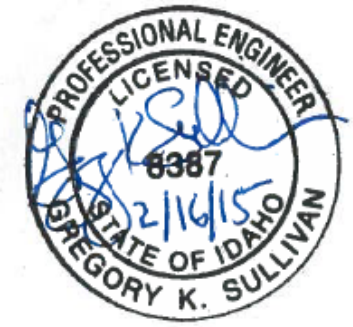
BEFORE THE DIRECTOR

OF THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION FOR WATER TO WATER RIGHT NO. 36-15501 (RANGEN, INC.)		**SPRONK WATER ENGINEERS, INC. EXPERT REBUTTAL REPORT FOR 2014 RANGEN DELIVERY CALL PREPARED FOR THE CITY OF POCATELLO FEBRUARY 16, 2015**



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Resumes of Gregory K. Sullivan, P.E., and Heidi M. Welsh

Expert Rebuttal Report
For 2014 Rangen Delivery Call
Prepared for the
City of Pocatello

7.0 Introduction[1]

On June 27, 2014, Rangen, Inc. ("Rangen") filed Rangen, Inc.'s Petition for Delivery Call ("2014 Rangen Call") with the Idaho Department of Water Resources ("IDWR") seeking a finding of injury to Rangen's 1957 priority water right (36-15501) as a result of junior-priority ground water pumping in the Eastern Snake Plain Aquifer ("ESPA").

The 2014 Rangen Call is the second delivery call filed by Rangen. The first delivery call was made on December 31, 2011 in Rangen, Inc.'s Petition for Delivery Call ("2011 Rangen Call"), in which Rangen sought a finding of injury to Rangen's 1962 priority water right (36-02551) and 1977 priority water right (36-07694) as a result of junior-priority ground water pumping in the ESPA. In the 2011 Rangen Call, Rangen did not allege injury to its 1957 priority water right (36-15501). On January 29, 2014, the Director issued the *Final Order Regarding Rangen, Inc.'s Petition for Delivery Call; Curtailing Ground Water Right's Junior to July 13, 1962* ("2014 Curtailment Order") which found injury to Rangen's 1962 priority water right and ordered curtailment of junior ground water pumping in the ESPA area of common ground water unless the impacts to Rangen from the junior pumping was mitigated. The curtailment order allowed mitigation to be phased in over a five year period starting with 3.4 cubic feet per second ("cfs") in the first year and reaching 9.1 cfs after five years[2].

[1] The section numbering of this rebuttal report commences with Section 7.0 and adds to Sections 1.0 – 6.0 contained in the January 26, 2015 Pocatello Report.

[2] Rangen, Pocatello, and the Idaho Ground Water Appropriators, Inc. ("IGWA") filed petitions seeking judicial review of the Director's 2014 Curtailment Order. On October 24, 2014, Judge Wildman issued a Memorandum of Decision and Order on Petitions for Judicial Review ("2014 Wildman Order"). Judge Wildman affirmed nearly all of the Director's findings in the 2014 Curtailment Order, but concluded that "the Director erred by applying a trim line to reduce the zone of curtailment" and remanded the case back to IDWR for further proceedings to address this issue.

On January 26, 2015, the following expert reports were filed on behalf of parties to the 2014 Rangen Call:

- Brendecke, C., and Sigstedt, S., 2015 Water Right, Water Measurement, and Groundwater Modeling Evaluation of Rangen 2014 Delivery ("IGWA Report")

- Brockway, C.E., and Colvin, D., 2015. Expert Report in Support of the Rangen, Inc.'s Delivery Call for Water Right No. 36-15501 ("Rangen Report").

- Contor, B. 2015. Technical Report in the Matter of Distribution of Water Rights Held by Rangen, Inc. Docket No, CM-DC-2014-004 (June 2014 Call for 1957-Priority Right, Prepared for Upper Valley Pumpers ("Upper Valley Report")

- Sullivan, G. 2015. Spronk Water Engineers, Inc. Expert Report for 2014 Rangen Delivery Call Prepared for the City of Pocatello, January 26, 2015 ("Pocatello Report").

On February 9, 2015, a memorandum was filed by IDWR to summarize the opinions of the IDWR staff regarding various technical matters related to the 2014 Rangen Call ("IDWR Memo"). The IDWR Memo was prepared by Jennifer Sukow with assistance from other IDWR personnel.

This rebuttal report was prepared on behalf of the City of Pocatello to respond to certain information and opinions contained in the Rangen Report and the IDWR Memo. The opinions described herein are based on our review of the January 2015 expert reports, the IDWR Memo, our work since the early 1990s in Idaho, our experience in the review and analysis of water use data, and our experience in conjunctive management and administration of ground water and surface water supplies and water rights. This rebuttal report supplements the January 26, 2015 Pocatello Report, and is styled to describe or quote the opinion contained in the Rangen Report or the IDWR Memo (in italics), followed by the rebuttal response.

8.0 Rebuttal to Rangen Report

8.1 Accuracy of Rangen Flow Measurements

Rangen Opinion (p. 2)

"We have reviewed the flow measurement procedures and it is our opinion that they are accurate and reliable as reported after IDWR replaced a pressure transducer on March 5, 2014. It appears from the data provided that some of the measurements reported were biased high before the new pressure transducer was installed."

Response

The Rangen Report contains no data or analysis to support the opinion that the flow measurement procedures are "accurate and reliable." The flow of the Curren Tunnel is determined as the sum of the flow that discharges from the Tunnel to the Farmer Box and the flow of the 6-inch White Pipe that diverts from within the tunnel upstream of the gage located near the mouth of the tunnel. As described in the Pocatello Report, the accuracy of the daily reported discharges from the Curren Tunnel to the Farmers Box is questionable due to the presence of the 6-inch White Pipe in the bottom of the tunnel, especially at low flows. The Pocatello Report also details the inaccuracy of the 6-inch White Pipe flow records because of the lack of a flow meter or other standard measuring device to determine the pipe discharge

Figure 1 of the Rangen Report purports to present the daily flows of the Curren Tunnel during the 2014 calendar year. The flows shown in Figure 1 do not accurately reflect the total daily flows of the Curren Tunnel because they do not include the 6-inch White Pipe flows. A plot of the total reported daily Curren Tunnel flows, including the 6-inch White Pipe flows, is provided in **Figure 8-1**.

The Rangen Report contains no data or analysis to support the statement that "some of the measurements reported were biased high before the new pressure transducer was installed." Nor does the Rangen Report contain description or information regarding the magnitude of the

alleged bias or the period of record affected by the alleged bias. Without the underlying bases for the Rangen opinions, we have no basis to respond and reserve the right to do so in the event Rangen presents additional information in its rebuttal report or is allowed to testify about additional information at trial.

9.0 Rebuttal to IDWR Memo

9.1 Impacts from Curtailment of ESPA Area of Common Ground Water Supply

IDWR Opinion (pp. 9 – 10)

"Comparison with simulations of curtailment of groundwater irrigation junior to July 13, 1962[6] indicate that curtailment of water rights with priority dates between July 1, 1957 and July 13, 1962 increases the predicted steady state response at Curren Tunnel by 2.9 cfs within the Great Rift trim line, 3.2 cfs within the current area of common groundwater supply, and 3.6 cfs within the ESPAM2.1 model domain. These predictions exceed the 1.46 cfs maximum diversion rate for water right 36-15501. If any of these areas is used as the area subject to curtailment, it would not be necessary to curtail all groundwater use with priority dates between July 1, 1957 and July 13, 1982 to result in a predicted steady state increase of 1.46 cfs at Curren Tunnel.

Response

IDWR has made available the results of its steady-state curtailment runs for the Rangen delivery calls. These results include the simulated effects of curtailing ground water uses within the ESPA area of common ground water with priorities junior to Rangen's July 1, 1957 water right (subject of the 2014 Rangen Call) and Rangen's July 13, 1962 priority water right (subject of the 2011 Rangen Call). The IDWR memo focuses on the simulated benefit to the flow of the Curren Tunnel that would result from curtailment.

The results from the IDWR curtailment runs also include the simulated increase in the flows of other springs and river reaches that would result from curtailment. The increase in spring flows and river flows at steady-state from curtailment in the ESPA area of common ground water of ground water rights junior to Rangen's July 13, 1962 priority water right and July 1, 1957 priority water right are summarized in **Table 9-1**. The differences between the steady-state accruals resulting from the 1962 and 1957 curtailment runs are also shown in **Table 9-1**. The additional curtailment of junior ground water rights from July 13, 1962 to July 1, 1957 results in an additional 5.1 cfs at the Rangen Spring model cell and an additional 3.2 cfs at the Curren Tunnel (63%).

Table 9-2 shows the predicted steady-state increase in river flows and spring flows that would result from curtailment of ground water rights with priorities junior to **July 13, 1962** in the ESPA area of common ground water, and the percentage of the total curtailed pumping that would accrue to each spring, spring reach, and river reach. The simulated increase in flow to the Rangen spring cell is 16.9 cfs, of which 10.7 cfs (63%) would accrue to the Curren Tunnel. This represents 0.7 percent of the total curtailed pumping (10.7 cfs/1,508.6 cfs). The other 99.3 percent of the curtailed junior pumping would accrue to other springs and river reaches.

Comparable results for curtailment of ground water rights with priorities junior to **July 1, 1957** in the ESPA area of common ground water are shown in **Table 9-3**. The simulated increase in flow to the Rangen spring cell is 22.0 cfs, of which 13.9 cfs (63%) would accrue to the Curren Tunnel. This represents 0.7 percent of the total curtailed pumping (13.9 cfs/1,907.5 cfs). The other 99.3 percent of the curtailed junior pumping would accrue to other springs and river reaches.

The results from the IDWR curtailment run for ground water rights junior to July 1, 1957 are also illustrated in **Figure 9-1** which shows the spatial distribution of the predicted steady-state accrual of water to springs and river reaches from curtailment. The steady-state increases in spring flows and river flows are shown next to colored arrows that are sized in relative proportion to the gains predicted by the model.

A substantial portion of the increased flow from curtailment will accrue to spring water rights that are junior to Rangen's 1962 and 1957 priority water rights. **Table 9-2** and **Table 9-3** show the percentages of the combined decreed flow rates for the water rights at each spring that are junior to Rangen's July 13, 1962 and July 1, 1957 priority dates, respectively.

Query of IDWR's water rights database shows the combined decreed flow rate for all of the spring water rights totals approximately 3,560 cfs. Of this amount, approximately 2,330 cfs (65%) are junior to Rangen's 1962 priority date and approximately 2,400 cfs (67%) are junior to

Rangen's 1957 priority date. Therefore, curtailment of junior ground water rights will have the paradoxical result that a substantial portion of the curtailed ground water use will benefit spring water rights with priorities that are junior to curtailed ground water uses. This is inconsistent with traditional water rights administration under the prior appropriation system.

9.2 Impacts from Curtailment of Pocatello Pumping

IDWR Opinion (pp. 9 – 10)

"IDWR staff agrees that the increase in discharge at Curren Tunnel resulting from curtailment of only the City of Pocatello's junior groundwater use would be minimal, however, this will be also true of any analysis of curtailment of only a single water user."

The increases in Curren Tunnel flows at steady-state from curtailing Pocatello ground water use within the ESPA area of common ground water junior to July 13, 1962 or junior to July 1, 1957 are shown at the bottom of **Table 9-1**. The total response to the Rangen cell was computed using the ESPAM 2.1 steady-state response functions developed by IDWR. The effect on the Curren Tunnel was computed as 63 percent of the computed response to the Rangen cell.

Pocatello's ESPA wells that are junior to Rangen's 1957 priority water right are primarily used for irrigation, including irrigation associated with City's Biosolids Program. The consumptive pumping for Pocatello's junior ESPA water rights was estimated using the decreed acres multiplied by the average annual irrigation water requirement at Pocatello from the ET-Idaho database for a crop mix of 50 percent alfalfa and 50 percent wheat. One of the junior wells is used for culinary and irrigation uses at the City's wastewater treatment facility, and the consumptive pumping for this well was estimated as 50 percent of the average 2009 – 2013 pumping.

The estimated annual consumptive pumping totals approximately 2,560 acre-feet for Pocatello's ESPA wells than are junior to July 13, 1962, and approximately 2,610 acre-feet for wells junior to July 1, 1957. Curtailment of these annual consumptive pumping volumes would produce approximately 0.0099 cfs (4.4 gpm) and 0.0101 cfs (4.5 gpm) at the Curren Tunnel, respectively.

The computed benefit to the Curren Tunnel represents approximately 0.3 percent of the curtailed consumptive pumping. The other 99.7 percent of the curtailed consumptive pumping would accrue to other springs and river reaches.

The foregoing estimates of the impacts of Pocatello's pumping on the Curren Tunnel represent a refinement of the estimates that were presented in Figure 5-3 of the January 26, 2015 Pocatello Report. The results in Figure 5-3 were based on total gross pumping for all Pocatello ESPA wells junior to July 1, 1957. The revised estimates reflect the estimated consumptive use portion of the pumping, and categorization of the pumping from two of the ESPA wells that are decreed as alternate points of diversions for water rights that are senior to July 1, 1957.

10.0 References

The following information was relied on in preparing this report.

1. Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

2. Brendecke, C.M., and Sigstedt, S., January 2, 2015. Water Right, Water Measurement, and Groundwater Modeling Evaluation of Rangen 2014 Delivery Call, Prepared for IGWA.

3. Brockway, C.E., and Colvin, D., January 26, 2015. Expert Report in Support of the Rangen, Inc.'s Delivery Call for Water Right No. 36-15501.

4. Contor, B. January 26, 2015. Technical Report in the Matter of Distribution of Water Rights Held by Rangen, Inc. Docket No, CM-DC-2014-004 (June 2014 Call for 1957-Priority Right, Prepared for Upper Valley Pumpers.

5. IDWR, ESPAM 2.1 model files accompanying the IDWR February 27, 2013 and February 9, 2015 staff memorandums.

6. IDWR, ESPAM2.1 steady state response functions, Available Online at: https://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/model_files/Version_2.1_Current/DepletionFactors/

7. IDWR, May 16, 2014. Amended Order Approving in Part and Rejecting in Part IGWA's Mitigation Plan; Order Lifting Stay Issued February 21, 2014, Amended Curtailment Order.

8. Sukow, J., February 9, 2015. Staff memorandum for Rangen, Inc. delivery call, water right 36-15501, CM-DC-2014-004.

9. Sullivan, G.K., January 26, 2015. Spronk Water Engineer's Expert Report In Matter of Distribution of Water to Rangen, Inc's Water Right Nos. 36-15501, Prepared for Pocatello.

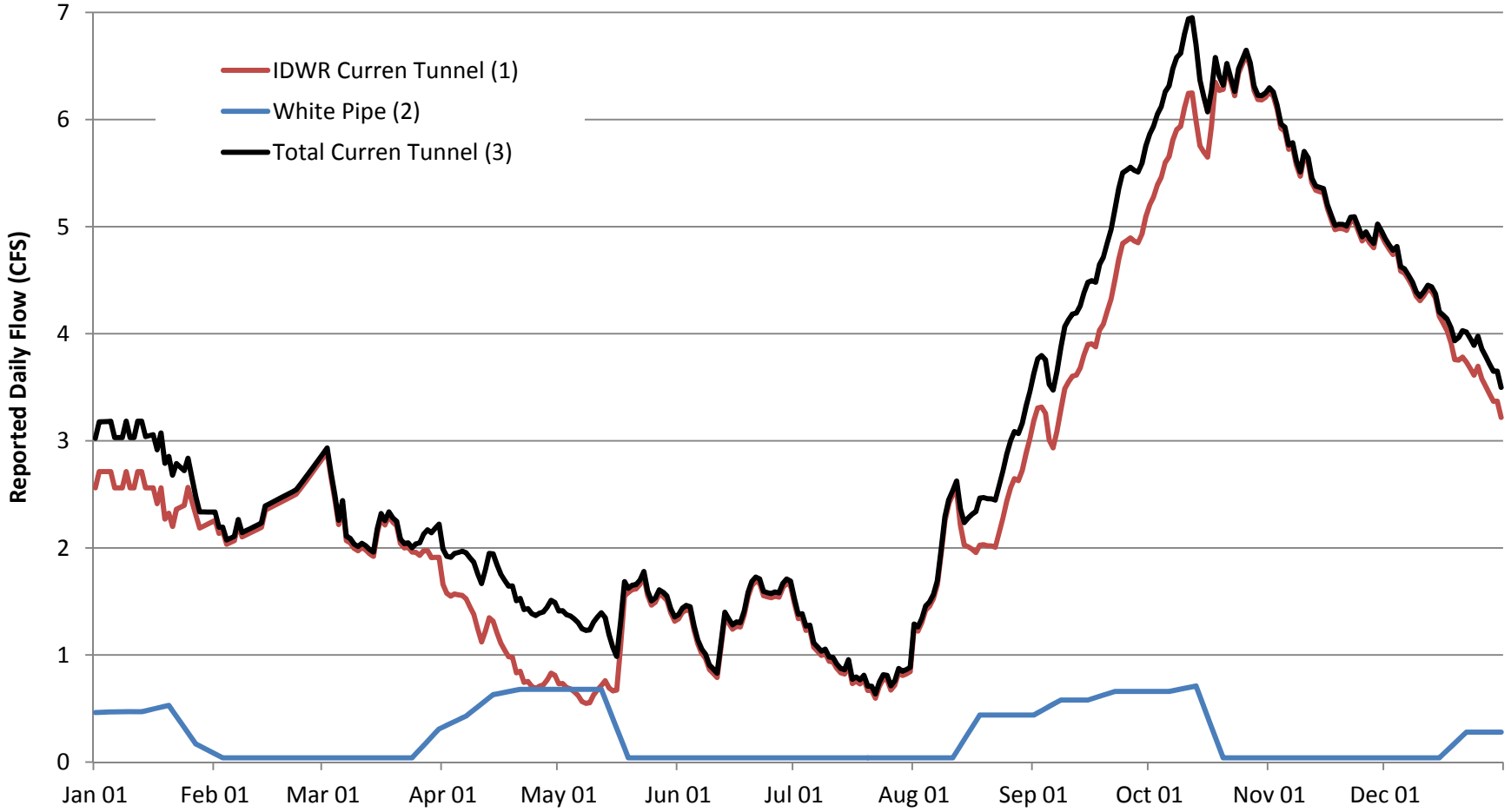
10. Snake River Basin Adjudication, Idaho Department of Water Resources, Partial Decrees for City of Pocatello Water Rights.

11. City of Pocatello well meter readings 2009 – 2013.

Figures

Figure 8-1

2014 Daily Total Reported Curren Tunnel Flows (CFS)



Note:

(1) Daily IDWR reported Curren Tunnel flows provided by the IDWR (1/15/2015).

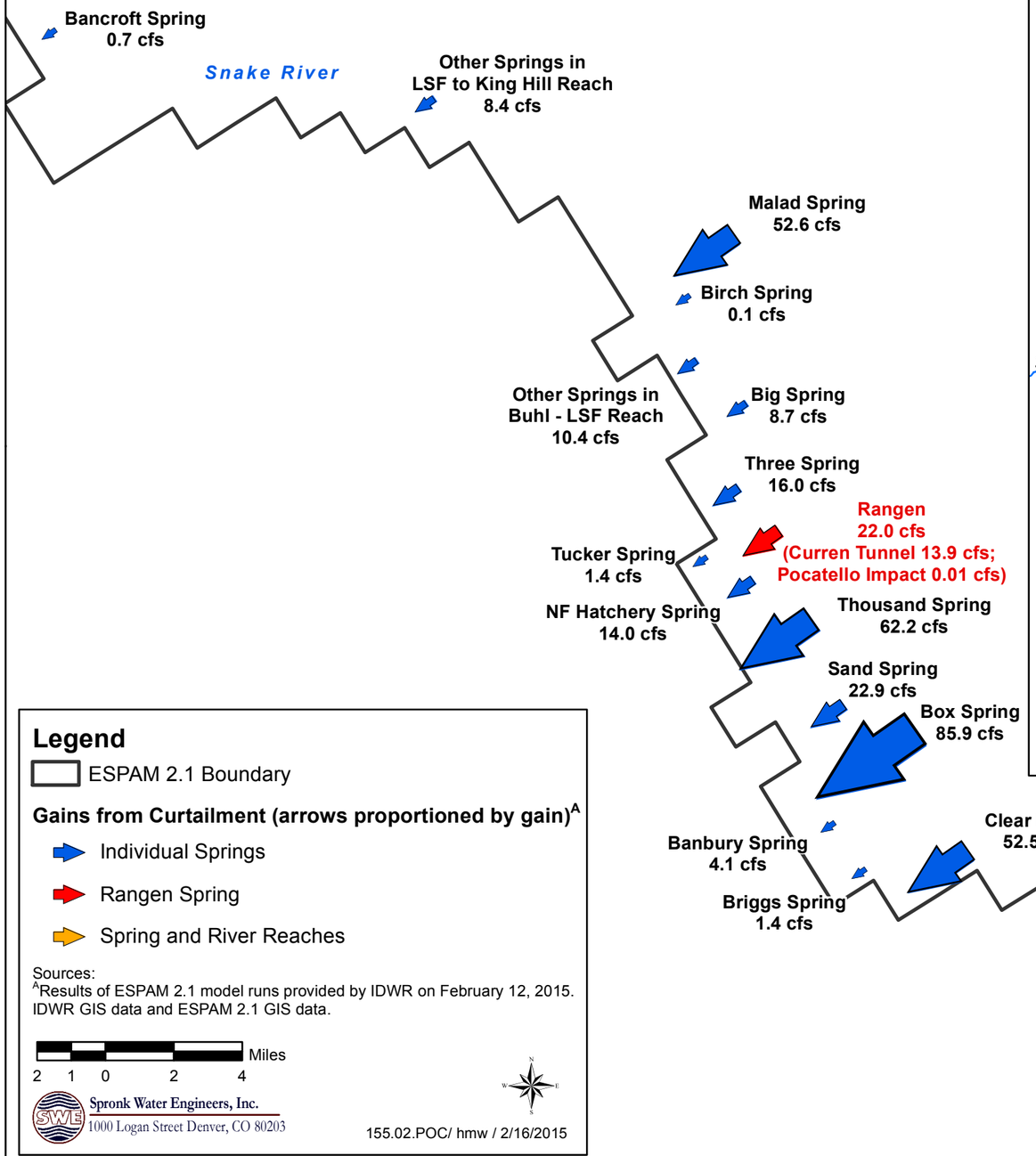
(2) Weekly 6-inch White Pipe reported flows provided by Rangen (1/23/2015). Daily flows are estimated per IDWR method (linear interpolation).

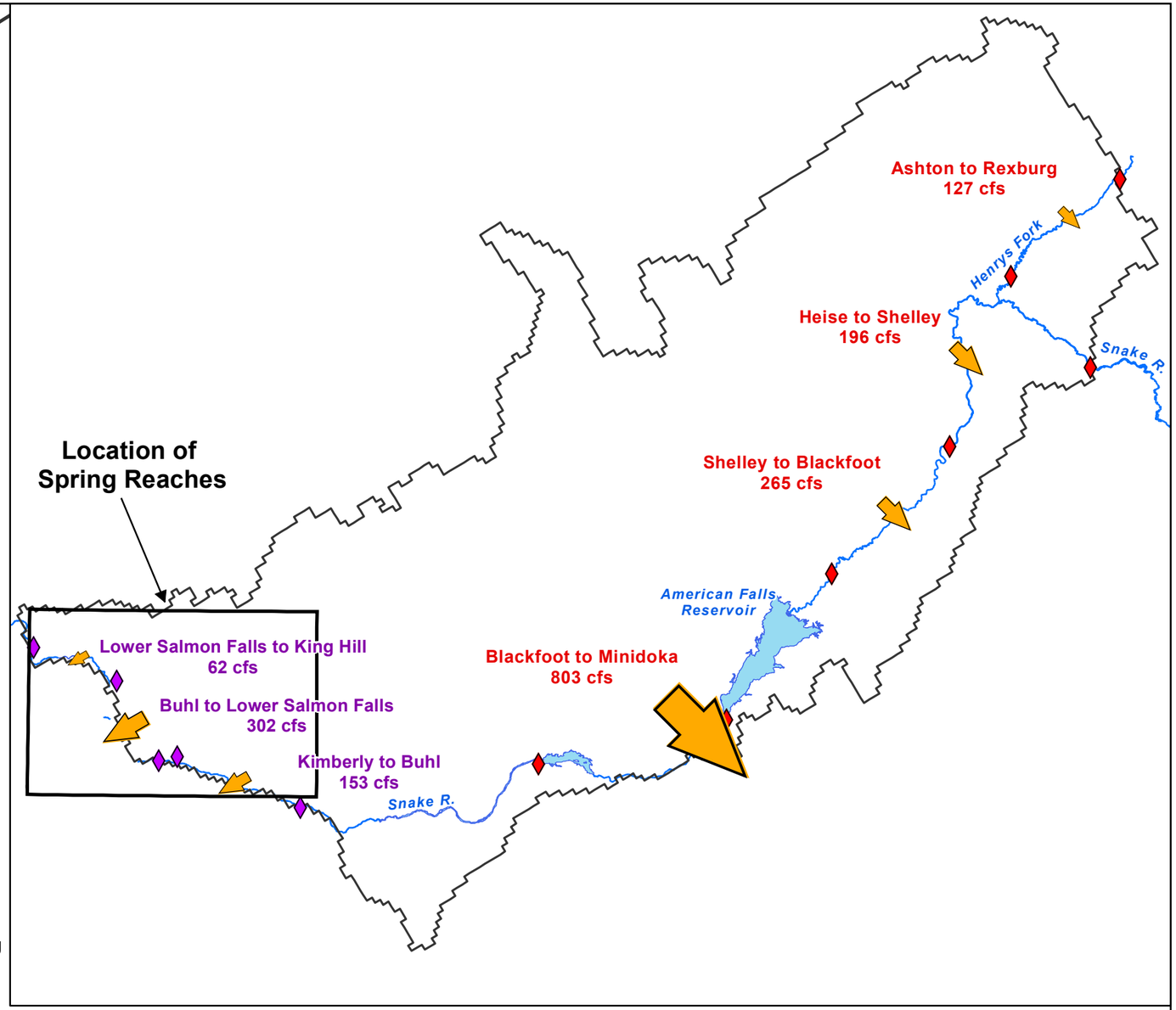
(3) Sum of (1) and (2).

Figure 9-1

ESPAM 2.1 Predicted Increases in Spring Flows and River Reach Gains at Steady State from Curtailment of ESPA Ground Water Rights in the Area of Common Ground Water

Junior to July 1, 1957





Legend

- ESPAM 2.1 Boundary

Gains from Curtailment (arrows proportioned by gain)[A]

- Individual Springs
- Rangen Spring
- Spring and River Reaches

Sources:
[A]Results of ESPAM 2.1 model runs provided by IDWR on February 12, 2015.
IDWR GIS data and ESPAM 2.1 GIS data.

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Tables

Table 9-1

Predicted Increase in Flow at Steady State from Curtailment of ESPA Ground Water Rights in the Area of Common Ground Water

(CFS)

	Spring/Reach	(1) Junior to July 13, 1962	(2) Junior to July 1, 1957	(3) Difference
	Spring Reach: Kimberly to Buhl			
	Niagara	30.1	39.8	9.7
	Crystal	43.0	57.4	14.4
	Blue Lakes	18.4	25.2	6.8
	Elison	0.1	0.1	0.0
	Devils Corral	6.7	9.3	2.6
	Devils Washbowl	5.2	7.1	2.0
	Other Springs	9.8	13.6	3.8
	Total Kimberly to Buhl	**113.3**	**152.6**	**39.3**
	Spring Reach: Buhl to Lower Salmon Falls			
	Clear Lakes	39.4	52.5	13.1
	Briggs	1.1	1.4	0.3
	Banbury	3.1	4.1	1.0
	Box Canyon	64.8	85.9	21.2
	Sand	17.3	22.9	5.6
	Thousand	47.4	62.2	14.8
	NF Hatchery	10.8	14.0	3.3
	Rangen	16.9	22.0	5.1
	Tucker	1.1	1.4	0.3
	Three	12.3	16.0	3.6
	Big	6.7	8.7	2.0
	Birch	0.1	0.1	0.0
	Other Springs	8.0	10.4	2.4
	Total Buhl to Lower Salmon Falls	**228.9**	**301.6**	**72.7**
	Spring Reach: Lower Salmon Falls to King Hill			
	Bancroft	0.7	0.8	0.1
	Malad	42.0	52.6	10.6
	Other Springs	6.8	8.4	1.6
	Total Lower Salmon Falls to King Hill	**49.5**	**61.8**	**12.3**
	River Reaches			
	Ashton to Rexburg	111.4	127.0	15.6
	Heise to Shelley	160.2	196.4	36.2
	Shelley to Near Blackfoot	209.3	264.6	55.3
	Near Blackfoot to Minidoka	635.9	803.4	167.5
	Total (All Reaches)	**1,508.6**	**1,907.5**	**398.9**
(4)	Increase at Curren Tunnel	10.7	13.9	3.2
(5)	Increase to Curren Tunnel from Pocatello	0.0099	0.0101	0.0002

Notes:

(1) Results of ESPAM 2.1 model runs provided by IDWR on February 27, 2013.

(2) Results of ESPAM 2.1 model runs provided by IDWR on February 12, 2015.

(3) = (2) - (1)

(4) Increase in flow at Rangen cell multiplied by 63%.

(5) Pocatello's junior consumptive pumping (decreed acreage multiplied by ETIdaho Pocatello actual ET) lagged to Rangen cell using IDWR steady-state response functions multiplied by 63%.

Table 9-2

Predicted Increase in Flow at Steady State from Curtailment of ESPA Ground Water Rights in the Area of Common Ground Water Junior to July 13, 1962

(CFS)

	Spring/Reach	(1) Increased Flow (CFS)	(2) Increased Flow (% Total)	(4) Spring Rights Junior to July 13, 1962
	Spring Reach: Kimberly to Buhl			
	Niagara	30.1	2.0%	88%
	Crystal	43.0	2.8%	100%
	Blue Lakes	18.4	1.2%	0%
	Elison	0.1	0.0%	0%
	Devils Corral	6.7	0.4%	100%
	Devils Washbowl	5.2	0.3%	0%
	Other Springs	9.8	0.7%	97%
	Total Kimberly to Buhl	**113.3**	**7.5%**	**96%**
	Spring Reach: Buhl to Lower Salmon Falls			
	Clear Lakes	39.4	2.6%	83%
	Briggs	1.1	0.1%	0%
	Banbury	3.1	0.2%	6%
	Box Canyon	64.8	4.3%	0%
	Sand	17.3	1.1%	0%
	Thousand	47.4	3.1%	46%
	NF Hatchery	10.8	0.7%	8%
	Rangen	16.9	1.1%	30%
	Tucker	1.1	0.1%	39%
	Three	12.3	0.8%	72%
	Big	6.7	0.4%	39%
	Birch	0.1	0.0%	0%
	Other Springs	8.0	0.5%	86%
	Total Buhl to Lower Salmon Falls	**228.9**	**15.2%**	**54%**
	Spring Reach: Lower Salmon Falls to King Hill			
	Bancroft	0.7	0.0%	100%
	Malad	42.0	2.8%	0%
	Other Springs	6.8	0.5%	3%
	Total Lower Salmon Falls to King Hill	**49.5**	**3.3%**	**67%**
	River Reaches			
	Ashton to Rexburg	111.4	7.4%	
	Heise to Shelley	160.2	10.6%	
	Shelley to Near Blackfoot	209.3	13.9%	
	Near Blackfoot to Minidoka	635.9	42.2%	
	Total (All Reaches)	**1,508.6**	**100.0%**	
(3)	Increase at Curren Tunnel	10.7	0.7%	

Notes:

(1) Results of ESPAM 2.1 model runs provided by IDWR on February 27, 2013.

(2) Percentage of water rights with spring water sources in the ESPAM 2.1 spring cells that have partial decrees that are junior to Rangen's July 13, 1962 water right. Computed as:

Total rate of diversion for junior spring water rights / total rate of diversion for all water spring rights in spring cell

Water rights were identified from IDWR water right points of diversion shapefile intersected with ESPAM 2.1 spring cells.

(3) Increase in flow at Rangen cell multiplied by 63%.

Table 9-3

Predicted Increase in Flow at Steady State from Curtailment of ESPA Ground Water Rights in the Area of Common Ground Water Junior to July 1, 1957

(CFS)

	Spring/Reach	(1) Increased Flow (CFS)	(2) Increased Flow (% Total)	(5) Spring Rights Junior to July 1, 1957
	Spring Reach: Kimberly to Buhl			
	Niagara	39.8	2.6%	88%
	Crystal	57.4	3.8%	100%
	Blue Lakes	25.2	1.7%	0%
	Elison	0.1	0.0%	0%
	Devils Corral	9.3	0.6%	100%
	Devils Washbowl	7.1	0.5%	0%
	Other Springs	13.6	0.9%	97%
	Total Kimberly to Buhl	**152.6**	**10.1%**	**96%**
	Spring Reach: Buhl to Lower Salmon Falls			
	Clear Lakes	52.5	3.5%	83%
	Briggs	1.4	0.1%	0%
	Banbury	4.1	0.3%	6%
	Box Canyon	85.9	5.7%	0%
	Sand	22.9	1.5%	0%
	Thousand	62.2	4.1%	46%
	NF Hatchery	14.0	0.9%	12%
	Rangen	22.0	1.5%	88%
	Tucker	1.4	0.1%	43%
	Three	16.0	1.1%	72%
	Big	8.7	0.6%	40%
	Birch	0.1	0.0%	0%
	Other Springs	10.4	0.7%	92%
	Total Buhl to Lower Salmon Falls	**301.6**	**20.0%**	**56%**
	Spring Reach: Lower Salmon Falls to King Hill			
	Bancroft	0.8	0.1%	100%
	Malad	52.6	3.5%	67%
	Other Springs	8.4	0.6%	3%
	Total Lower Salmon Falls to King Hill	**61.8**	**4.1%**	**67%**
	River Reaches			
	Ashton to Rexburg	127.0	8.4%	
	Heise to Shelley	196.4	13.0%	
	Shelley to Near Blackfoot	264.6	17.5%	
	Near Blackfoot to Minidoka	803.4	53.3%	
	Total (All Reaches)	**1,907.5**	**126.4%**	
(3)	Increase at Curren Tunnel	13.9	0.7%	

Notes:

(1) Results of ESPAM 2.1 model runs provided by IDWR on February 12, 2015.

(2) Percentage of water rights with spring water sources in the ESPAM 2.1 spring cells that have partial decrees that are junior to Rangen's July 13, 1962 water right. Computed as:

Total rate of diversion for junior spring water rights / total rate of diversion for all water spring rights in spring cell

Water rights were identified from IDWR water right points of diversion shapefile intersected with ESPAM 2.1 spring cells.

(3) Increase in flow at Rangen cell multiplied by 63%.

Appendix

Gregory K. Sullivan, P.E.

Principal Water Resources Engineer

Education:

B.S., Civil Engineering, May 1985, Colorado State University.

M.S., Civil Engineering, May 1990, University of Colorado - Denver. Thesis - "Optimal Water Supply Capacity Expansion Using Objective Space Dynamic Programming"

Continuing Education: Applied Ground Water Flow Modeling, International Ground Water Modeling Center, Colorado School of Mines

Professional Registration:

Professional Engineer in Colorado (#26802), Idaho (#8387), Nevada (#10868), and New Mexico (#22620)

Professional Experience:

1990 - Present: ***Spronk Water Engineers, Inc., Principal and Senior Water Resources Engineer***

Mr. Sullivan is responsible for the management and successful completion of water rights engineering and water resources planning projects. Projects include water supply planning, changes of water rights, plans for augmentation, historical consumptive use and stream depletion analyses, water rights evaluations and appraisals, water supply planning, reservoir operations studies, ground water modeling and water rights accounting. Mr. Sullivan has extensive experience in litigation support and has provided expert testimony before courts and state agencies on numerous occasions.

1985 – 1990: ***J. W. Patterson & Associates, Inc., Water Resources Engineer***

Performed water supply, hydraulic and hydrologic analyses for agricultural, industrial, commercial and municipal developments. Managed yield and impact analyses of water rights adjudications, transfers, exchanges and plans for augmentation. Conducted ground water studies including aquifer testing, project dewatering and water well design and construction monitoring.

List of Representative Projects:

Arkansas River Compact Litigation, Kansas v. Colorado.
Change of Water Rights and Plan for Augmentation, Perry Park Water & Sanitation
Change of Water Rights, City of Loveland
Cherry Creek Aquifer Modeling Project
Conjunctive Management Rules, Water Resource Coalition (Idaho)
Eastern Snake Hydrologic Modeling Committee, City of Pocatello, Idaho
Lawn Irrigation Return Flow Study, Arapahoe County Water and Wastewater Authority (ACWWA)
Plan for Augmentation, Arapahoe County Water and Wastewater Authority
Plan for Augmentation, Climax Molybdenum
Plan for Augmentation, Boulder Mountain Lodge
Plan for Augmentation, Upper Cherry Creek Water Association (UCCWA)
Plan for Augmentation, Cherry Creek Project Water Authority
Rio Grande Project Modeling, State of New Mexico
Snake River Basin Adjudication, City of Pocatello
Snake River Delivery Calls and Litigation, City of Pocatello, Idaho
Water Rights Accounting, ACWWA
Water Rights Accounting, City of Loveland
Water Rights Accounting, UCCWA
Water Rights Protection, ACWWA
Water Rights Protection, East Cherry Creek Valley Water and Sanitation District
Water Rights Protection, Climax Molybdenum
Water Rights Protection, City of Loveland
Water Supply Planning and Modeling, ACWWA
Water Supply Yield Modeling, Genesee Water and Sanitation District
Water Supply Yield Modeling, City of Loveland
Water Supply Yield Modeling, Cherry Creek Project Water Authority
Water Supply Yield Modeling, Genesee Water & Sanitation District
Water Supply Yield Modeling, Perry Park Water & Sanitation

Heidi M. Welsh

Staff Watershed Scientist

Education: B.S. Watershed Science, 2007, Colorado State University

Professional Experience:

2009 - Present: ***Spronk Water Engineers, Inc., Staff Watershed Scientist***

Responsible for compilation and analysis of water resources, water rights and hydrologic data including climatological data, streamflow data, diversion records, cropping patterns, call records, water rights tabulations and decrees. Analyses include quantification of historical consumptive use, crop evapotranspiration calculations, water availability analyses, stream depletion modeling, point flow modeling, and other surface water modeling. Assists with water rights protection, substitute water supply plans, augmentation plans, and water rights accounting. Responsible for GIS mapping and modeling related to water resources including georeferencing and digitizing, delineation and quantification of irrigated area, hydrologic analyses, and geospatial analysis.

2007 – 2009: ***AATA International, Inc., Environmental/GIS Specialist***

Compiled and interpreted social and environmental data for preparation of large-scale environmental impact assessments and other technical reports. Conducted impact analysis, assessed water supply sources, and developed mitigation and monitoring plans for natural resource development projects. Utilized GIS software in mapping and analyses of environmental data and prepared numerous figures for technical reports.

2006 – 2007: ***USDA Forest Service, Hydrologic Technician***

Completed soil, stream crossing, and stream health surveys for timber sale units. Managed grazing by the completion of soil inventories for NEPA compliance. Mapped streams and forest roads using GPS and GIS. Evaluated Best Management Practices for feasibility and effectiveness.

2006: ***Teton Science School, Hydrology Intern***

Measured stream discharge, monitored ground water well levels and collected water quality samples weekly at twelve sites. Entered and analyzed data for technical documentation. Taught watershed science and hydrology field methods to adults and children.

Description of Representative Projects:

Town of La Salle, Water Supply Consulting.
State of New Mexico, Rio Grande Compact.
Cherry Creek Project Water Authority.
City of Pocatello, Water Rights Protection and Water Supply.
Climax Molybdenum, Plan for Augmentation in Division 2.
Centennial Water & Sanitation District, Water Rights Protection.
Perry Park Water and Sanitation District, Change of Water Rights.
Yellowstone River Compact.