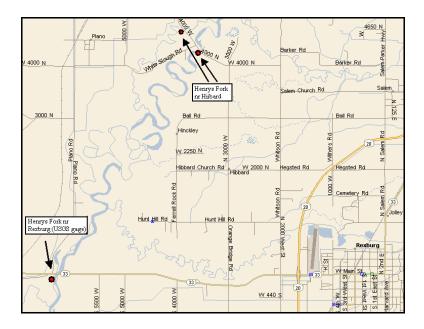
Henrys Fork near St Anthony (USGS gage) July 2002.

Henrys Fork near Parker

HF near Parker	Latitude	43º55'39"	Channel Width	140 feet
November 2001	Longitude	111º46'37"	Max Depth	5.9 feet
	Discharge	1,000 cfs	Max Velocity	2.1 feet/sec

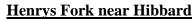


Henrys Fork near Parker October 2001.





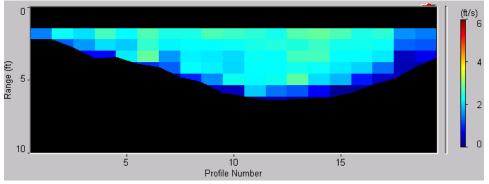
Henrys Fork near Hibbard November 2002.



Access: On right bank downstream of W4000N road crossing. Note: There is a second channel to the northwest that can be waded downstream of the W4000N crossing.

HF near Hibbard November 2002

Latitude	43º53'16"
Longitude	111º50'57"
Discharge	1,280 cfs
Channel Width	110 feet
Max Depth	6.4 feet
Max Velocity	2.6 feet/sec

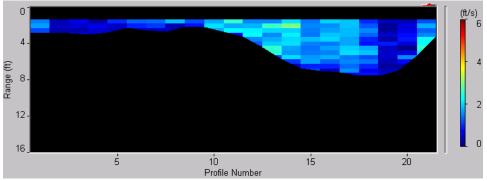


Henrys Fork near Hibbard November 2002.

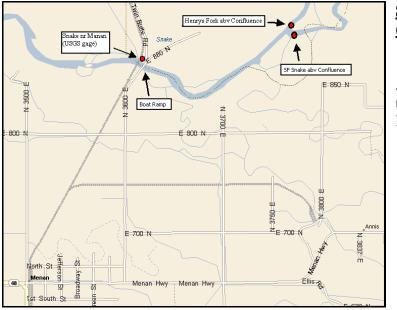
Henrys Fork near Rexburg (USGS gage)

Access: On the right bank downstream of the highway 33 crossing.

Rexburg (USGS gage)	Latitude	43º49'33"	Channel Width	170 feet
July 2002	Longitude	111º54'18"	Max Depth	7.6 feet
	Discharge	1,110 cfs	Max Velocity	2.1 feet/sec



Henrys Fork near Rexburg (USGS gage) July 2002.



<u>Snake River near Menan</u> (USGS gage)

Access: On the right bank upstream of the Twin Butte Road crossing.

Menan (USGS	gage)
Latitude	43º45'10"
Longitude	111º58'45"

Henrys Fork above the Confluence

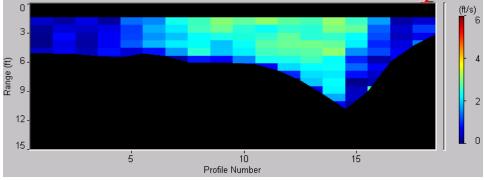
Access: Boat ramp on the left bank upstream of the Twin Butte Road crossing. Proceed up river approximately 2 miles to the confluence.



HF above Confluence November 2002

Latitude	43º45'30"
Longitude	111º56'55"
Discharge	1,370 cfs
Channel Width	105 feet
Max Depth	10.8 feet
Max Velocity	2.6 feet/sec

Henrys Fork above Confluence November 2002.



Henrys Fork above Confluence November 2002.

South Fork Snake River above the Henrys Fork Confluence

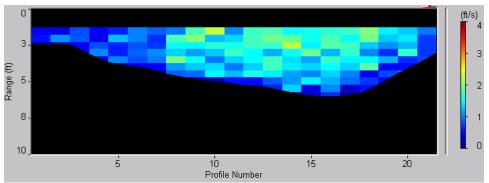


Access: Boat ramp on the left bank upstream of the Twin Butte Road crossing. Proceed up river approximately 2 miles to the confluence.

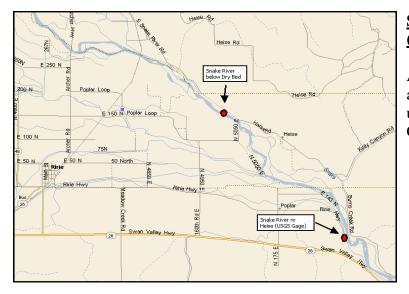
SF above Confluence November 2002

Latitude	43º45'24"
Longitude	111º56'52"
Discharge	614 cfs
Channel Width	100 feet
Max Depth	6.0 feet
Max Velocity	1.7 feet

South Fork Snake River above Confluence November 2002.



South Fork Snake River above Confluence November 2002.



Snake River near Heise (USGS gage)

Access: On the left bank, along Ririe highway, 850 feet upstream of the Anderson Canal headgate.

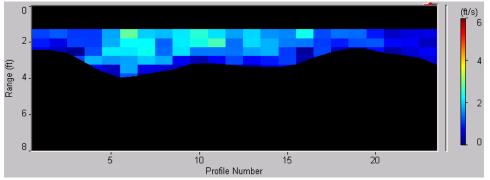
Heise (USGS gage)

	9-/
Latitude	43º36'45"
Longitude	111º39'36"

Snake River below Dry Bed Diversion

Access: From dirt road on right bank .25 miles downstream of N5050E crossing.

Snake below Dry Bed	Latitude	43º39'04"	Channel Width	175 feet
November 2002	Longitude	111º42'40"	Max Depth	4.0 feet
	Discharge	856 cfs	Max Velocity	2.2 feet/sec



Snake River below Dry Bed November 2002.



Snake River near Lorenzo (USGS gage)

43º44'07'

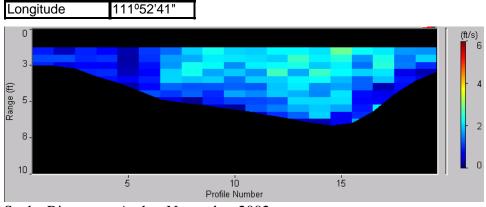
Latitude

Snake River near Archer

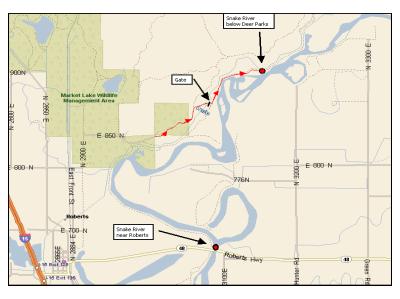
Access: Proceed onto dirt road (W8200S) over Reid Canal and through gate (always open), left at pump (crossing field) to levee, left (East) on levee for 100 yards & through wire gate to the right (South). This access is through BLM land.

Snake near Archer November 2002

Latitude	43º42'09"
Longitude	111º48'30"
Discharge	641 cfs
Channel Width	90 feet
Max Depth	6.7 feet
Max Velocity	2.2 feet/sec



Snake River near Archer November 2002.

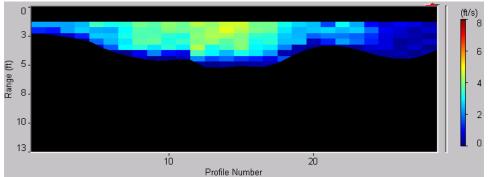


Snake River below Deer Parks

Access: Dirt Road from E850N, There is a chained gate (not locked) near Deer Parks Spillback structure. Access is through private land. Be sure to consult landowner as you pass his ranch. He is friendly.

Snake below Deer Parks November 2002

Latitude	43º45'50"
Longitude	112º04'14"
Discharge	1,980 cfs
Channel Width	160 feet
Max Depth	5.3 feet
Max Velocity	4.1 feet/sec

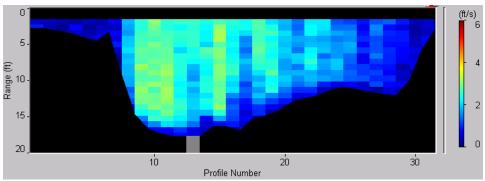


Snake River below Deer Parks November 2002

Snake River at Roberts Bridge

Access: Boat landing on the right bank upstream of the Roberts bridge.

Snake River above Roberts Bridge November 2002.



Snake River above Roberts Bridge Summer 2002.

Snake near Roberts

43º43'16"

112º05'11

8,540 cfs

355 feet

18.0 feet

3.0 feet

July 2002 Latitude

Longitude

Discharge

Max Depth

Max Velocity

Channel Width



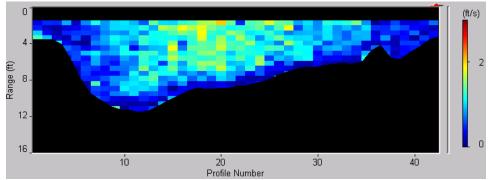
Snake River above Dry Bed

Access: Pull off old Highway 91. Carry equipment over railroad tracks.

Snake above Dry Bed	
April 2002	

Latitude	43º40'42"
Longitude	112º06'10"
Discharge	2,400 cfs
Channel Width	350 feet
Max Depth	13.3 feet
Max Velocity	2.4 feet/sec

Near Idaho Falls	(USGS gage)
Latitude	43º36'17"
Lonaitude	112º03'31"

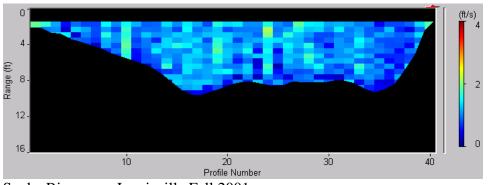


Snake River above Dry Bed Spring 2002.

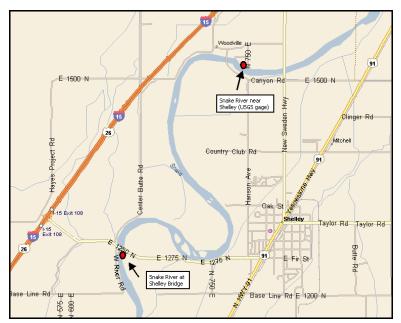
Snake River near Lewisville

Access: On the right bank upstream of county road bridge crossing.

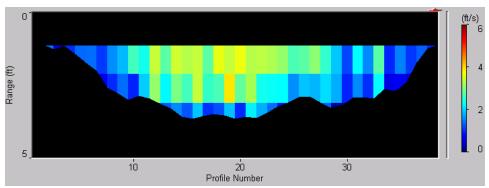
Snake near Lewisville	Latitude	43º37'41"	Channel Width	365 feet
November 2001	Longitude	112º04'00"	Max Depth	9.6 feet
	Discharge	2,210 cfs	Max Velocity	1.6 feet/sec



Snake River near Lewisville Fall 2001.



Snake River near Shelley USGS gage Fall 2001.



Snake River near Shelley USGS gage Fall 2001.

<u>Snake River near Shelley</u> (USGS gage)

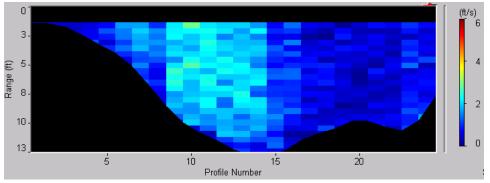
Access: This is on private land. Contact Idaho Falls USGS office if access is required.

Near Shelley (USGS gage) November 2001

Latitude	43º24'48"
Longitude	112º08'03"
Discharge	1,910 cfs
Channel Width	460 feet
Max Depth	3.7 feet
Max Velocity	3.7 feet/sec

Snake River at Shelley Bridge

Snake at Shelley Bridge	Latitude	43º22'35"	Channel Width	240 feet
November 2001	Longitude	112º10'07"	Max Depth	12.9 feet
	Discharge	2,090 cfs	Max Velocity	2.1 feet/sec



Snake River at Shelley Bridge Fall 2001.





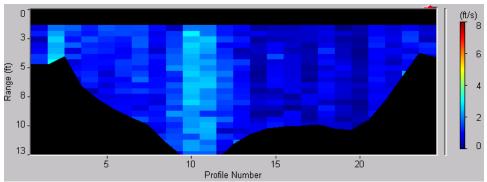
Snake River below Firth Bridge Fall 2001.

Snake River at Firth Bridge

Access: Downstream of Firth Bridge on left bank.

Snake below Firth Bridge November 2001

Latitude	43º18'45"
Longitude	112º11'00"
Discharge	1,760 cfs
Channel Width	320 feet
Max Depth	13.3 feet
Max Velocity	2.4 feet/sec



Snake River below Firth Bridge Fall 2001.



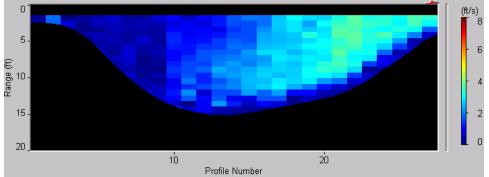
Snake River near Kimball

Access: Through Private land at the end of Kennedy Road. Consult documentation for landowner information to arrange access.

Snake near Kimball November 2002

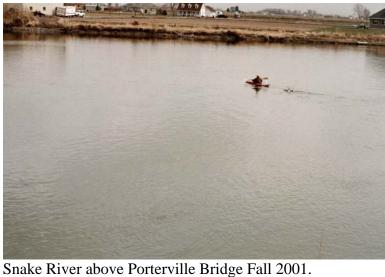
Latitude	43º16'41"
Longitude	112º13'58"
Discharge	2,310 cfs
Channel Width	150 feet
Max Depth	15.2 feet
Max Velocity	3.4 feet/sec

Snake River near Kimball Fall 2001.



Snake River near Kimball November 2002.



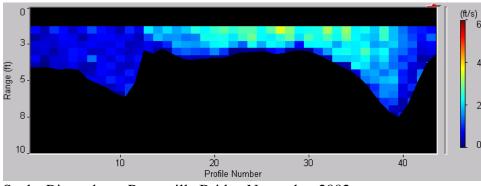


Snake River at Porterville Bridge

Access: Boat ramp on the right bank upstream of Porterville Bridge.

Snake at Porterville Bridge November 2002

Latitude	43º13'45"
Longitude	112º19'41"
Discharge	2,290 cfs
Channel Width	360 feet
Max Depth	7.5 feet
Max Velocity	2.9 feet/sec



Snake River above Porterville Bridge November 2002.



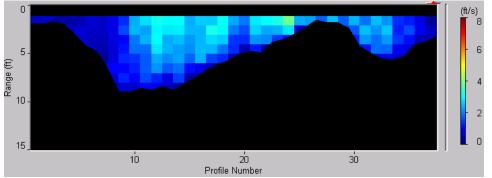
Snake River at Blackfoot USGS gage Fall 2001.

<u>Snake River at Blackfoot</u> (USGS gage)

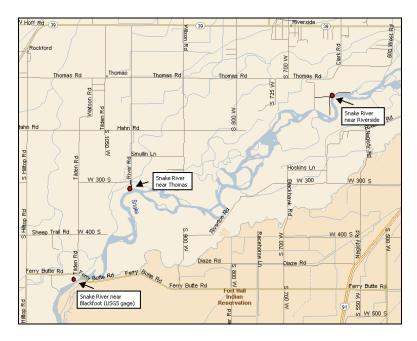
Access: Between W Bridge Street and train bridge on left bank.

At Blackfoot (USGS gage) November 2001

Latitude	43º11'51"
Longitude	112º22'09"
Discharge	1,630 cfs
Channel Width	325 feet
Max Depth	9.0 feet
Max Velocity	3.9 feet/sec



Snake River at Blackfoot USGS gage Fall 2001.





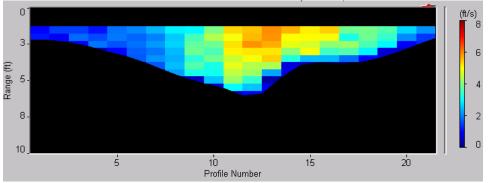
Snake river near Riverside

Access: Access is through private land. Consult documentation for landowner information to arrange access.

Snake near Riverside November 2002

43º10'37"
112º25'06"
2,060 cfs
140 feet
6.0 feet
4.9 feet/sec

Snake River near Riverside Fall 2001.



Snake River near Riverside November 2002.

Snake River near Thomas

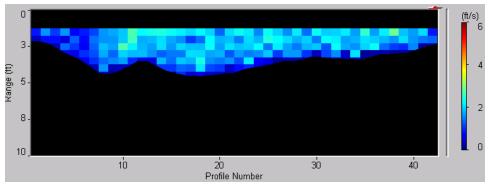
Access: Dirt boat launch on right bank 3 miles south of Hwy 39.



Snake near Thomas November 2002

Latitude	43°09'06"
Longitude	112º29'38"
Discharge	2,060 cfs
Channel Width	310 feet
Max Depth	4.6 feet/sec
Max Velocity	2.0 feet/sec

Snake River near Thomas November 2002.

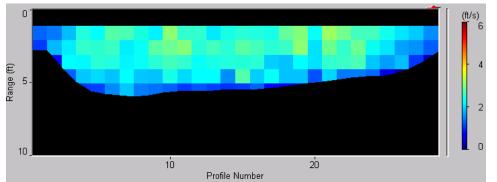


Snake River near Thomas November 2002.

Snake River near Blackfoot (USGS gage)

Access: On the right bank downstream of Tilden Bridge.

Nr Blackfoot (USGS gage)	Latitude	43º07'31"	Channel Width	260 feet
November 2001	Longitude	112º31'06"	Max Depth	6.0 feet
	Discharge	1,670 cfs	Max Velocity	2.9 feet/sec



Snake River near Blackfoot USGS gage Spring 2001.





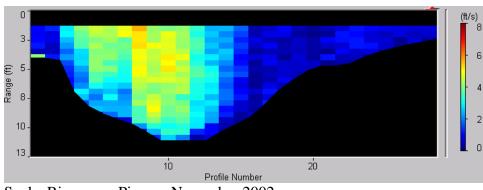
Snake River near Pingree November 2002.

Snake River near Pingree

Access: Either an almost 4 mile boat ride up from McTucker Creek or access through private land on the right bank

Snake near Pingree November 2002

Latitude	43º03'35"
Longitude	112º34'34"
Discharge	2,430 cfs
Channel Width	135 feet
Max Depth	11.9 feet
Max Velocity	4.6 feet/sec



Snake River near Pingree November 2002.



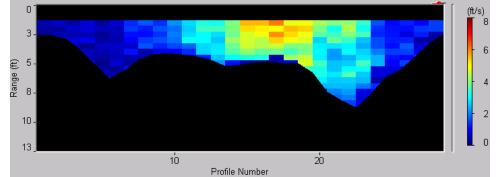
McTucker Creek Boat Landing November 2002.

Snake River below McTucker Creek

Access: Follow Sportsman's access signs from highway 39 just East of Springfield to BLM boat landing (1 mile upstream of Snake River). Navigation can be difficult at low water.

Snake below McTucker Creek November 2002

Latitude	43º01'24"
Longitude	112º39'25"
Discharge	2,550 cfs
Channel Width	175 feet
Max Depth	8.8 feet
Max Velocity	5.1 feet/sec



Snake River below McTucker Creek November 2002.



Snake River 12 miles above American Falls Dam

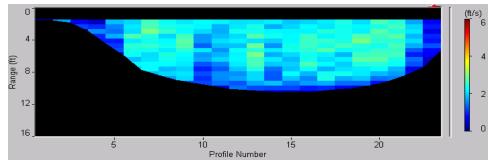
Access: Proceed up to a ½ mile to the North from the end of Beach Road. If the reservoir is low enough, the original river channel is exposed within 200 yards of the road.

Snake 12 miles above American Falls Dam November 2001

November 2001	
Latitude	42º55'43"
Longitude	112º45'41"
Discharge	2,580 cfs
Channel Width	150 feet
Max Depth	10.5 feet
Max Velocity	2.5 feet/sec



Snake River 12 miles above American Falls Dam Fall 2001.

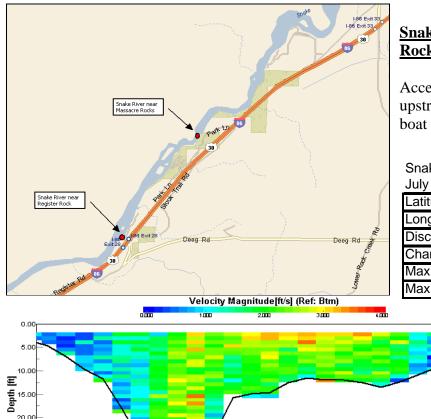


Snake River 12 miles above American Falls Dam Fall 2001.



Snake River near Neeley (USGS gage)

Neeley (USGS gage)		
Latitude	42º46'03"	
Longitude	112º52'46"	

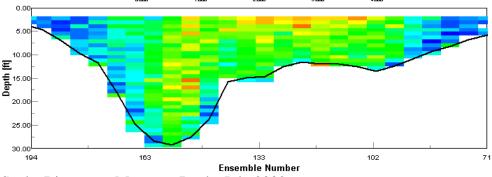


Snake River near Massacre Rocks

Access: 2 to 3 mile boat ride upstream from Register Rock boat launch.

Snake near Massacre Rocks July 2002

42º41'05"
112º58'47"
10,300 cfs
330 feet
31.6 feet
2.5 feet/sec



Snake River near Massacre Rocks July 2002.



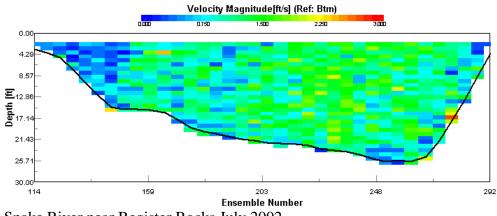
Snake River near Register Rocks November 2002.

Snake River at Register Rock

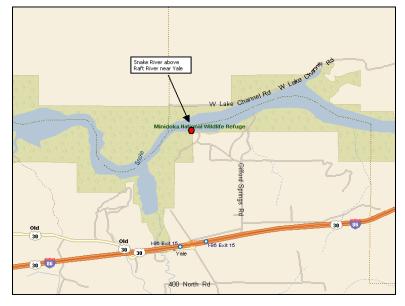
Access: Register Rock boat launch on left bank. Take Freeway exit 28.

Snake near Register Rock July 2002

<u> </u>	
Latitude	42°39'39"
Longitude	113º00'09"
Discharge	10,300 cfs
Channel Width	510 feet
Max Depth	28.1 feet
Max Velocity	1.5 feet/sec



Snake River near Register Rocks July 2002.

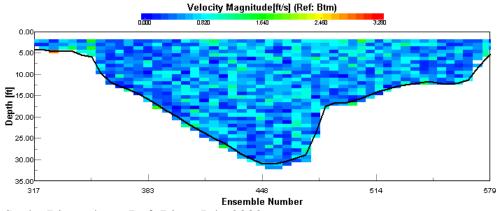


Snake River above Raft River

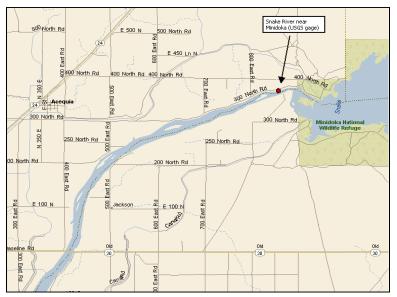
Access: Freeway exit 15 and follow Sportsman's access signs to a boat launch.

Snake above Raft River July 2002

Latitude	42º37'31"
Longitude	113º14'12"
Discharge	10,400 cfs
Channel Width	1,430 feet
Max Depth	33.6 feet
Max Velocity	0.65 feet/sec



Snake River above Raft River July 2002.



<u>Snake River near Minidoka</u> (USGS gage)

Minidoka (USGS gage)		
Latitude	42º40'23"	
Longitude	113º29'58"	

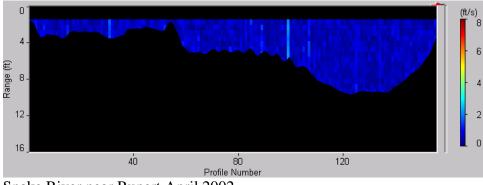


Snake River near Rupert

Access: Boat launch ¼ mile downstream of highway 77 on the right bank. Measure upstream of highway 77 bridge.

Snake near Rupert April 2002

Latitude	42º34'58"
Longitude	113º37'28"
Discharge	590 cfs
Channel Width	960 feet
Max Depth	9.5 feet
Max Velocity	0.48 feet/sec

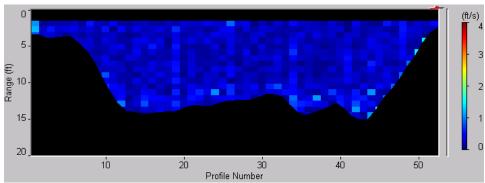




Snake River at Burley

Access: Pull-out under railroad bridge on right bank .1 mile downstream of highway 30.

Snake at BurleyLatitude42°32'56"Channel Width620 feetApril 2002Longitude113°45'52"Max Depth16.2 feetDischarge600 cfsMax Velocity0.3 feet/sec



Snake River at Burley April 2002.



Snake River near Milner

Lower Milner Power Plant				
Latitude 42°31'29"				
Longitude 114º01'46"				

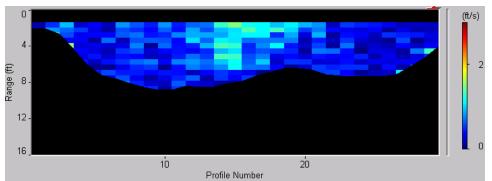
Milner Bypass (USGS gage)				
Latitude 42°31'41"				
Longitude 114º01'04"				

Snake River above Murtaugh Bridge

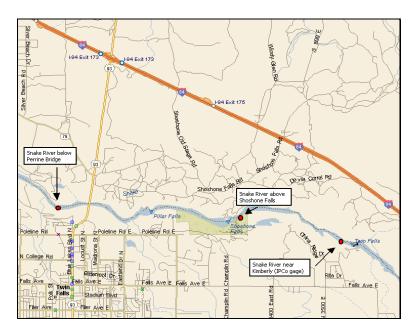
Snake above Murtaugh Bridge November 2002

Latitude	42º29'57"
Longitude	114º09'10"
Discharge	480 cfs
Channel Width	145 feet
Max Depth	8.9 feet
Max Velocity	1.2 feet/sec

Access: Dirt Pull-out on right bank .1 mile upstream of murtaugh bridge.



Snake River above Murtaugh Bridge November 2002.



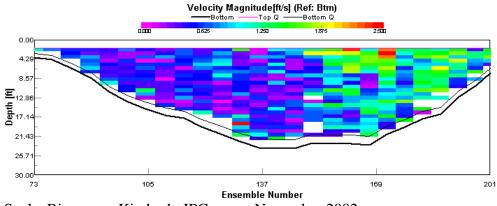


<u>Snake River near Kimberly</u> (IPCo gage)

Access: Twin Falls Power Plant private road on left bank. Contact IPCo to arrange access.

Kimberly (IPCo gage) November 2002

Latitude	42º35'28"
Longitude	114º21'34"
Discharge	770 cfs
Channel Width	127 feet
Max Depth	24.0 feet
Max Velocity	1.4 feet/sec

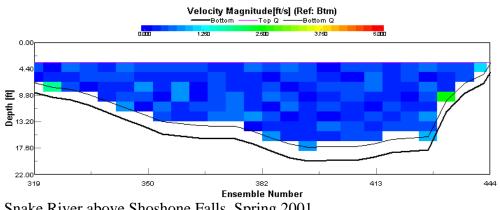


Snake River near Kimberly IPCo gage November 2002.

Snake River above Shoshone Falls

Access: Through Shoshone Falls municipal park (entry fee may apply). Proceed to boat landing.

Snake abv Shoshone Falls	Latitude	42º35'57"	Channel Width	475 feet
April 2001	Longitude	114º23'39"	Max Depth	19.7 feet
	Discharge	890 cfs	Max Velocity	0.35 feet/sec

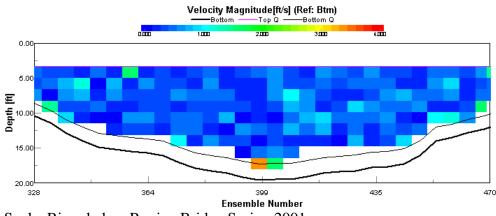


Snake River above Shoshone Falls Spring 2001.

Snake River below Perrine Bridge

Access: Boat landing in Centennial Waterfront Park on left bank.

Snake blw Perrine Bridge	Latitude	42º36'05"	Channel Width	300 feet
April 2001	Longitude	114º28'07"	Max Depth	19.5 feet
	Discharge	950 cfs	Max Velocity	0.47 feet/sec



Snake River below Perrine Bridge Spring 2001.

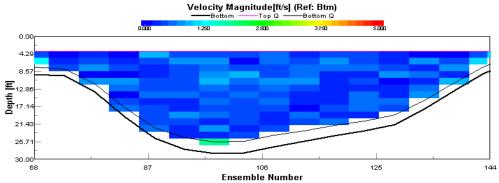


<u>Snake River above Crystal</u> <u>Springs</u>

Access: Boat launch at fish hatchery on left bank 1 mile upstream of Cedar Draw mouth. Proceed upstream to a point above Crystal Springs (on right bank

Snake above Crystal Springs April 2001

Latitude	42º39'14"
Longitude	114º38'02"
Discharge	1,540 cfs
Channel Width	280 feet
Max Depth	28.5 feet
Max Velocity	0.48 feet/sec



Snake River above Crystal Springs Spring 2001.

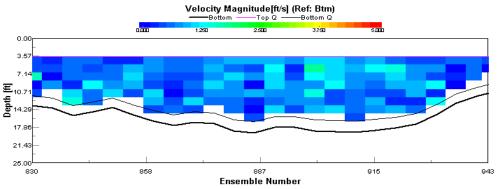
<u>Snake River near Buhl (USGS gage)</u>

Buhl (USGS gage) Latitude 42°39'58" Longitude 114°42'41"

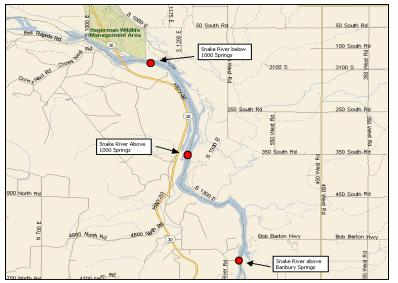
Snake River below Clear Lakes

Access: Boat launch on the right bank of the Snake, downstream edge of Clear Lakes mouth.

Snake below Clear Lakes	Latitude	42º39'55"	Channel Width	245 feet
April 2001	Longitude	114º46'58"	Max Depth	18.3 feet
	Discharge	2,510 cfs	Max Velocity	1.0 feet/sec



Snake River below Clear Lakes outlet Spring 2001.

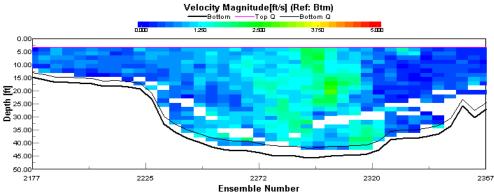


<u>Snake River above Banbury</u> <u>Springs</u>

Access: Private boat launch at Sligars Hot Springs on the left bank across from 1000 Springs (fee may apply)

Snake above Banbury Spring July 2002

••••) =•••=	
Latitude	42º41'12"
Longitude	114º49'33"
Discharge	2,770 cfs
Channel Width	100 feet
Max Depth	45.6 feet
Max Velocity	1.5 feet/sec

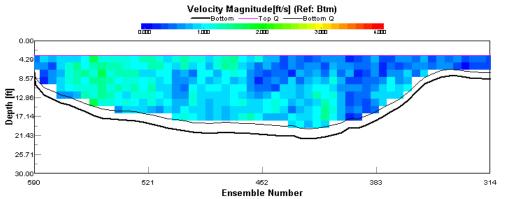


Snake River above Banbury Springs July 2002.

Snake River above Thousand Springs

Access: Private boat launch at Sligars Hot Springs on the left bank across from 1000 Springs (fee may apply).

Snake above 1000 Springs	Latitude	42º43'27"	Channel Width	245 feet
July 2002	Longitude	114º50'51"	Max Depth	22.0 feet
	Discharge	3,720 cfs	Max Velocity	1.4 feet/sec

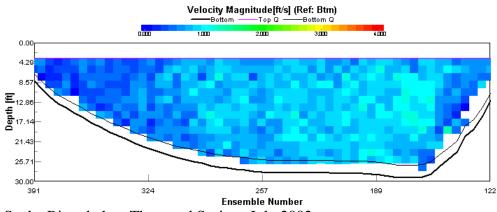


Snake River above thousand Springs July 2002.

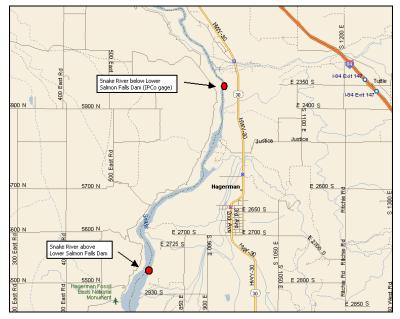
Snake River Below Thousand Springs

Access: Private boat launch at Sligars Hot Springs on the left bank across from 1000 Springs (fee may apply).

Snake below 1000 Springs	Latitude	42º45'25"	Channel Width	275 feet
July 2002	Longitude	114º52'08"	Max Depth	28.4 feet
	Discharge	4,710 cfs	Max Velocity	1.0 feet/sec



Snake River below Thousand Springs July 2002.

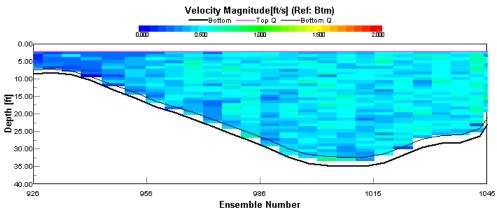


<u>Snake River above Lower</u> <u>Salmon Dam</u>

Access: Bell Rapids Boat Ramp 2 miles SW of Hagerman.

Snake abv Lower Salmon Dam April 2002

Latitude	42º48'04"
Longitude	114º55'58"
Discharge	5,170 cfs
Channel Width	430 feet
Max Depth	34.8 feet
Max Velocity	0.57 feet/sec

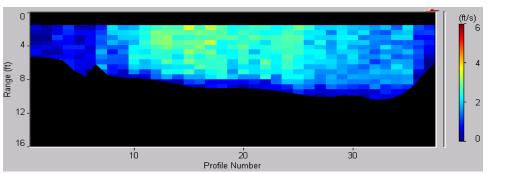


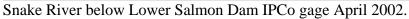
Snake River above Lower Salmon Dam April 2002.

Snake River below Lower Salmon Dam (IPCo gage)

Access: Boat launch on right bank just below Lower Salmon Dam.

Lower Salmon (IPCO gage)	Latitude	42º50'55"	Channel Width	300 feet
April 2002	Longitude	114º54'02"	Max Depth	10.4 feet
	Discharge	5,070 cfs	Max Velocity	2.7 feet/sec





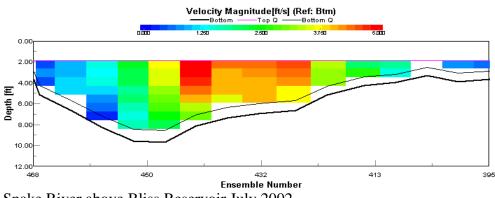


<u>Snake River above Bliss</u> <u>Reservoir</u>

Access: Kayak access just above pumping station on right bank 1 mile below Bliss Shoestring Road river crossing (at the bottom of Bliss Grade).

Snake abv Bliss Reservoir July 2002

Latitude	42°54'55"
Longitude	114º59'15"
Discharge	6,310 cfs
Channel Width	310 feet
Max Depth	9.7 feet
Max Velocity	4.5 feet/sec

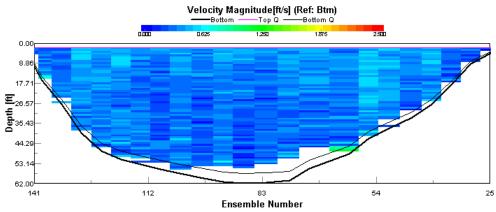


Snake River above Bliss Reservoir July 2002.

Snake River below Bliss Dam (IPCo gage).

Access: Boat landing at park on right bank just above Bliss Dam.

Bliss (IPCO gage)	Latitude	42º54'52"	Channel Width	420 feet
November 2002	Longitude	115º05'33"	Max Depth	61.6 feet
	Discharge	5,890 cfs	Max Velocity	4.0 feet/sec



Snake River 100 yards above Bliss Dam November 2002.

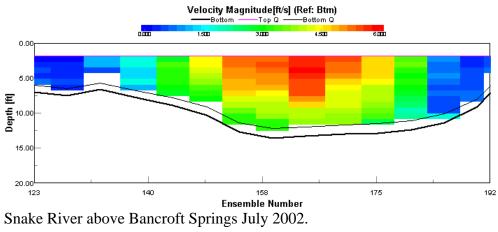


<u>Snake River above Bancroft</u> <u>Springs</u>

Access: Dirt boat launch (right at measurement site) on left bank accessed through Paradise Valley Interstate exit.

Snake above Bancroft Springs July 2002

Latitude	42°55'52"
Longitude	115º09'21"
Discharge	6,310 cfs
Channel Width	100 feet
Max Depth	13.5 feet
Max Velocity	5.1 feet/sec



Snake River at King Hill (USGS gage)

King Hill (USGS gage)

Latitude	43º00'08"
Longitude	115º12'06"