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DEPARTMENT OF
WATER RESOURCES

Rebuttal Report by Thomas L. Rogers

Expert Witness on the behalf of the Idaho Ground Water Appropriators, Inc.

In The Matter of Distribution of Water to Water Right Nos. 36-02551 & 36-07694 (Rangen, Inc.)

February 8, 2013

1.0 INTRODUCTION

This report presents rebuttal of certain statements and claims presented in the December 21, 2012, report by Charlie Smith and the December 21, 2012 report by Brockway, Colvin and Brannon submitted on behalf of Rangen, Inc. The format of this rebuttal addresses each section of the respective reports, presenting the specific statement to be rebutted followed by detailed responses. I also provide a general comment on the December 21, 2012 report by Gregory Sullivan. A summary of my rebuttal opinions is found at the end of this report.

2.0 REBUTTAL TO REPORT BY CHARLIE SMITH

Page 2 Paragraph 5:

> *I visited the Research Hatchery on July 23-25, 2012 where I reviewed the hatchery water system, the hatchery configuration, determined where pipelines originated and if all water was put to beneficial use. Based on the empty tanks in the Research Hatchery and hatch house/early rearing building, as well as the majority of empty outside raceways where most of the fish production occurs, it was clear that insufficient water flow was a major limiting factor at the hatchery.*

Mr. Smith visited the hatchery two times, making his first visit during the low flow cycle of the water supply. How and when raceways are utilized depend on the production timing at Rangen Hatchery, with some raceways empty when moved to the next rearing containers. As fish grow, they are moved, leaving incubators empty, troughs empty, small or large raceways unused, depending on the time of year and what part of the production cycle they are in. There was sufficient flow to rear the Idaho Power fish at the Rangen Hatchery as they met their mitigation criteria for density, flow and numbers in 2012. (Spronk Engineering Inc. Expert Report 2012, Figure 4.4, Appendix F, G). Under current conditions, the water is sufficient to meet the Idaho Power Contracts with the ability to rear additional fish for spot sales.

Page 3 Paragraph 5:

> *Rangen is using all of the available flow of water currently going to the Research Hatchery to raise fish and conduct research.*

Although the Rangen hatchery is capturing all of the available water flow, not all the water is being used throughout the entire hatchery; much of the first use water cannot be used in the hatch house, green house or small raceways because of the design of the hatchery. (Rogers Expert Report Figure 3.1 [1]) This occurs because not all the available flow is captured high enough in the system to be delivered to the indoor rearing containers and small raceways. In my opinion, this is a design flaw in the Rangen Hatchery.

As a hatchery manager and hatcheries supervisor for over 25 years, I participated in the design of two new hatcheries and the reconstruction of two other hatchery facilities, all of which allowed for sufficient first use water to be delivered to all parts of the hatchery. In this case, the Rangen Hatchery relies on a delivery system that does not allow all first use water to be used throughout the facility. Rangen successfully raises fish for Idaho Power Company at a conservation level. If however, Rangen were operating its facility for commercial purposes to maximize production, (rearing fish at higher density and flow indices) the design of the hatchery would limit production.

The statement that Rangen is using all available flow also fails to account for the efficiency with which water is used at Rangen. As explained in my Expert Report, Rangen is not raising as many fish as it could, even with the constraints of Density and Flow Indices required under the IPC contracts. (Rogers Expert Report p. 9).

Page 5, Paragraph 2*:*

> *Currently rainbow trout being raised at Rangen Research Hatchery are those being raised under contract for Idaho Power Company for planting in American Falls and Strike Reservoirs and the mid-Snake river. This is due to much better price per pound than that paid for processed fish by processors in the area. However, the contract does require that fish are raised at lower fish loadings (lbs/gpm water flow) and fish densities (lbs/ft3 of space). Any excess fish are sold to a processor. Lack of sufficient water flow to the Research Hatchery prevents production of large numbers of fish for processors in the area. There is ample raceway space sitting empty, but insufficient water flows to the hatchery raise additional fish."*

My Expert Report includes a number of scenarios with that would enable Rangen to produce additional fish within current contract criteria using low flow and density indices. (Rogers Expert Report Table 5.4). If Rangen were motive to maximize production, it could

[1] References to Rogers Expert Report is to my expert report dated December 21, 2012 and corrected January 24, 2013.

raise more fish with existing water supplies. (Rogers Expert Report Table 5.4) Rangen has admittedly decided not to maximize production out of a business decision to avoid competing with commercial producers who purchase fish feed from Rangen.

Page 5, Paragraph 3-4:

> *i)* Greenhouse/*early rearing hatchery*
>
> *Egg incubation room: within the hatch house are located 12 upwelling incubators for hatching eyed-eggs. The incubators have a total egg capacity of 300,000 eggs. Water flow to each incubator is initially 8.5 gallons per minute (gpm) just prior to hatching, then increased to10 gallons per minute.*
>
> *Eggs: eyed eggs are purchased from broodstock hatcheries and are available all year round. Historically, approximately 2, 100,000 were purchased each year in batches of 300,000, 7 times each year approximately 52 days apart. However, these shipments depend upon available water flows throughout the year.*

Mr. Smith's report makes a unexpected claim that 300,000 eggs could be reared in the 12 upwelling incubator jars, and an assumption that these eggs would ultimately hatch into fry and reared in the 12 rearing troughs. However, to reach this number of fish, it would require that the rearing troughs found in the hatchery building exceed a maximum flow index of 1.5 and density index of 1.0. It is my opinion that only 138,738 fish can be reared based on acceptable flow and density indices (Rogers Expert Report Table 5.4). Rangen own records indicate that exceeding 14,000 fish per trough is detrimental to fish health. (Research Report N0203, RANGEN BATES __) The only way that 300,000 eggs/fry could be safely reared would be to use additional early rearing container space such as that found in the green house; however, I have found nothing in my review of Rangen's information to indicate this has ever been done.

Page 6, Paragraph 1:

> *There are 12 fiberglass rearing troughs located within the hatch house for early rearing of fry to fingerlings stage. Each is 16 feet long, 2' wide and 1' deep and has a carrying capacity of 25,000 fingerlings and a total weight of 175 lbs (143/lb, (@2.5 inches). Water flow to each trough is 30 gpm.*

According to Rangen documents, rearing trough volume is 17 cubic feet per trough. Mr. Smith's calculations are based on 32 cubic feet of rearing space per trough. This results in a 15 cubic feet discrepancy. Mr. Smith's assumption of 32 cubic feet of rearing pace per trough almost doubles the rearing capacity of each trough and is not supported by information contained in the documents produced by Rangen. **Table 2.0** summarizes the volume discrepancies.

In addition, Mr. Smith suggests a carrying capacity 25,000 fish per trough, or a total of 300,000 fish per lot. This would violate acceptable flow and density indices: the Flow Index would equal 2.33 and the Density Index would equal 2.19. Industry standards for density and flow indices are based on what type a fish culture program is developed, but for many commercial facilities, optimal fish environments fall within the flow index of .5 to 1.5 and a density index between .4 to 1.0. (Trout Production, James L. Shelton) With fish reared to 2.5 inches in length (143/lb), both indices are higher than recommended by Piper formulations which are industry standard.

It is highly unlikely that 2.1 million fish could be produced using current early rearing container constraints. Furthermore, Mr. Smith's claim contradicts Rangen's own parameters for fish rearing. In a Rangen research report (N0203) it is documented that there should not be over 14,000 fish/trough or a total of 168,000 fish reared in these troughs at any one time.

Page 6, Paragraph 2:

> *Fingerlings are moved to outside concrete nursery ponds at 2.6 to 3.0 inches in length where they are held for 2.5 to 3.5 months. Currently the nursery ponds are not being used due to insufficient water flow. Maximum capacity is 30,000 fish weighing 1100 pounds.*

The statement that the small raceways are not being used due to insufficient water flow does not appear accurate. The timing of Mr. Smith's visit coincided with fish having been already moved to the large raceways and hatch house fish still being reared in the troughs. Thus, it is more likely that the small raceways were not being utilized due to timing of the fish lots, not necessarily due to insufficient water flow. As Mr. Smith points out two paragraphs later:

> *Fish from the nursery ponds are moved to the production ponds when they are 6 inches in length (12/lb) and are held in the 8 ft wide rearing raceways for 3 to 4 months.* (Smith Expert Report Page 6, Paragraph 4).

Thus, nursery ponds (small raceways) continue to be used when fish lots are moved out from the hatch house and the early rearing troughs to the small raceways. The capacity of these small raceways using IPC contract criteria is 107,895 fish (6,786 pounds) at 5.04 inches and 15.9 fish per pound using IPC production records from 2011. This production is based on a maximum of 10 cfs of water flow and using 8-narrow raceways and 2-wide raceways or a total of 6,508 cubic feet of rearing space as described in IPC production records for 2011 Mr. Smith's assumptions of the fish size and poundage is not supported by Rangen's actual practice of moving small raceway fish at 5.04 inches in length and 15.9 fish per pound. Fish were kept in the small raceways from a mean length of 2.67 inches to mean length of 5.04 inches over a period of time from October 14, 2011 to November 23, 2011 or approximately 5 weeks. This shows 2.37 inches of growth in only 5 weeks which is extremely fast growth at any hatchery and demonstrates that additional fish could be stocked as one would normally expect only 1.5 inches of growth in 5 weeks. (Exhibit 38)

Page 6, Paragraph 6:

> *Market fish are graded every 2 to 3 weeks and 11 to 13 inch (@1.2/lb) fish are shipped to market. Fish are in the market ponds for 2 to 3 months before being processed. Total capacity of the market ponds is normally 25,000 fish and 14,000 pound (sic). With an increased flow and pristine water, production would increase considerably.*

This contradicts the statements found in Rangen depositions where it is not desirable to compete on the commercial fish market with their feed customers. (Kinyon Depo, 2012) Also, pristine water would have to go through the large raceways without fish production to remain pristine for production in the CTR raceways. Currently, only water flowing through the large raceways can be utilized in the CTR Raceways.

Page 7, Paragraphs 2-3:

> *Usually, the first limiting factor in aquaculture production systems is oxygen and this is true for rainbow trout in raceways and ponds. It is recommended to keep minimum dissolved oxygen levels above 5.0 ppm and ideally at 7.0 ppm and above.*
>
> *The second limiting factor is ammonia. Ammonia is a metabolic excretory product associated with catabolism of protein (amino acids). When ammonia is dissolved in water, an equilibrium is established between ammonia and ammonium ions: NH3 + H2O + NH4 ++OH-. As pH and water temperature increase, the proportion of unionized ammonia (toxic gaseous portion) increases.*

Fortunately, unionized ammonia rarely approaches toxic levels in flow-through systems. (Fornshell, (2002))

I cannot agree that oxygen is a limiting factor in Rangen aquaculture production as oxygen appears to be saturated in the inflow water at this hatchery and very little information appears in records where oxygen is being monitored closely throughout production cycles. Rangen also fails to note monitoring of ammonia in effluent waters from any of the rearing containers at the Rangen facility. I have not found records from Rangen that show regularly scheduled monitoring of ammonia or oxygen and find no indication that these factors have been a limiting factor at the Rangen Hatchery. Limiting factors for increased numbers of fish produced continue to be low density and flow indices as per the contract needs for IPC production, and the lack of desire to accommodate intensive fish culture practices as found with other commercial hatchery facilities. In contrast with fish propagation for conservation purposes, intensive fish culture includes pushing Flow indices to maximum levels, Density indices to at least 1.0 and monitoring of oxygen, ammonia, turnover rates, conversion rates and frequent cycles of fish lots through the system.

Page 9, Paragraph 5:

Rangen was not wasting water.

When an operation is adhering to low Density and Flow Indices due to contract obligations it is using water less efficiently than it could. Additionally, even with the indices limitations of the IPC contract, Rangen is not rearing the maximum number fish that it can. Therefore, I would have to say the water for raising the additional fish is being wasted.

Page 9, Paragraph 6:

Due to insufficient water flow the water was being used in other areas of the facility because with limited flows there was no ability to put another crop of fish through the facility.

Mr. Smith visited the hatchery twice, once in July and once in October. His first visit in July occurred during the lowest level of the water cycle, and the later visit in October when fish were in the hatch house and also in the large raceways when the small raceways were not needed. It is my opinion Rangen could raise additional cycles or "crops" of fish, and could raise more fish within each crop, with its current water supply as water flows rebound later in the year, especially if the restrictive density and flows were not present during the rearing process. Additionally, a progressive water management program including recirculation, pumping of first use water from the head of the large raceways or large raceway diversion to the small raceways, hatchery redesign, and programming fish to better use the high water cycle, would provide additional fish for Rangen production as pointed out in my Expert Report dated December 21, 2012.

Page 10, Paragraph 2:

> *I visited the hatchery on two occasions this past summer/fall. A diagram showing facility usage is attached hereto as Exhibit 4. In both instances, it was clearly evident that there was insufficient water flow at the facility to conduct research testing, egg hatching, or early fry rearing.*

Mr. Smith draws a broad conclusion of insufficient water to conduct research, hatch eggs, or rear early fry based on poorly timed visit. Rangen's records demonstrate a history of hatching eggs and rearing fry in the troughs (eggs received in March, August and November). The timing of these eggs continue to be determined by timing of the end product for IPC contracts and the hatch house is only used approximately 22 weeks annually for this production plus some spot market fish production. Rangen has had sufficient water to meet its obligations to IPC.

Page 10, Paragraph 3, 4:

> B. *Rangen could raise more fish and/or conduct more research at the research facility if more water was available.*

This is true only if Rangen abandons the current business practice of low Density and Flow index rearing and undertakes to maximize production and thereby compete with its feed customers. Research is still available to be accomplished using existing green house containers and using outside containers if needed. Side by side research does not appear to be a driving concern with existing production at Rangen when greenhouse containers remain empty and side by side research can be undertaken even with existing production and water levels.

General Comments on Report by Charlie Smith

There are a number of rearing container capacity discrepancies I have noted when trying to determine hatchery production capacity. Differences in cubic feet of rearing space are quite significant such as in the rearing troughs. It has been very difficult to determine the correct information when looking through various reports submitted by Rangen. I find it disturbing that depending which report is reviewed, there is so much variation. In my experience, it is critical to know how much rearing space you have, and how much water flow is required for each unit to ensure fish health. I do not see that the records reflect an intensive monitoring program for water quality, flow, and rearing capacity as found in most commercial hatchery programs.

The record keeping done by Rangen indicates a hatchery program that is not trying to maximize fish production or use of water. I have noted very few water quality monitoring reports regarding monitoring of Oxygen and Ammonia levels. Intensive fish culture requires frequent monitoring of these parameters to ensure a good fish rearing environment. If water is a limiting factor and the hatchery needs to maximize production, this type of water quality work would be routine.

3.0 REBUTTAL OF EXPERT REPORT BY CHARLES BROCKWAY ET. AL

Page 9, Paragraph 1:

These pipes can convey 3.6, 14.3, and 59.0 CFS respectively.

I have been unable to verify the source of these figures.

Page 9, Paragraph 7:

Rangen has evaluated alternative points of diversion which could possibly increase the water supply necessary for operation of their Research Hatchery.

Alternative methods of increasing water flows to the Rangen Hatchery are set forth in my Expert Report previously filed. I have found no indication that the alternative methods have been fully evaluated by Rangen outside the attempt to obtain funding by the Idaho Department of Commerce and Labor's Eastern Snake Plain Aquifer Mitigation Program. Pumped water is a viable option to increase water flows at hatcheries as pointed out in my Expert Report previously filed, where a number of Idaho hatchery facilities have enhanced existing water flows by adding pumping capability, or developing new wells to enhance flows. Reuse water may also be utilized with a number of processes to clean up and improve water quality.

Page 11, Paragraph 3:

> *Rangen's use of water has historically been non-consumptive and a sustainable pumpback system with sufficient water treatment would likely be an expensive system with some amount of water consumption.*

Other fish hatcheries use pumpback systems. The basis for the opinion that this would "likely be an expensive system" has not been provided. Depending on how much degassing would have to take place a pumpback systems would prove to provide very little water consumption. The only consumption would be through evaporation which is not considered consumptive use in my experience.

Page 11 Paragraph 4:

> *It is our opinion that the current Rangen Research Hatchery diversion structures are reasonable and that they fully utilize available water to Rangen's water rights. The diversion structures are consistent with the industry standard for aquaculture facilities in the Magic Valley. Based upon our knowledge of other area facilities, the Rangen Research Hatchery is consistent with the industry standard of practice for conservation and beneficial use of available water and does not waste diverted water. Rangen has made significant efforts, and yet no alternative method of water diversion has been identified that would provide the Rangen facility additional water with a viable quantity and quality that isn't already being accessed by existing diversion structures.*

When developing a hatchery facility, the ability to capture water efficiently and deliver it to the hatchery it is extremely critical. Rangen has succeeded in capturing some of the water from an existing irrigation diversion, but continues to use water inefficiently, especially in light of the fact that a fish hatchery depends on a constant water flow and a reliable water delivery system. When developing water for a hatch house for instance, sufficient water needs to be produced throughout the year to provide enough water for incubation, early rearing and final rearing of fish. Rangen's facility has been modified throughout the years to accommodate modifications to both research needs (the green house addition) and also final rearing ponds (the CTR raceways). Rangen continued to expand the hatchery with very little attention to how to provide sufficient clean water to those structures. The CTR raceways, for instance, utilize reuse water from the large raceways, and cannot be provided a "clean water source" if fish are held in all of the large raceways. This is an example of developing a hatchery in an area where water diversions were not designed for hatchery use, making this a less than efficient design for rearing any large numbers of fish. If you look at the industry standards in surrounding hatchery programs, you will see much more efficient methods of capturing water for fish rearing purposes. See also my comments on page 3 above. Therefore it is my opinion that the Rangen Hatchery does not operate with industry standards or local standards as reflected by other local hatcheries.

4.0 COMMENTS TO EXPERT REPORT BY GREGORY SULLIVAN

I have carefully read through Gregory Sullivan's Expert Report filed in this matter. It is my opinion his report is an accurately characterizes representation of current and past aquaculture practices and hatchery infrastructure at the Rangen Hatchery.

Mr. Sullivan's report and his summary of the data are consistent with the analyses I have developed included in my report. Mr. Sullivan has taken a conservative approach in developing Figure 4.4 as he projects production from 15,000 to 20,000 pounds of fish per cfs. Actual production using Rangen's records from 1972-1979 "Fish Fed by Hand and Blower from Percent of Body Weight Chart" indicates up to 26,227 pounds per cfs. This indicates Rangen is not producing as many pounds of fish as they could be, especially if they changed business plans and moved away from conservation hatchery flow and densities.

5.0 SUMMARY OF OPINIONS

1) It is unreasonable to conclude that raceways or facilities at the Rangen Hatchery are not being used due to low water flows only. It is just as likely that the raceways or facilities are not used due to the timing of the fish rearing cycle and practices to meet the IPC contract requirements.

2) The Rangen Hatchery has design flaws and its operations are not consistent with the industry standards or local standards of other hatcheries. The design and operation does not allow it to efficiently convey and use water throughout its entire facility nor maximize fish production.

3) Charlie Smith's claim that 300,000 eggs could be hatched at the Rangen Hatchery is not based on actual records or practice by Rangen.

4) Charlie Smith's assumptions on how fish are moved from one part of the Rangen Hatchery are not based on actual practice by Rangen.

5) Rangen is not using all the water available to it to raise fish and therefore is wasting water and not maximizing efficiencies in its water use.

6) Rangen's record keeping and lack of close monitoring of oxygen and ammonia levels indicate that it does not employ intense fish culture practices.

Table 2.0 Comparing Volumes / Capacities of Rangen Structures

Structure	Excel Table (9/15/2012)[2]	Charlie Smith Expert Report (12/21/2012)	IPCO Production Records[3]	Rangen Outline of Operations [4](undated)	Tom Rogers Expert Report (12/21/2012)
Incubators	N/A	12 incubators	N/A	6 incubators	N/A
Hatchery Troughs (volume in cubic feet "ft^3")	Each: 27.27 ft^3 x 12 = **Total: 327 ft^3**	Each: 32 ft^3 x 12 = **Total : 384 ft^3** Cap: 300,000 fingerlings	Each: 17 ft^3 x 12 = Total : **204 ft^3**	Each: 16 ft^3 x 12 = Total : **192 ft^3** Cap: 180,000 fingerlings	Each: 17 ft^3 x 12 = Total : **204 ft^3**
Small Raceways #1-16 (narrow)	Each: 809 ft^3 x 16 = **Total: 12,944 ft^3**	Each: 700 ft^3 x 16 = Total: **11,200 ft^3** Cap: 480,000 fish	Each: 580 ft^3 x 16 = Total : **9,280 ft^3**	Each: 580 ft^3 x 16 = Total : **9,280 ft^3** Cap: 176,000 fish	Each: 580 ft^3 x 16 = Total : **9280 ft^3**
Small Raceways #17-20 (wide)	Each: 1,213 ft^3 x 4 = **Total: 4,852 ft^3**	Each: 1,213 ft^3 x 4 = Total: **4,352 ft^3** Cap: 120,000 fish	Each: 934 ft^3 x 4 = Total : **3,736 ft^3**	Each: 830 ft^3 x 4 = Total : **3,320 ft^3** Cap: 100,000 fish	Each: 934 ft^3 x 4 = Total : **3,736 ft^3**
Large Raceways	Each: 2,097[5] ft^3 x 30 = **Total: 62,918 ft^3**	Each: 1,920 ft^3 x 30 = Total: **57,600 ft^3**	Each: 1,640 ft^3 x 30 = Total : **49,200 ft^3**	Each: 1,640 ft^3 x 30 = Total : **49,200 ft^3** Cap: 420,000 fish	Each: 1,640 ft^3 x 30 = Total : **49,200 ft^3**
CTR Raceways	Each: 8,924[6] ft^3 x 9 = Total: **80,316 ft^3**	Each: 8,640 ft^3 x 9 = Total: **77,760 ft^3**[7] Cap: 225,000 fish	Each: 8,244 ft^3 x 9 = Total : **74,196 ft^3**	Each: 8,244 ft^3 x 9 = Total : **74,196 ft^3** Cap: 225,000 fish	Each: 8,244 ft^3 x 9 = Total : **74,196 ft^3** (Not used in report)

[2] This table reflects information collected at the facility on 9/15/2012, provided by R. Brody in a 2/1/2013 e-mail sent in response to Sarah Klahn's January 18, 2013 letter requesting expert documentation.
[3] IPCO Production Records are at Bates Nos. RANGEN007991 to RANGEN008087
[4] Bates Nos. RANGEN016916 –RANGEN016918.
[5] The average of the top, center, and bottom volumes which appeared in the spreadsheet were used to calculate individual pond size, the quiescent zone volume was not subtracted from this volume.
[6] See note 4 above.
[7] The CTR volume herein is equal to the dimensions from Smith's report (180'x16'x3' = 8,640 cu ft). However, in Exhibit 3, Smith uses 7,800 cu. ft. per CTR raceway (70,200 cu ft. total).