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BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO WATER RIGHT NOS. 36-04013A, 36-04013B AND 36-7148 (Snake River Farm)	**AUGMENTATION TO 2009 REPLACEMENT WATER PLAN AND THIRD MITIGATION PLAN (OVER-THE-RIM) OF NORTH SNAKE GROUND WATER DISTRICT AND MAGIC VALLEY GROUND WATER DISTRICT**

COMES NOW North Snake Ground Water District (NSGWD) and Magic Valley Ground Water District (MVGWD) (collectively "Ground Water Districts"), through counsel, and on behalf of their ground water district members and those ground water users who are non-member participants in the Ground Water Districts' mitigation activities, and hereby submit this Augmentation to 2009 Replacement Water Plan pursuant to *Order On Scheduling and Holding Notice of Curtailment in Abeyance* dated March 16, 2009.

I. INTRODUCTION

On March 17, 2009, the parties to this matter had a meeting to discuss the technical matters of concern to IDWR and the parties. At that meeting, certain issues were raised and IDWR requested that the Ground Water Districts provide additional information to address three

primary issues relating to their 2009 Replacement Water Plan and Third Mitigation Plan (Over-The-Rim) of North Snake Ground Water District and Magic Valley Ground Water District ("Over-The-Rim" Plan"). The issues addressed herein are: 1) water quality and temperature; 2) operational plan for wells, including a measurement plan; 3) timing of conversions and construction.

II. ADDITIONAL INFORMATION

Over-The-Rim

1. Water Temperature and Quality – As part of the proposed Over-the-Rim Plan, the Ground Water Districts will institute a monitoring program that will measure water quality and temperature the results of which can be periodically reported to the Department and Clear Springs as needed. Water temperature data from surrounding wells indicates that the temperature of the water supplied is nearly the same as the temperature of the water emanating from the spring outlet at Clear Springs, Snake River Farm. Some temperature and presumably water quality variations exist inter-year and intra-year at Clear Springs, yet are apparently suitable now for fish raised by Clear Springs. Clear Springs has not disclosed any of this information and should be required to do so in order to establish base lines and parameters for both. Because the pipeline will be buried and because the water source is the same, temperatures in the mitigation water supplied should remain nearly constant throughout the winter and summer months and will approximate the same temperatures as exist in the aquifer supplying Clear Springs with the same or similar inter-year and intra-year variations. Since the pipe line proposed over the rim will also be buried or covered aquifer temperatures will be maintained even in the summer. **Exhibit 8** provided herewith is a technical memo from Dr. Brendecke and describes a preliminary analysis of heat gain in the buried pipeline and concludes

the under worst-case conditions, the increase in delivered water temperature would be less than 0.2 degrees Centigrade and would cause less than 0.01 degree Centigrade change in water temperature of hatchery influent. If unexpected water temperature increases are found beyond existing variations and unsuitable for trout rearing then simple aeration of the water at the spring box can be done to provide any needed evaporative cooling.

Available data reported from surrounding wells indicates that water quality is not an issue either, as one would reasonably conclude since the aquifer is the same source for the Over-the-Rim Plan wells and Clear Springs. This conclusion is further supported by the fact that many domestic wells supply homeowners in the same area. **Exhibit 9** is a spreadsheet that contains water quality data for surrounding wells. This water quality data from surrounding wells show very similar quality to that found at Clear Springs, Snake River Farm spring outlet. Reasonable steps, such as locked cages or well houses will be taken to insure that the wellheads are secure and that contamination at the wells will not occur. Because the pipeline will be buried, there is no possibility of contamination in the pipeline itself. Please refer to **Exhibit 10**, which is a technical memo from Mr. Schuur that provides for further explanation on both water temperature and quality.

2. Operation Plan – A final system operation plan has not yet been developed but will be when the system becomes operational. This will be undertaken once the Over-the-Rim Plan is approved and any conditions imposed by the Director are known. However, the operation plan will provide for the delivery of water from the seven wells as needed to provide a continuous flow of water to Clear Springs, Snake River Farm within the combined historical annual pumping volume for the wells. Delivery of water will come from two or more wells at any one time and will be designed in a manner to provide a reliable, year-round water supply.

Routine maintenance will be rotated between the wells in a manner so as to not interrupt water delivery to Clear Springs. This redundancy will also insure that water can be delivered in the event of failure of a well. As concluded in **Exhibit 11**, rotation of pumping among the wells is not expected to create any material change in impact to Clear Springs, Snake River Farm.

The wells utilized to deliver water will not be used for irrigation purposes. All of the water right owners have agreed in principle to the long-term lease of their water rights and the conversion of their lands to surface water irrigation. A long-term water lease and conversion agreement has been circulated to the water right owners to confirm these commitments.

District members indicate that the power supply in the area is very reliable with outages uncommon and short in duration. Ground Water Districts are attempting to confirm this information with Idaho Power. Because multiple wells will be available to supply water to Clear Springs there is built-in redundancy in the proposal. This redundancy provides excess capacity to further reduce any risks of short-term interruptions. Furthermore, Clear Springs, Snake River Farm's operation would not be substantially effected by short-term flow variations of a small magnitude as they already are accustomed to that when the Clear Lake Country Club takes approximately 2 cfs directly from the raceway intake when their pumps turn on each night and off each day during the irrigation season to water the golf course.

Finally, the Ground Water Districts operational plan will measure the amount of water pumped from each well and the total amount of water delivered to Clear Springs. The measuring devices will also record water quality data, or a plan will be employed to perform periodic water quality testing.

Conversions and Construction

Once the Over-the-Rim Plan is approved, it is expected that the conversion of the approximately 1100 acres can be completed within one month. The over-the-rim delivery pipeline and facilities is being designed and it is anticipated the construction will proceed simultaneously with the conversion work.

DATED this 19th day of March, 2009.

RACINE OLSON NYE BUDGE &
BAILEY CHARTERED

By: _____
Randall C. Budge
Candice M. McHugh
Attorneys for North Snake and
Magic Valley Ground Water Districts

CERTIFICATE OF MAILING

I hereby certify that on this 19th day of March, 2009, the above and foregoing was sent to the following by U.S. Mail, proper postage prepaid and by e-mail for those with listed e-mail addresses:

DAVID R. TUTHILL, DIRECTOR PHILLIP J. RASSIER IDAHO DEPARTMENT OF WATER RESOURCES P.O. BOX 83720 BOISE, IDAHO 83720-0098 Dave.tuthill@idwr.idaho.gov Phil.rassier@idwr.idaho.gov Chris.bromley@idwr.idaho.gov	[✓] U.S. Mail/Postage Prepaid [ ] Facsimile [ ] Overnight Mail [ ] Hand Delivery [✓] E-Mail
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Candice M. McHugh

EXHIBIT 8

MEMORANDUM

TO: Candice McHugh, Randy Budge
FROM: Chuck Brendecke
SUBJECT: Temperature Gain Analysis
DATE: March 19, 2009

In the technical review discussion held on March 17th questions were raised about the potential for water temperature gain in the delivery pipeline proposed in the Ground Water District's over-the-rim mitigation plan. This memo addresses this concern.

A preliminary steady-state heat transfer analysis was conducted to determine the expected water temperature change in the pipeline transporting water from the seven wells to the Snake River Farm. The alternative route shown on Exhibit 2 "Over the Rim Delivery Plan Schematic" was assumed. The pipeline was analyzed in sections based on well locations. Flow rates, pipe sizes, pipe lengths, and materials of construction were based on the same assumptions used for reconnaissance level cost estimates submitted with the mitigation plan. The heat transfer computations considered factors such as:

- Burial depth;
- Flow rates;
- Pipe size, length, materials of construction and associated properties;
- Soil type, moisture content, and associated properties;
- Soil temperature; and
- Well water temperature.

ARS personnel in Kimberly suggested that soil temperatures in the area at a depth of 3 ft could range from a low of 30 degrees F in the winter to a high of 65 degrees F in summer. The heat transfer analysis assumed that soil temperature would be at the peak summer level year-around.

Observation well 08S 15E 33ABB1 is the nearest upgradient observation well to the mitigation wells. In 2004, the last year observed, the water temperature in this well was 14.7 degrees Centigrade (58.5 degrees F). Thus for most periods of the year when soil temperatures are less than 58.5 degrees F the pipeline will likely cool the well water rather than heat it.

Nevertheless, the heat transfer analysis showed that, based on a 3 foot burial depth, a well water temperature of 14.7 °C, and a year-around soil temperature of 65 °F, the water

delivered to Snake River Farm would be approximately 14.9 °C. Thus, a 0.2 °C temperature rise could be expected in delivered water under worst-case conditions.

Considering the dilution afforded by mixing the 2 cfs of delivered mitigation water with the roughly 90 cfs of spring discharge, it is not likely that hatchery influent temperatures will be measurably increased by mitigation water delivery.

EXHIBIT 9

Statewide Groundwater Quality Monitoring Program

Station: 08S 15E 33ABB1
Site ID: 424138114420801
Metal Tag #: A0009144
Sample years: 1991, 1995, 1999, and 2004

Sample Date	Contents	Analyte	Reported Value	Numeric Value	Units
08/28/1991	Inorg & Field	Alkalinity	160	160	mg/L
08/28/1991	Inorg & Field	Ammonia	<0.010	BRL	mg/L
08/28/1991	Inorg & Field	Arsenic	2	2	ug/L
08/28/1991	Inorg & Field	Bicarbonate	195	195	mg/L
08/28/1991	Inorg & Field	Cadmium	<1.0	BRL	ug/L
08/28/1991	Inorg & Field	Calcium	50	50	mg/L
08/28/1991	Inorg & Field	Carbonate	0	0	mg/L
08/28/1991	Inorg & Field	Chloride	40	40	mg/L
08/28/1991	Inorg & Field	Chromium	2	2	ug/L
08/28/1991	Inorg & Field	Copper	1	1	ug/L
08/28/1991	Inorg & Field	Cyanide	<0.01	BRL	mg/L
08/28/1991	Inorg & Field	Fecal Coliform	<1	BRL	col/100 ml
08/28/1991	Inorg & Field	Fluoride	0.60	0.6	mg/L
08/28/1991	Inorg & Field	Hardness	211	211	mg/L
08/28/1991	Inorg & Field	Iron	7	7	ug/L
08/28/1991	Inorg & Field	Lead	<1	BRL	ug/L
08/28/1991	Inorg & Field	Magnesium	21	21	mg/L
08/28/1991	Inorg & Field	Manganese	<1	BRL	ug/L
08/28/1991	Inorg & Field	Mercury	<0.1	BRL	ug/L
08/28/1991	Inorg & Field	Nitrate	1.80	1.8	mg/l as N
08/28/1991	Inorg & Field	pH	7.75	7.75	pH

08/28/1991	Inorg & Field	Phosphorus	0.020	0.02	mg/L
08/28/1991	Inorg & Field	Potassium	4.4	4.4	mg/L
08/28/1991	Inorg & Field	Selenium	<1	BRL	ug/L
08/28/1991	Inorg & Field	Silica	35	35	mg/L
08/28/1991	Inorg & Field	Sodium	26	26	mg/L
08/28/1991	Inorg & Field	Solids	328	328	mg/L
08/28/1991	Inorg & Field	Specific Conductance	535	535	uS/cm
08/28/1991	Inorg & Field	Sulfate	48	48	mg/L
08/28/1991	Inorg & Field	Water Temperature	14.2	14.2	°C
08/28/1991	Inorg & Field	Zinc	98	98	ug/L
08/28/1991	Radiochem	Alpha, Gross (as Americium)	0 ± 2	0	pCi/l
08/28/1991	Radiochem	Beta, Gross	6.7 ± 2.5	6.7	pCi/l
08/28/1991	VOCs	1,4-Dichlorobenzene	<0.21	BRL	ug/L
08/28/1991	VOCs	1-ethyl-2,4-dimethylbenzene	<0.22	BRL	ug/L
08/28/1991	VOCs	Benzene	<0.10	BRL	ug/L
08/28/1991	VOCs	Bromobenzene	<0.14	BRL	ug/L
08/28/1991	VOCs	Bromochloromethane	<0.01	BRL	ug/L
08/28/1991	VOCs	Bromoform	<0.20	BRL	ug/L
08/28/1991	VOCs	Bromomethane	<0.19	BRL	ug/L
08/28/1991	VOCs	Butylbenzene, n-	<0.14	BRL	ug/L
08/28/1991	VOCs	Butylbenzene, -sec	<0.16	BRL	ug/L
08/28/1991	VOCs	Carbon Tetrachloride	<0.17	BRL	ug/L
08/28/1991	VOCs	Chlorobenzene	<0.09	BRL	ug/L
08/28/1991	VOCs	Chloroethane	<0.13	BRL	ug/L
08/28/1991	VOCs	Chloroform	<0.10	BRL	ug/L
08/28/1991	VOCs	Chlorotoluene-p	<0.07	BRL	ug/L

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08/28/1991	VOCs	Dibromochloromethane	<0 11	BRL	ug/L
08/28/1991	VOCs	Dibromochloropropane (DBCP)	<0.2	BRL	ug/L
08/28/1991	VOCs	Dibromoethane,1,2- (EDB)	<0.17	BRL	ug/L
08/28/1991	VOCs	Dibromomethane	<0 07	BRL	ug/L
08/28/1991	VOCs	Dichlorobenzene,1,2-	<0.17	BRL	ug/L
08/28/1991	VOCs	Dichlorobenzene,1,3-	<0.19	BRL	ug/L
08/28/1991	VOCs	Dichlorobromomethane	<0.16	BRL	ug/L
08/28/1991	VOCs	Dichlorodifluoromethane	<0.29	BRL	ug/L
08/28/1991	VOCs	Dichloroethane,1,1-	<0 12	BRL	ug/L
08/28/1991	VOCs	Dichloroethane,1,2-	<0.12	BRL	ug/L
08/28/1991	VOCs	Dichloroethene,1,1-	<0.26	BRL	ug/L
08/28/1991	VOCs	Dichloroethene,1,2,cis-	<0.05	BRL	ug/L
08/28/1991	VOCs	Dichloroethene,1,2,trans-	<0.17	BRL	ug/L
08/28/1991	VOCs	Dichloropropane,1,2-	<0 12	BRL	ug/L
08/28/1991	VOCs	Dichloropropane,1,3-	<0.02	BRL	ug/L
08/28/1991	VOCs	Dichloropropane,2,2-	BRL	BRL	ug/L
08/28/1991	VOCs	Dichloropropene,1,1-	<0.05	BRL	ug/L
08/28/1991	VOCs	Dichloropropene,1,3 cis-	<0.15	BRL	ug/L
08/28/1991	VOCs	Dichloropropene,1,3 trans-	<0 20	BRL	ug/L
08/28/1991	VOCs	Ethylbenzene	<0.09	BRL	ug/L
08/28/1991	VOCs	Ethylbenzene, 2,3-Dimethyl-	<0.11	BRL	ug/L
08/28/1991	VOCs	Hexachlorobutadiene	<0.09	BRL	ug/L
08/28/1991	VOCs	Isodurene	<0.15	BRL	ug/L
08/28/1991	VOCs	Isopropylbenzene	<0 14	BRL	ug/L
08/28/1991	VOCs	Methylene chloride	<0 14	BRL	ug/L
08/28/1991	VOCs	Naphthalene	<0 05	BRL	ug/L

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08/28/1991	VOCs	o-Chlorotoluene	<0.04	BRL	ug/L
08/28/1991	VOCs	Paraldehyde	<0.16	BRL	ug/L
08/28/1991	VOCs	Styrene	<0.08	BRL	ug/L
08/28/1991	VOCs	Tetrachloroethane,1,1,1,2-	BRL	BRL	ug/L
08/28/1991	VOCs	Tetrachloroethane,1,1,2,2-	<0.28	BRL	ug/L
08/28/1991	VOCs	Tetrachloroethylene	<0.31	BRL	ug/L
08/28/1991	VOCs	Tetralin	<0.1	BRL	ug/L
08/28/1991	VOCs	Toluene	<0.05	BRL	ug/L
08/28/1991	VOCs	Toluene, 2-Isopropyl-	<0.13	BRL	ug/L
08/28/1991	VOCs	Trichlorobenzene,1,2,3-	<0.06	BRL	ug/L
08/28/1991	VOCs	Trichlorobenzene,1,2,4-	<0.08	BRL	ug/L
08/28/1991	VOCs	Trichloroethane,1,1,1-	<0.12	BRL	ug/L
08/28/1991	VOCs	Trichloroethane,1,1,2-	<0.04	BRL	ug/L
08/28/1991	VOCs	Trichloroethylene	<0.16	BRL	ug/L
08/28/1991	VOCs	Trichlorofluoromethane	<0.34	BRL	ug/L
08/28/1991	VOCs	Trichloropropane	<0.02	BRL	ug/L
08/28/1991	VOCs	Trimethylbenzene,1,2,4-	<0.10	BRL	ug/L
08/28/1991	VOCs	TRIMETHYLBENZENE,1,3,5-	<0.11	BRL	ug/L
08/28/1991	VOCs	Vinyl chloride	<0.52	BRL	ug/L
07/06/1995	Inorg & Field	Air Temperature	26.0	26	°C
07/06/1995	Inorg & Field	Alkalinity	158	158	mg/L
07/06/1995	Inorg & Field	Ammonia	0.050	0.05	mg/L
07/06/1995	Inorg & Field	Arsenic	2	2	ug/L
07/06/1995	Inorg & Field	Bicarbonate	193	193	mg/L
07/06/1995	Inorg & Field	Cadmium	<1.0	BRL	ug/L
07/06/1995	Inorg & Field	Calcium	51	51	mg/L

07/06/1995	Inorg & Field	Carbonate	0	0	mg/L
07/06/1995	Inorg & Field	Chloride	41	41	mg/L
07/06/1995	Inorg & Field	Chromium	2	2	ug/L
07/06/1995	Inorg & Field	Copper	2	2	ug/L
07/06/1995	Inorg & Field	Fecal Coliform	<1	BRL	col/100 ml
07/06/1995	Inorg & Field	Fluoride	0 60	0 6	mg/L
07/06/1995	Inorg & Field	Hardness	214	214	mg/L
07/06/1995	Inorg & Field	Iron	<3	BRL	ug/L
07/06/1995	Inorg & Field	Lead	<1	BRL	ug/L
07/06/1995	Inorg & Field	Magnesium	21	21	mg/L
07/06/1995	Inorg & Field	Manganese	<1	BRL	ug/L
07/06/1995	Inorg & Field	Nitrate	2 10	2.1	mg/l as N
07/06/1995	Inorg & Field	Nitrite	<0.010	BRL	mg/L
07/06/1995	Inorg & Field	pH	7 75	7.75	pH
07/06/1995	Inorg & Field	Phosphorus	0.040	0.04	mg/L
07/06/1995	Inorg & Field	Potassium	4.4	4.4	mg/L
07/06/1995	Inorg & Field	Selenium	<1	BRL	ug/L
07/06/1995	Inorg & Field	Silica	33	33	mg/L
07/06/1995	Inorg & Field	Sodium	26	26	mg/L
07/06/1995	Inorg & Field	Solids	330	330	mg/L
07/06/1995	Inorg & Field	Specific Conductance	566	566	uS/cm
07/06/1995	Inorg & Field	Sulfate	49	49	mg/L
07/06/1995	Inorg & Field	Water Temperature	14 3	14.3	°C
07/06/1995	Inorg & Field	Zinc	60	60	ug/L
07/06/1995	Pesticides	Alachlor	<0 002	BRL	ug/L
07/06/1995	Pesticides	Atrazine	0.0130	0.013	ug/L

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07/06/1995	Pesticides	Atrazine, desethyl (DEET)	0 003	0 003	ug/L
07/06/1995	Pesticides	Benefin	<0.002	BRL	ug/L
07/06/1995	Pesticides	BHC, alpha-	<0 002	BRL	ug/L
07/06/1995	Pesticides	BHC, gamma- (Lindane)	<0.004	BRL	ug/L
07/06/1995	Pesticides	Carbaryl (Sevin)	<0.003	BRL	ug/L
07/06/1995	Pesticides	Carbofuran	<0.003	BRL	ug/L
07/06/1995	Pesticides	Chlorpyrifos	<0 004	BRL	ug/L
07/06/1995	Pesticides	Cyanazine	<0.004	BRL	ug/L
07/06/1995	Pesticides	Dacthal (DCPA)	<0.002	BRL	ug/L
07/06/1995	Pesticides	DDE,4,4'-	<0 006	BRL	ug/L
07/06/1995	Pesticides	Diazinon	<0.002	BRL	ug/L
07/06/1995	Pesticides	Dieldrin	<0.001	BRL	ug/L
07/06/1995	Pesticides	Diethylaniline,2,6-	<0.003	BRL	ug/L
07/06/1995	Pesticides	Dipropylthiocarbamate, S-Ethyl (EPTC)	<0 002	BRL	ug/L
07/06/1995	Pesticides	Disulfoton	<0.017	BRL	ug/L
07/06/1995	Pesticides	Dyfonate	<0 003	BRL	ug/L
07/06/1995	Pesticides	Ethalfluralin	<0.004	BRL	ug/L
07/06/1995	Pesticides	Ethoprop	<0 003	BRL	ug/L
07/06/1995	Pesticides	Guthion	<0 001	BRL	ug/L
07/06/1995	Pesticides	Linuron	<0 002	BRL	ug/L
07/06/1995	Pesticides	Malathion	<0.005	BRL	ug/L
07/06/1995	Pesticides	Metolachlor	<0 002	BRL	ug/L
07/06/1995	Pesticides	Metribuzin	<0.004	BRL	ug/L
07/06/1995	Pesticides	Molinate	<0 004	BRL	ug/L
07/06/1995	Pesticides	Napropamide	<0.003	BRL	ug/L
07/06/1995	Pesticides	Parathion	<0 004	BRL	ug/L

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07/06/1995	Pesticides	Parathion-methyl	<0 006	BRL	ug/L
07/06/1995	Pesticides	Pebulate	<0 004	BRL	ug/L
07/06/1995	Pesticides	Penoxalin	<0 004	BRL	ug/L
07/06/1995	Pesticides	Permethrins	<0 005	BRL	ug/L
07/06/1995	Pesticides	Phorate	<0 002	BRL	ug/L
07/06/1995	Pesticides	Pronamide	<0 003	BRL	ug/L
07/06/1995	Pesticides	Propachlor	<0.007	BRL	ug/L
07/06/1995	Pesticides	Propanil	<0 004	BRL	ug/L
07/06/1995	Pesticides	Propargite	<0.013	BRL	ug/L
07/06/1995	Pesticides	Simazine	<0 005	BRL	ug/L
07/06/1995	Pesticides	Tebuthiuron	<0 010	BRL	ug/L
07/06/1995	Pesticides	Terbacil	<0 007	BRL	ug/L
07/06/1995	Pesticides	Terbufos	<0.013	BRL	ug/L
07/06/1995	Pesticides	Thiobencarb	<0 002	BRL	ug/L
07/06/1995	Pesticides	Triallate	<0.001	BRL	ug/L
07/06/1995	Pesticides	Trifluralin	<0 002	BRL	ug/L
07/06/1995	Pesticides (Immu)	2,4-D	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Alachlor	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Aldicarb	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Atrazine	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Carbofuran	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Cyanazine	BRL	BRL	ug/L
07/06/1995	Pesticides (Immu)	Metolachlor	BRL	BRL	ug/L
07/06/1995	Radiochem	Alpha, Gross (as Americium)	1.7 ± 2 6	1 7	pCi/l
07/06/1995	Radiochem	Beta, Gross	6 4 ± 2 4	6.4	pCi/l
07/06/1995	VOCs	1,4-Dichlorobenzene	<0 5	BRL	ug/L

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07/06/1995	VOCs	Benzene	<0.5	BRL	ug/L
07/06/1995	VOCs	Bromobenzene	<0.5	BRL	ug/L
07/06/1995	VOCs	Bromochloromethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Bromoform	<0.5	BRL	ug/L
07/06/1995	VOCs	Bromomethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Butylbenzene, n-	<0.5	BRL	ug/L
07/06/1995	VOCs	Butylbenzene, -sec	<0.5	BRL	ug/L
07/06/1995	VOCs	Carbon Tetrachloride	<0.5	BRL	ug/L
07/06/1995	VOCs	Chlorobenzene	<0.5	BRL	ug/L
07/06/1995	VOCs	Chloroethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Chloroform	<0.5	BRL	ug/L
07/06/1995	VOCs	Chlorotoluene-p	<0.5	BRL	ug/L
07/06/1995	VOCs	Dibromochloromethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Dibromochloropropane (DBCP)	<0.5	BRL	ug/L
07/06/1995	VOCs	Dibromoethane, 1,2- (EDB)	<0.2	BRL	ug/L
07/06/1995	VOCs	Dibromomethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichlorobenzene, 1,2-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichlorobenzene, 1,3-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichlorobromomethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichlorodifluoromethane	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloroethane, 1,1-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloroethane, 1,2-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloroethene, 1,1-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloroethene, 1,2,cis-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloroethene, 1,2,trans-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloropropane, 1,2-	<0.5	BRL	ug/L

07/06/1995	VOCs	Dichloropropane,1,3-	<0 5	BRL	ug/L
07/06/1995	VOCs	Dichloropropane,2,2-	<0 5	BRL	ug/L
07/06/1995	VOCs	Dichloropropene,1,1-	<0.5	BRL	ug/L
07/06/1995	VOCs	Dichloropropene,1,3 cis-	<0 5	BRL	ug/L
07/06/1995	VOCs	Ethylbenzene	<0 5	BRL	ug/L
07/06/1995	VOCs	Hexachlorobutadiene	<0 5	BRL	ug/L
07/06/1995	VOCs	Isodurene	<0 5	BRL	ug/L
07/06/1995	VOCs	Isopropylbenzene	<0 5	BRL	ug/L
07/06/1995	VOCs	Methyl tertiary butyl ether (MTBE)	<0 5	BRL	ug/L
07/06/1995	VOCs	Methylene chloride	<0 5	BRL	ug/L
07/06/1995	VOCs	Naphthalene	<0 5	BRL	ug/L
07/06/1995	VOCs	o-Chlorotoluene	<0.5	BRL	ug/L
07/06/1995	VOCs	Paraldehyde	<0 5	BRL	ug/L
07/06/1995	VOCs	Styrene	<0 5	BRL	ug/L
07/06/1995	VOCs	Tetrachloroethane,1,1,1,2-	<0.5	BRL	ug/L
07/06/1995	VOCs	Tetrachloroethane,1,1,2,2-	<0 5	BRL	ug/L
07/06/1995	VOCs	Tetrachloroethylene	<0.5	BRL	ug/L
07/06/1995	VOCs	Tetralin	<0 5	BRL	ug/L
07/06/1995	VOCs	Toluene	<0.5	BRL	ug/L
07/06/1995	VOCs	Toluene, 2-Isopropyl-	<0 5	BRL	ug/L
07/06/1995	VOCs	Trichlorobenzene,1,2,3-	<0.5	BRL	ug/L
07/06/1995	VOCs	Trichlorobenzene,1,2,4-	<0.5	BRL	ug/L
07/06/1995	VOCs	Trichloroethane,1,1,1-	<0 5	BRL	ug/L
07/06/1995	VOCs	Trichloroethane,1,1,2-	<0.5	BRL	ug/L
07/06/1995	VOCs	Trichloroethylene	<0 5	BRL	ug/L
07/06/1995	VOCs	Trichlorofluoromethane	<0.5	BRL	ug/L

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07/06/1995	VOCs	Trichloropropane	<0 5	BRL	ug/L
07/06/1995	VOCs	Trimethylbenzene,1,2,4-	<0 5	BRL	ug/L
07/06/1995	VOCs	TRIMETHYLBENZENE,1,3 ,5-	<0 5	BRL	ug/L
07/06/1995	VOCs	Vinyl chloride	<0.5	BRL	ug/L
07/06/1995	VOCs	Xylenes	<0 5	BRL	ug/L
07/28/1999	Inorg & Field	Air Temperature	29 0	29	°C
07/28/1999	Inorg & Field	Alkalinity	217	217	mg/L
07/28/1999	Inorg & Field	Ammonia	< 020	BRL	mg/L
07/28/1999	Inorg & Field	Arsenic	2	2	ug/L
07/28/1999	Inorg & Field	Barium	39	39	ug/L
07/28/1999	Inorg & Field	Bicarbonate	260	260	mg/L
07/28/1999	Inorg & Field	Cadmium	<1 0	BRL	ug/L
07/28/1999	Inorg & Field	Calcium	48	48	mg/L
07/28/1999	Inorg & Field	Carbonate	0	0	mg/L
07/28/1999	Inorg & Field	Chloride	36	36	mg/L
07/28/1999	Inorg & Field	Copper	1.3	1.3	ug/L
07/28/1999	Inorg & Field	Depth to Water	76 61	76 61	ft
07/28/1999	Inorg & Field	Dissolved Oxygen	7.3	7.3	mg/L
07/28/1999	Inorg & Field	Fecal Coliform	<1	BRL	col/100 ml
07/28/1999	Inorg & Field	Fluoride	59	0 59	mg/L
07/28/1999	Inorg & Field	Hardness	200	200	mg/L
07/28/1999	Inorg & Field	Iron	<10	BRL	ug/L
07/28/1999	Inorg & Field	Lead	<1 0	BRL	ug/L
07/28/1999	Inorg & Field	Magnesium	21	21	mg/L
07/28/1999	Inorg & Field	Manganese	<3.0	BRL	ug/L
07/28/1999	Inorg & Field	Nitrate	2 50	2.5	mg/l as N

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07/28/1999	Inorg & Field	Nitrite	< 010	BRL	mg/L
07/28/1999	Inorg & Field	pH	7 5	7.5	pH
07/28/1999	Inorg & Field	Phosphorus	064	0.064	mg/L
07/28/1999	Inorg & Field	Potassium	4.5	4 5	mg/L
07/28/1999	Inorg & Field	Selenium	1	1	ug/L
07/28/1999	Inorg & Field	Silica	34	34	mg/L
07/28/1999	Inorg & Field	Sodium	26	26	mg/L
07/28/1999	Inorg & Field	Solids	359	359	mg/L
07/28/1999	Inorg & Field	Specific Conductance	547	547	uS/cm
07/28/1999	Inorg & Field	Sulfate	48	48	mg/L
07/28/1999	Inorg & Field	Water Temperature	16.6	16.6	°C
07/28/1999	Inorg & Field	Zinc	22	22	ug/L
07/28/1999	Pesticides (Immu)	Alachlor	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Aldicarb	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Atrazine	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Carbofuran	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Chlorpyrifos	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Cyanazine	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Metolachlor	BRL	BRL	ug/L
07/28/1999	Pesticides (Immu)	Metribuzin	BRL	BRL	ug/L
07/28/1999	VOCs	1,4-Dichlorobenzene	<0.50	BRL	ug/L
07/28/1999	VOCs	Benzene	<0.50	BRL	ug/L
07/28/1999	VOCs	Bromobenzene	<0 50	BRL	ug/L
07/28/1999	VOCs	Bromochloromethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Bromoform	<0.50	BRL	ug/L
07/28/1999	VOCs	Bromomethane	<0 50	BRL	ug/L

07/28/1999	VOCs	Butylbenzene, n-	<0.50	BRL	ug/L
07/28/1999	VOCs	Butylbenzene, -sec	<0.50	BRL	ug/L
07/28/1999	VOCs	Carbon Tetrachloride	<0.50	BRL	ug/L
07/28/1999	VOCs	Chlorobenzene	<0.50	BRL	ug/L
07/28/1999	VOCs	Chloroethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Chloroform	<0.50	BRL	ug/L
07/28/1999	VOCs	Chlorotoluene-p	<0.50	BRL	ug/L
07/28/1999	VOCs	Dibromochloromethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Dibromochloropropane (DBCP)	<0.50	BRL	ug/L
07/28/1999	VOCs	Dibromoethane,1,2- (EDB)	<0.20	BRL	ug/L
07/28/1999	VOCs	Dibromomethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichlorobenzene,1,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichlorobenzene,1,3-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichlorobromomethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichlorodifluoromethane	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloroethane,1,1-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloroethane,1,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloroethene,1,1-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloroethene,1,2,cis-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloroethene,1,2,trans-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloropropane,1,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloropropane,1,3-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloropropane,1,3-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloropropane,2,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Dichloropropene,1,1-	<0.50	BRL	ug/L
07/28/1999	VOCs	Ethylbenzene	<0.50	BRL	ug/L

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07/28/1999	VOCs	Hexachlorobutadiene	<0 50	BRL	ug/L
07/28/1999	VOCs	Isodurene	<0 50	BRL	ug/L
07/28/1999	VOCs	Isopropylbenzene	<0 50	BRL	ug/L
07/28/1999	VOCs	Methyl tertiary butyl ether (MTBE)	<0 50	BRL	ug/L
07/28/1999	VOCs	Methylene chloride	<0.50	BRL	ug/L
07/28/1999	VOCs	Naphthalene	<0 50	BRL	ug/L
07/28/1999	VOCs	o-Chlorotoluene	<0 50	BRL	ug/L
07/28/1999	VOCs	Paraldehyde	<0.50	BRL	ug/L
07/28/1999	VOCs	Styrene	<0 50	BRL	ug/L
07/28/1999	VOCs	Tetrachloroethane,1,1,1,2-	<0 50	BRL	ug/L
07/28/1999	VOCs	Tetrachloroethane,1,1,2,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Tetrachloroethylene	<0 50	BRL	ug/L
07/28/1999	VOCs	Tetralin	<0.50	BRL	ug/L
07/28/1999	VOCs	Toluene	<0 50	BRL	ug/L
07/28/1999	VOCs	Toluene, 2-Isopropyl-	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichlorobenzene,1,2,3-	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichlorobenzene,1,2,4-	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichloroethane,1,1,1-	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichloroethane,1,1,2-	<0.50	BRL	ug/L
07/28/1999	VOCs	Trichloroethylene	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichlorofluoromethane	<0 50	BRL	ug/L
07/28/1999	VOCs	Trichloropropane	<0 50	BRL	ug/L
07/28/1999	VOCs	Trimethylbenzene,1,2,4-	<0 50	BRL	ug/L
07/28/1999	VOCs	TRIMETHYLBENZENE,1,3,5-	<0.50	BRL	ug/L
07/28/1999	VOCs	Vinyl chloride	<0 50	BRL	ug/L
07/28/1999	VOCs	Xylenes	<0 50	BRL	ug/L

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09/02/2004	Inorg & Field	Air Temperature	16	16	°C
09/02/2004	Inorg & Field	Alkalinity	158	158	mg/L
09/02/2004	Inorg & Field	Ammonia	<0.04	BRL	mg/L
09/02/2004	Inorg & Field	Arsenic	2.2	2.2	ug/L
09/02/2004	Inorg & Field	Barium	44.7	44.7	ug/L
09/02/2004	Inorg & Field	Bicarbonate	193	193	mg/L
09/02/2004	Inorg & Field	Cadmium	<0.04	BRL	ug/L
09/02/2004	Inorg & Field	Calcium	55.7	55.7	mg/L
09/02/2004	Inorg & Field	Carbonate	0	0	mg/L
09/02/2004	Inorg & Field	Chloride	39.9	39.9	mg/L
09/02/2004	Inorg & Field	Dissolved Oxygen	4.7	4.7	mg/L
09/02/2004	Inorg & Field	Fecal Coliform	<1	BRL	col/100 ml
09/02/2004	Inorg & Field	Fluoride	0.6	0.6	mg/L
09/02/2004	Inorg & Field	Hardness	230	230	mg/L
09/02/2004	Inorg & Field	Iron	E4	4	ug/L
09/02/2004	Inorg & Field	Magnesium	22.8	22.8	mg/L
09/02/2004	Inorg & Field	Manganese	<0.8	BRL	ug/L
09/02/2004	Inorg & Field	Nitrate	2.2	2.2	mg/l as N
09/02/2004	Inorg & Field	Nitrite	<0.008	BRL	mg/L
09/02/2004	Inorg & Field	pH	7.3	7.3	pH
09/02/2004	Inorg & Field	Phosphorus	0.03	0.03	mg/L
09/02/2004	Inorg & Field	Potassium	4.96	4.96	mg/L
09/02/2004	Inorg & Field	Selenium	0.8	0.8	ug/L
09/02/2004	Inorg & Field	Silica	33.2	33.2	mg/L
09/02/2004	Inorg & Field	Sodium	28.2	28.2	mg/L
09/02/2004	Inorg & Field	Solids	338	338	mg/l

09/02/2004	Inorg & Field	Specific Conductance	562	562	uS/cm
09/02/2004	Inorg & Field	Sulfate	49.7	49.7	mg/L
09/02/2004	Inorg & Field	Water Temperature	14.7	14.7	°C

Legend

Results Codes:

<	below the laboratory reporting limit
BRL	below the laboratory reporting limit
ND	not detected
E	estimated
IN	indeterminate

Hardness Scale:

<75 mg/l	soft
75-150 mg/l	moderately hard
151-300 mg/l	hard
>300 mg/l	very hard

Unit Abbreviations:

ug/l	micrograms per liter (parts per billion)
mg/l	milligrams per liter (parts per million)
‰	parts per thousand
uS/cm	microSiemens per centimeter
pCi/l	picoCuries per liter
ft	feet
°C	degrees Celsius
col/100 ml	colonies per 100 milliliters

Miscellaneous:

IMMU	means Immunoassay (enzyme) testing

The data on these pages

Idaho Department of

322 E Front Street
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EXHIBIT 10

Technical Memorandum

Water Quality and Temperature Considerations in Over the Rim Mitigation Proposal

Prepared by Anthonie M. Schuur[1]
Aquaculture Management Services
11583 Valensin Road
Galt, CA 95632
772-971-6500
amschuur@aol.com

[1] Appendix 1 hereto provides Mr. Schuur's qualifications and background information.

I. INTRODUCTION

This Technical Memorandum is being provided to augment information contained in the 2009 Replacement Water Plan and Third Mitigation Plan (Over-the-Rim) of North Snake Ground Water District and Magic Valley Ground Water District dated March 12, 2009.

II. DISCUSSION

The principal categories of water quality concern for the Over the Rim (OTR) mitigation proposal are temperature, dissolved gas, and dissolved solids. Each of these requires a more detailed description of specific issues as provided below:

A. TEMPERATURE

Temperature is a physical property of water that can be changed by heat transfer from the surrounding environment. Based on my review of SRF records supplied to the Idaho Department of Environmental Quality, the typical SRF temperature at the spring outlet is 14.5 C. Assuming that the well water in the well is similar to the typical SRF temperature of 14.5 C (to be determined by samples and evaluation), temperature change depends on the heat transfer to (or from) the water through the pipe.

The present information indicates that the proposed supply wells above the rim have water temperatures at discharge that are within a degree of Snake River Farm (SRF) raceway temperature of 14.5 C. We anticipate that the delivered water temperature at the spring box will be very close to the existing temperature range at SRF. I suggest that for the very worst case in which we would mix 3% of the flow with water that is 1.5 C warmer than the existing temperature of 14.5 C the result would be 3% of 1.5 C or about 0.045 C warming. That is less than 0.1 C and would therefore not even be detectable with normal thermometers. Even in what I anticipate as an extreme, the OTR mitigation supply is very unlikely to cause any change in the SRF raceway temperature and that it will remain in the optimal growth range for trout and that the trout will experience no stress from temperature fluctuations caused by the OTR flow.

B. DISSOLVED GAS SUPERSATURATION

Dissolved gas supersaturation is another physical property of water that arises when the dissolved gas in solution exceeds the solubility of the gas in water. This can be dangerous to fish but is, with proper and simple engineering, unlikely to occur in the OTR mitigation proposal pipeline. One of the likely means of delivering water to the SRF spring box is likely to be a spray aeration system that will dissipate the energy from the water at about 100 psi on a rock bed. This accomplishes three things:

- Equilibration of dissolved gases to atmospheric pressure
- Saturation of the flow with oxygen
- Evaporative cooling that would offset any warming in the pipe

The two principal ways of inducing supersaturation are increasing the temperature of water that is already saturated and entraining air in the pipe by the Venturi effect caused by leaks in the pipe or joints. The temperature increase is not indicated because of the inherent temperature stability of the system. Any entrainment of air is prevented by proper pipe installation. Even if supersaturation should occur, the aeration system at delivery would rectify any supersaturation.

C. DISSOLVED SOLIDS

Dissolved solids are the dissolved chemical constituents in the water that are likely to be constant from the well to the spring box. Assuming acceptable chemical quality in the well water is determined, it is unlikely to change during conveyance to the spring box.

APPENDIX 1

Anthonie M. Schuur

Aquaculture Management Services
Office at The Fishery

11583 Valensin Road

Galt, CA 95632
Phone (cell) 772-971-6500 Fax 916 687-8823
e-mail amschuur@aol.com

Personal: Born Whittier, California August 12, 1945
Languages: English, Spanish
Education: B.S. Biological Science, University of California, Irvine, 1969; Graduate Studies in Agricultural Economics, University of California, Davis.

Employment Summary:

1988 to present, **Aquaculture Management Services**
Principal Aquaculture Consultant

1994 to 1997, **Altrix International/Jamaica Flour Mills Investments**
Project Development Manager
Project Manager, Altrix Panama shrimp farm expansion
Project Manager, Hellshire Hatchery design and construction

1984 to 1988, **Agrifuture Inc.**
Vice President, Director, Agrifuture, Inc.
Vice President, Tomales Shellfish Farms, Inc.
Vice President, Aquafuture, Inc.
Consultant to the World Bank (Indonesia)

1978 to 1984, **James M. Montgomery Consulting Engineers, Inc.**
Supervising Aquaculture Scientist
Senior Aquaculture Scientist

1976 to 1978, **Maricultura, S.A.**, Costa Rica
Production Manager
Assistant Operations Manager

1972 to 1976, **University of California, Davis**
Postgraduate Research Economist, Department of Agricultural Economics
Program Manager, Aquaculture Development Program
Staff Research Associate

1970 to 1972 **Brown and Caldwell, Consulting Engineers**
Water Quality Biologist

1965 to 1967 **United States Marine Corps**
Sergeant, communications specialist

Specific Experience Areas:

- Preparation of commercial fish and shrimp farm studies for clients in Panama, Guatemala, Jamaica, Honduras, Nicaragua, Colombia, Venezuela, Ecuador, Mexico, Trinidad, India, Malaysia, South Africa, Sri Lanka, Bangladesh, and Indonesia
- Operational management of commercial shrimp, shellfish, and finfish production programs.
- Preparation of business plans and financial projections for commercial aquaculture ventures.
- Preparation of bioengineering criteria and design studies and for commercial intensive and semi-intensive aquaculture production systems.
- Mathematical modeling of bioengineering systems.
- Preparation of rural development project plans in Africa, Asia, and Latin America.
- Instruction in bioenergetics and bioengineering (Associate Instructor, Aquaculture Department, Harbor Branch Oceanographic Institution)
- Project management including construction of water systems, supervision of civil including pump stations, water control structures, and ponds.

Publications:

Co-author of Bioeconomics of Aquaculture, a monograph. Author or co-author of the following academic papers and more than 60 technical reports, system designs, and financial plans.

Schuur, A.M., Allen, P.G., and Botsford, L.W. 1974. An analysis of three facilities for the commercial production of Homarus americanus. American Society of Agricultural Engineers. Paper No. 74-5517.

Shleser, R.A., and Schuur, A.M. 1975. Utilization of power plant thermal effluent for mariculture. In: Water Management by the Electrical Power Industry. Water Resources Symposium. 8:307-312. Center for Research in Water Resources.

Botsford, L. W., Raush, H.E., Schuur, A.M. and Shleser, R.A. 1975. An economically optimum aquaculture facility. Proceedings of the World Mariculture S ociety, 6:407-420.
Schuur, A.M., Fisher, W.S., Van Olst, J., Carlberg, J., Shleser, R.A., and Ford, R. 1976.

Hatchery Methods for the Production of Juvenile Lobsters (Homarus americanus). University of California Sea Grant Program. Publication 48.

Wickham, D.E., Shleser, R.A., and Schuur, A.M. 1976. Observations on the inshore population of Dungeness Crab, Cancer magister, in Bodega Bay. California Fish and Game, 62(1): 89-92.

Allen, P.G., L.W. Botsford, A.M. Schuur, and W.E. Johnston, 1984. Bioeconomics of Aquaculture. A Systems Approach. Elsevier, New York, 386 pp.

Schuur, A.M. 1991. A bioenergetic model for application to intensive fish culture system management. Fisheries Bioengineering Symposium, American Fisheries Society Symposium 10: 393-401.

Rolland Laramore, S. Allen, P.Hitchens, X. Romero, and A. Schuur. 2000. Artificial induction of active accommodation for white spot syndrome virus (WSSV) in *Penaeus vannamei* with tolerine products. Presented at 4th Congreso Centroamericano de Acuicultura, June 2000.

Schuur, A.M. 2003. Evaluation of biosecurity applications for intensive shrimp farming. Aquacultural Engineering 28 (1-2): 3-20.

Organizations:
California Aquaculture Association, President, 1988, Chairman of the Board, 1989; National Aquaculture Association, founding Director, 1990, Newsletter Editor, 1991; Editorial Board, Aquacultural Engineering, 1998-present; member World Aquaculture Society, and Aquacultural Engineering Society; California Aquaculture Association, Vice President and Chairman of the Governmental Affairs Committee, 2006 to present.

NARRATIVE SUMMARY
Anthonie M. Schuur

Mr. Schuur is a professional aquaculture scientist with over 30 years of experience in aquaculture both as an operational manager and as a consultant. He has direct experience as the manager of commercial fin-fish, shrimp, and bivalve production facilities encompassing both intensive and extensive production methods. His consulting experience includes 7 years as a Supervising Environmental Scientist with James M. Montgomery Consulting Engineers and 18 years as an independent consultant specializing in services to commercial aquaculture clients. The scope of his consulting includes bioengineering studies, facility planning and design, operational advisory services, expert testimony, marketing development, and financial analysis.

He is a co-author of *Bioeconomics of Aquaculture*, a monograph describing the interrelationships between the biological, engineering, and economic aspects of aquaculture production. His scientific publications often emphasize the field of bioenergetics that underlies many of the criteria for aquaculture production facilities. He has conducted several seminars demonstrating the use of bioenergetics models for aquaculture systems management at national aquaculture technical meetings and at the University of California, Davis.

He has completed several comprehensive planning studies that include conceptual development, facility engineering, capital cost assessment, and analysis of projected financial performance. Under contract to the International Finance Corporation of the World Bank, he prepared an extensive shrimp farming feasibility study for a 6,000-acre site in Nicaragua. The study included an integrated plan for a shrimp farming industry complex including a hatchery, a shrimp farm capable of five million pounds of output per year, and a processing facility. In 1997, he completed an assignment as the project manager of a shrimp farm and hatchery complex in Panama and Jamaica. The Panama farm expansion involved construction of 300 hectares of new ponds, renovation of 100 hectares, construction of a 12 cum/sec pump station, and other ancillary structures. The Jamaica hatchery has the capacity to produce approximately 30 million shrimp post-larvae per month. In 1999, he prepared a comprehensive planning study for a shrimp-farming venture in Venezuela comprising more than 5,000 acres.

He has also prepared plans and system designs for several intensive fin-fish farming ventures including the facilities employed by The Fishery near Sacramento, California. The intensive facility is used for the production of sturgeon caviar and produces several tons of select caviar annually. He has also prepared similar designs for intensive culture of several kinds of fish including catfish, tilapia, and stripped bass.

Due to his specialization in aquaculture economics and the financial assessment of aquaculture ventures, Mr. Schuur has served several institutional clients requiring appraisals for aquaculture facilities. On five occasions, he prepared expert opinions for submission in court proceedings. His expert testimony was used to ascertain asset values and other financial issues. Mr. Schuur has also assisted lending institutions and development agencies in assessing loans for proposed aquaculture projects.

Mr. Schuur has served as a technical and management advisory resource to many commercial aquaculture production clients such as The Fishery, Shrimp Culture Inc., Sea Ark International, Sierra AquaFarms, SeaChick of Mississippi, Solar AquaFarms (Chiquita Brands), GrupoGranjas Marinas de San Bermardo, Altrix International, Jamaica Flour Mills (ADM) and Bluepoints Company, Inc. Services for these clients span a diversity of species and culture system approaches.

As an independent consultant, Mr. Schuur provides planning and bioengineering professional services to private, corporate, and public clients and serves on the editorial board of the journal, Aquacultural Engineering.

MEMORANDUM

TO: Candice McHugh, Randy Budge
FROM: Chuck Brendecke
SUBJECT: Operation of Over-the-Rim Delivery
DATE: March 19, 2009

In the technical review discussion held on March 17th questions were raised about the proposed spatial distribution of pumping under the Ground Water District's over-the-rim mitigation plan. The concern was, as I understand it, that concentration of pumping from the wells nearest the canyon rim would change the spatial distribution of pumping impact on the Buhl-Thousand Springs reach, possibly increasing it. This memo addresses this concern.

I reviewed the historical pumping of the wells in terms of its spatial distribution vis-à-vis the ESPA ground water model. The table below summarizes the essential information from this review.

Exhibit 2 Well #	Well Tag #	ESPA Cell ID	Avg* Pumped acre-ft/yr
1	A0001689	050013	322.9
2	A0001521	050013	222.8
3	A0003643	050013	238.1
			783.8
4	A0001510	050014	501.4
5	A0003548	050014	446.2
			947.6
6	A0003549	050015	500.3
7	A0003550	050015	211.9
			712.2

* For years 2003-2007

These data indicate that the mitigation wells all lie in 3 adjacent model cells. Each of these model cells has a slightly different response relationship to the Buhl-Thousand Springs reach. Cell 050013, the nearest to Snake River Farm, has a 59.5% response to the reach (4.1% response to SRF) while cell 050015, the furthest from Snake River Farm, has a 38.4% response to the reach (2.6% to SRF).

Applying the model's steady state response functions for each of the three cells to the historical pumping in each cell reveals that the impact on Snake River Farm from this

pumping in its historical locations is 0.11 cfs. If all historical pumping were concentrated in cell 050013, the nearest to Snake River Farm, the impact of that pumping on SRF would be 0.14 cfs, an increase of 0.03 cfs.

This 0.03 cfs (13 gallons per minute) represents about 1.5% of the mitigation requirement of 1.99 cfs and would be below that limits of accuracy of most measurement devices sized to monitor that mitigation requirement delivery. However, even if this minute increase were to be made an additional mitigation requirement, it could easily be delivered via the proposed system within the historical parameters.

From this I would conclude that the operation of this mitigation plan could move historical pumping among any of the mitigation wells with negligible change in pumping impact to Snake River Farm.