Expert witnesses Erick Powell and Greg Sullivan acknowledged that, despite the need for improvement to the WRV1.1 Model, the model is the best available tool to evaluate the effects of ground water pumping on flows of Silver Creek (Tr. at 1320; 1452).

In 2019, Sukow published a report on a model simulation of the cumulative impacts to streamflow resulting from full curtailment of consumptive use ground water diversions from 1995 through 2014. *Id.* at 16.

2021 Drought Year

The Surface Water Supply Index (SWSI) is a predictive indicator of surface water availability in a river basin compared to historic supply. IDWR Ex. 1 at 1. The Natural Resources Conservation Service ("NRCS") computes the SWSI by summing the two major sources of surface water supply for irrigation: streamflow runoff and reservoir carryover. *Id.*

The NRCS determines SWSI values by "normalizing the magnitude of annual water supply variability between basins. The non-exceedance values are then rescaled to range from +4.1 (extremely wet) to -4.1 (extremely dry). A SWSI value of 0.0 indicates a median water supply as compared to historic occurrences." *Id.*

At the beginning of each month (excluding November and December), the NRCS publishes a table with 10-, 30-, 50-, 70-, and 90-percent exceedance forecasts for the current season along with measured volumes for the previous 30 years. *Id.*

There is a strong correlation between the SWSI for the Big Wood River above Hailey and flows in Silver Creek. IDWR Ex. 6. The SWSI for the Big Wood River above Hailey is a good predictor of the available supply for surface water users in the Wood River Valley as well as downstream users that don't have access to water from Magic Reservoir but instead divert water from Silver Creek or the Little Wood River. IDWR Ex. 1 at 2.

The April SWSI for the Big Wood River above Hailey was -2.7 with a predicted April through September runoff volume of 127 KAF. *Id.* at 3.

Based on the April SWSI, for the period 1991 to 2020, the years with the most similar total supplies to the 50% exceedance forecast for 2021 were 2004 (SWSI = -2.6) and 2020 (SWSI = -2.8). *Id.*

In early June 2021, the NRCS published a SWSI table for June through September 2021 for the Big Wood River at Hailey. *See* IDWR Ex. 5. The SWSI value corresponding to the June through September 2021 50% exceedance forecast volume was -4.0, which is worse than the June through September SWSI for any of the previous 30 years. Tr. at 48, 50; IDWR Ex 5. The next closest SWSI is -3.9 in 1994. Tr. 50.

Water District 37 watermaster Kevin Lakey testified that this year's flows at the Sportsman's Access gage and Station 10 are lower than the flows on comparable dates in any analogous water supply year, and agreed that the water supply conditions this year are the "worst" he has seen since taking over as watermaster in 2003. Tr. p.766. Lakey predicted that, based on current conditions, all 1884 priorities on the Little Wood River would be cut during June 2021, and that the April 1, 1883 priority would be cut by June 30, 2021. Tr. pp. 771-72 788-89; Rigby Ex. 2.

As a result of the predicted dismal surface water supply, surface water rights from Silver Creek and the Little Wood River senior in priority to ground water rights in the Bellevue Triangle will be curtailed unusually early during the 2021 irrigation season.

2021 Model Simulation

The WRV1.1 Model was used to simulate the impact of curtailing consumptive use of groundwater for agricultural, municipal, residential, commercial, and irrigation uses during the 2021 irrigation season. IDWR Ex. 2 at 17. The year 2002 was used as a baseline dry year for the model simulation. *Id.*

Curtailment of irrigation was simulated with different starting dates of May 1, June 1, July 1, and August 1. *Id.*

Curtailment was simulated within two areas. *See Id.*, Figure 15. The first area was the WRV1.1 Model boundary. Although the effects of the curtailment were simulated with the model for a period of approximately 12 years, the WRV1.1 Model predicts most of the impacts to streamflow are realized in less than 2 years. *Id.*, Figure 16.

The second area for which curtailment was simulated comprised most of the model area south of Glendale Bridge. *See Id.*, Figure 15, Figure 17. The second area excludes areas where groundwater pumping has minimal impact on streamflow in Silver Creek. Glendale Bridge crosses the Big Wood River at the north end of the Dry Bed. *Id.* at 22. Aquifer water levels deepen at the northern margin of the triangle between Bellevue and Glendale Bridge. *Id.*

Because the Basin 37 Administrative Proceeding was initiated to address water delivery during the 2021 irrigation season, the simulation results focus on the hydrologic responses that are predicted to occur by the end of September 2021. *Id.* at 17.

Predicted increases to the average monthly Silver Creek streamflow during the 2021 irrigation season, starting July 1 through September, range from 23 to 28 cfs. *Id.*

The simulation of curtailment indicates that 99% of the predicted in-season benefit to Silver Creek streamflow can be achieved by curtailing 70% of the consumptive groundwater use within the model domain by reducing the area of curtailment to the area south of Glendale Bridge. IDWR Ex. 2 at 22-23. This area coincides with the Bellevue Triangle area identified as the 2021 potential curtailment area. The remaining 30% of the consumptive groundwater use has minimal impact on Silver Creek.

Surface Water Flow Outside of the Model Boundaries

The Little Wood River and part of Silver Creek are outside the WRV1.1 Model boundary. IDWR Ex. 2, Figure 19. Many of the senior surface water rights potentially affected by ground water diversions in the Bellevue Triangle are outside the model boundary.

For the 2020 irrigation season, average monthly seepage losses between the Sportsman Access gage and Little Wood River Station 10 were calculated using the USGS recorded streamflow at the Sportsman Access gage and Water District 37 records of streamflow (Little Wood River Station 10, thirty diversions from Silver Creek, and two inflows to Silver Creek). IDWR Ex. 2 at 26, and Table 3. Estimated seepage losses range from 16 cfs to 46 cfs and from 20% to 37% of the inflow to the reach. *Id.* at 26. Gains to Silver Creek, between Highway 20

Bridge and Station 10, resulting from curtailment of groundwater will likely incur similar rates of seepage loss. *Id.* at 30.

Kevin Lakey testified that he had observed the discharge at Station 10 increase within five to ten days after voluntary curtailment of some upstream ground water rights. Tr. p.785-87. The surface water users and one of the ground water users also testified that, based on their observations, flows in the Little Wood River and Silver Creek respond to changes in ground water pumping in the Bellevue Triangle. Tr. pp. 404, 493-94, 612-13, 1130. The range is a few days to two weeks.

Injury

The Director's request for staff memoranda sought, among other things, an analysis identifying lands irrigated by water from Silver Creek and the Little Wood River "that could be injured by depletions caused by ground water pumping." *Request* at 2. The Request also sought an explanation of "methods of analysis for identifying possible injury" to senior water rights arising from depletions caused by ground water pumping. *Id.* at 3.

Pre-ground Water Pumping vs. Post-ground Water Pumping

The staff memorandum prepared by Tim Luke ("Luke Memorandum") compares water right priorities on Silver Creek and the Little Wood River deliverable in a year before the advent of ground water pumping but having a water supply year analogous to 2021, with priorities that may be deliverable in 2021. The Luke Memorandum also included an analysis of watermaster records to determine water right deliveries for water rights in water supply years analogous to 2021. IDWR Ex. 4 at 11-27. The Luke Memorandum identifies lands potentially injured by ground water pumping using IDWR's water rights spatial data, including GIS feature layers, that identity the places of use ("POU") for water rights diverting from Silver Creek and the Little Wood River. *Id.* at 18. The resulting list of water rights was modified to exclude: 1) all water rights with POUs that are also irrigated by ground water, 2) water rights having a "drain" or "wastewater" source, 3) water rights owned by BWCC or AFRD2 that may receive water from another source, and 4) all water rights having the "Exchange Condition" that authorizes the exchange of water from the Big Wood and Little Wood Rivers for Snake River water injected into the Wood River system via the Milner-Gooding Canal. *Id.* at 7, 18. The list of potentially injured water rights is attached to the Luke Memorandum as "Attachment A." *Id.* at 18.

The Exchange Condition rights were excluded from Attachment A based on the understanding that "the Exchange Condition water rights, to the extent they are in priority, shall receive Snake River water conveyed by the Milner-Gooding Canal in coordination with AFRD2." *Id.*, Attachment B, p. 2. Testimony at the hearing, however, established that when an exchange right is out of priority, the exchange no longer applies and the water user must then look to a supplemental supply, if the water users has one. Tr. p. 291-92. Not all Exchange Condition water rights also have a "supplemental" supply of water, and even those that do may not have a sufficient supplemental supply to replace the amounts of water that would have been available under the water rights had they not been curtailed. Tr. pp. 289-97, 778-80. Thus, even Little Wood River water rights with the Exchange Condition can be injured by ground water pumping in the Bellevue Triangle.

The years 1937 and 1939 are the two years "in the pre-groundwater development period" for which priority delivery records exist that are "closest" to the 2021 April SWSI, based on the NRCS's historical SWSI analysis of the 104-year period of record for the Big Wood River above Hailey. 2004 and 2020 are analog years for the post-ground water development period, based on the staff memorandum of Sean Vincent. *Id.* at 23.[4]

Comparison of the 2004 and 2020 water right priority cuts with the 1937 and 1939 priority cuts "generally indicates that the 1884 priority rights were cut more frequently and longer in 2020/2004 than 1939/37." *Id.* at 23.[5] While most 1884 priority dates were cut for multiple weeks or months in 2004 and 2020, most 1884 priority dates were not cut at all in the years 1937 and 1939. *Id.* at 24-25. When 1884 priority dates were cut in the years 1937 and 1939, they were cut for shorter periods of time: 1 to 2 weeks. *Id.*; *see also* Tr. p. 374. The relatively junior April 1, 1885, priority was also cut for significantly shorter periods in 1937 and 1939 (25 days) than in 2004 and 2020 (66-69 days). IDWR Ex. 4 at 23-25.

Evapotranspiration

The staff memorandum prepared by Philip Blankenau ("Blankenau Memorandum") compares evapotranspiration ("ET") values for water right places of use during years of adequate water supply and reduced water supply. IDWR Ex. 3. The Blankenau Memorandum looks at water right POUs in five areas during recent years of above-median, below-median, and near-median SWSIs for the Big Wood River above Hailey (2011, 2013, and 2016, respectively). *Id.* The five areas are:

1. Irrigated fields within ground water POUs and within the Bellevue Triangle, which were assumed to have a full water supply;

2. Irrigated fields north of Shoshone and east of the Milner-Gooding Canal ("North Shoshone Area") which are supplied primarily from Magic Reservoir, and do not receive a full supply when the reservoir does not fill;

3. Irrigated fields northwest of Richfield and the Little Wood River ("Richfield Area"), which are known to have an insufficient water supply when Magic Reservoir does not fill;

4. Irrigated fields within the area west of the Milner-Gooding Canal supplied by American Falls Reservoir District No. 2 ("AFRD2") and not overlapping the North Side Canal Company's service area or other surface or ground water right POUs, which were also assumed to have a full supply;

---

[4] The Luke Memorandum noted that while the SWSIs for the years 1961 and 1988 were actually closer to 2021 April SWSI, the years 2004 and 2021 were selected because they are more recent and should be more representative of ground water pumping in 2021. IDWR Ex. 4 at 23-24.

[5] Water rights diverting from Silver Creek and the Little Wood River under 1883 and 1884 priority dates are considered "good priority rights that are not cut often." Tr. p.367.

5. Irrigated fields within POUs for water rights diverting from Silver Creek and the Little Wood River and having no overlapping ground water right POUs. These water rights could potentially be injured by ground water use during the 2021 irrigation season.

IDWR Ex. 3 at 3; Tr. pp.238-41.

The Blankenau Memorandum determined that ET values for the Richfield and North Shoshone areas in 2013 (the below-median SWSI year) showed a widespread and deep decrease in ET values as compared to the above- and near-median years of 2011 and 2016, and that these decreases can safely be attributed to fields being dried down due to a water shortage. IDWR Ex. 3 at 6, 9-10; Tr. p.242. The Blankenau Memorandum did not find similar ET value decreases in the Little Wood and Silver Creek area during 2013, however. IDWR Ex. 3 at 9; Tr. p.249. The Blankenau Memorandum concluded, therefore, that the ET analysis "did not clearly identify water shortage in the Little Wood and Silver Creek area during the 2013 drought." IDWR Ex. 3 at 10.

Blankenau noted in his testimony that "in this analysis, [I] wasn't going to call an area water-short unless it was pretty clearly water-short," and that "individual fields could have water supply issues, but this analysis I don't think is sensitive enough to detect that." Tr. p.243. The Blankenau Memorandum also identified several factors that might limit the ability of the ET analysis to identify a water shortage at individual fields, including, among others, purchases of supplemental water by water users whose rights had been curtailed. IDWR Ex. 3 at 9-10. Subsequent testimony established that some water users in the Little Wood and Silver Creek area had purchased supplemental water during 2013 that could have affected the ET analysis. Tr. pp.904-06.

Ground Water use Within the Bellevue Triangle

The majority of irrigation and municipal ground water diversions within the Potential Area of Curtailment have priority dates later than 1940. IDWR Ex. 2, Figure 13. The majority of surface water rights on Silver Creek and its tributaries have priority dates prior to 1925. IDWR Ex. 4, Figure 3. The ground water rights in the Potential Area of Curtailment are junior to the surface water rights on Silver Creek and its tributaries.

The Potential Area of Curtailment contains a small portion of Galena's and the majority of South Valley's irrigated land. IDWR Ex. 2, Figure 17; SVGWD & GGWD Ex. 23 at 5; SVGWD & GGWD Ex. 41; Tr. pp. 1272-1273. Galena members hold twenty-one ground water rights, for a total of 4.04 cfs, within the Potential Area of Curtailment. SVGWD & GGWD Ex. 41; Tr. pp. 1272-1273. South Valley's members use ground water to irrigate approximately 22,000 acres of land. Tr. pp. 1158-1159. South Valley members use their ground water to grow grain, alfalfa, pasture, seed potatoes, and mustard, among other things. Tr. pp. 1159-1160. South Valley members have improved their irrigation efficiencies. Tr. pp. 1075, 1113-1125.

IDFG operates Hayspur Fish Hatchery, which is located within the Potential Area of Curtailment. Tr. p. 1008. The Hatchery uses three ground water rights in its operation. Tr. pp. 1011. Two of the water rights say they are non-consumptive on their face. IDFG Exs. 4, 6. The Hatchery pipes water through a series of concrete raceways and ponds, discharging the water to settling basins which flow into Butte Creek. Tr. pp. 1015-1026. Butte Creek flows to Loving

Creek which flows to Silver Creek. Tr. p. 1026. Measurements of the inflow to the Hatchery (IDFG Ex. 23) and measurements of the outflow of the Hatchery (IDFG Ex. 26) indicate the Hatchery discharges more water to Butte Creek than it diverts in ground water. The increase of flow can be attributed to spring seepage in the settling basin. Tr. pp. 1034-1035.

Water Supplies for Water Right Holders Diverting from Silver Creek or the Little Wood River

Fred Brossy owns and manages Barbara Farms, which is located near Shoshone.[6] Barbara Farms holds several surface water rights, including water rights 37-344A (Barbara Exs. 6, 7) and 37-973 (Barbara Exs. 4, 5), which authorize diversions of 4 cfs and 2 cfs from the Little Wood River under priorities of April 6, 1883, and April 1, 1884. This year, Brossy is growing organic potatoes, organic garden bean seed, organic pinto beans, barley, alfalfa, and various small acreages of seed crops. Tr. p. 442. In normal water supply years, Barbara Farms' water rights are sufficient to irrigate the farm's crops, although in recent years they have been curtailed more frequently. Tr. pp. 442-443. Brossy expects that his 1883 and 1884 water rights will be curtailed within one or two weeks of the hearing, and his water rights will not provide enough water to irrigate his crops during the 2021 irrigation season. Tr. p. 449. Brossy has rented 100 shares of AFRD#2 storage water from the City of Shoshone as a supplemental supply, and made some changes to his plantings to conserve and extend his water supply. Tr. pp. 441, 442, 453. Brossy testified he will need additional supplemental water to fully irrigate his crops this year, and has been attempting to secure it. *Id.* If he cannot, Brossy expects the water supply shortfall will adversely affect his 2021 crop production and revenue.

Brossy submitted estimates of his expected 2021 water supply shortfall, and the effects the shortfall would have on his crop production and revenue. Barbara Ex. 1. Brossy projected a total injury of approximately $220,000 as a result of water shortage in 2021. Barbara 1: Tr. pp. 448-451. Brossy's water supply shortage estimates and loss projections may be high because they are based on existing conditions, which are subject to change, and on assumptions and computations that may not be entirely accurate or correct. Even so, the record supports a finding that a shortage of water in 2021 has already impacted Brossy's farming activities, and will likely cause significant economic injury by the end of the 2021 irrigation season.

Brossy believes that ground water pumping in the Bellevue Triangle reduces the amount of Little Wood River water available for diversion under his water rights, and that curtailing junior water rights in the Bellevue Triangle would provide additional water for diversion. Tr. pp. 445-447. Brossy believes that curtailment on July 1 will provide water in time to save his crops. Tr. pp. 467-471.

Rodney Hubsmith owns and operates a farm and ranch near Richfield. Tr. p. 481. A portion of this land is irrigated under water right 37-472, which authorizes diversion of 1.2 cfs from the Little Wood River under a priority date of April 1, 1884. Hubsmith Exs. 2, 3. Hubsmith bought his farm in 1981 from his grandfather who had owned it for 40 years previously, and considered the farm's water right to be "the best water right in Richfield" prior to

[6] Brossy is the managing member of the entities that own and operate Barbara Farms: Barbara Farms LLC and Ernie's Organics LLC.

large-scale ground water pumping. Tr. p.487, 491. Since the 1990s, it has become increasingly common for Hubsmith's water right to be curtailed. Tr. pp. 484-486.

This year, Hubsmith is using the water right to irrigate alfalfa, Timothy grass, and pasture lands. Hubsmith's water right provides a full supply of water for these purposes if the right is not curtailed. Hubsmith anticipates that his water right will be curtailed in June this year, however, and that he will not have a full supply of water to grow his crops and irrigate his pasture land during the 2021 irrigation season. Hubsmith does not have an alternative or supplemental water supply for this land, and will take losses on his 2021 crop and livestock production if his water right is curtailed.

Hubsmith submitted estimates of his expected 2021 water supply shortfall, and the effects the shortfall would have on his crop production and livestock revenue. Hubsmith Ex. 1. Hubsmith projected a total injury of approximately $68,000 as a result of water shortage in 2021. *Id.*; Tr. pp. 495-497. Hubsmith's water supply shortage estimates and loss projections may be high because they are based on existing conditions, which are subject to change, and on assumptions and computations that may not be entirely accurate or correct. Even so, the record supports a finding that a shortage of water in 2021 has already impacted Hubsmith's farming activities, and will probably cause significant economic injury by the end of the 2021 irrigation season.

Hubsmith has lived and worked near the Little Wood River and Station 10 for many years, and is familiar with both. Tr. pp. 489-490. Hubsmith testified that the flows of the Little Wood River in the area of Station 10 have become increasingly lower in recent years, and he believes the reduction in flows is due in part to ground water pumping in the Bellevue Triangle. Tr. pp. 490-494. Hubsmith believes that ground water pumping in the Bellevue Triangle is injuring his water right. Tr. pp. 499-500. Hubsmith testified that when pumping in the Bellevue Triangle is reduced, flows in the Little Wood River near Station 10 increase within a few days. Tr. p. 493.

Carl Pendleton is a farmer-rancher who owns and rents farmland north of Shoshone. Pendleton is also the chairman of the board of the Big Wood Canal Company ("BWCC") and appeared on behalf of the company. Tr. p. 520. BWCC holds a number of water rights to divert from the Little Wood River for irrigation purposes, ranging in priority from April 6, 1883, to June 1, 1920. Fletcher Ex. 1. The most junior water rights (those later than 1885) are curtailed relatively early in most years, and are primarily used to send spring runoff flows to the Dietrich Tract, which helps conserve the storage supply in Magic Reservoir. Tr. p. 529. The most reliable of BWCC's Little Wood River water rights are 37-21402, 37-21405, and 37-21401, which have priority dates of April 6, 1883, April 1, 1884, and May 15, 1885. Tr. pp. 528-529. In normal years, the 1883 and 1884 water rights generally stay in priority until late in the irrigation season (Tr. p. 547.) , and the 1885 water right stays in priority until midsummer (Tr. p. 546.).

When these water rights are in priority, BWCC diverts them into the Dietrich Main Canal (Tr. p. 529.), but only if storage water from Magic Reservoir is being injected into the Little Wood River upstream, via the Richfield Canal and the Jim Burns Slough (Tr. p. 535.). If no storage is being released from Magic Reservoir, BWCC does not divert these water rights into the Dietrich Main Canal because the relatively small quantity of water they cover would not make it to BWCC's water users at the end of the canal on its own. Tr. pp. 531-533. BWCC therefore allows its Little Wood River water to remain in the river after Magic Reservoir releases