

Emails Week of August 25, 2008

From: cstampingr@dakotacom.net [mailto:cstamping@dakotacom.net]
To: info@tucsonpimawaterstudy.com

Subject: The Future of Perchlorate and Tucson

Dear Tucson Pima Water Study Members,

The Center for Disease Control (CDC) found perchlorate in the urine of every person tested (Ref: Organic Consumers Association). The US EPA has established a reference dose of 0.7 ug/L-an MCL for perchlorate may be designated by US EPA in 2008. FDA has designated perchlorate intake doses from food for different ages of US citizens. The perchlorate sum of daily oral water and food intake is the total daily human perchlorate dose.

Relative perchlorate history for Tucson:

1999: Lake Mead water in 1999 contained 480 ppb of perchlorate (Ref: ADEQ).

2000: Saddle Island in Lake Mead contained 9.87 ppb of perchlorate (ADEQ).

2001: Tucson Water Dept. reported a drinking water maximum of 11.9 ppb of perchlorate in its 2001 Annual Water Quality Report.

2004: On July 8, 2004, perchlorate monitoring results were (Ref: AZDEQ: Perchloate in Arizona)

<u>WELL</u>	<u>ppb</u>
1. 21 CAVSARP	2.4
2. 22 CAVSARP	2.3
3. 9 Avra Valley Recharge	2.4
4. 2-P Avra Valley Recharge	2.4

2004: On June 30, 2004, the Santa Cruz River downstream from Roger Road Wastewater Treatment Plant had <4ppb of perchlorate (Ref: ADEQ).

NOTE:FLOW PATH OF PERCHLORATE IS: LAKE MEAD, LOWER COLORADO RIVER, CAP CANAL, AVRA VALLEY CAP WATER INTO TUCSON POTABLE WATER, THROUGH TUCSON CITIZENS INTO PIMA COUNTY WASTEWATER, INTO SANTA CRUZ RIVER. Tucson citizens intake additional perchlorates from food and beer.

2005: In 2005, Hoover Dam had 4 ppb of perchlorates (Ref: Clean Colorado River Alliance: Recommendations to address Colorado River Quality, 2006).

2006: The CAP Water Quality Report, 2006, at the San Xavier Pumping Station cited a perchlorate contamination of 2.3 ppb in May, 2006.

2008: Las Vegas drinking water is treated at two plants. The Las Vegas 2008 Water Quality Summary cites a maximum of 4.9 ppb perchlorate in drinking water from the Alfred Merritt Smith Water Treatment Plant and a maximum of 5.9 ppb in the drinking water from the River Mountain Water Treatment Plant. Both treatment plants intake their water from Lake Mead and their tertiary treated wastewater flows back into Lake Mead (Ref: Southern Nevada Water Systems).

Perchlorate remediation adjacent to Las Vegas Wash included (Ref: General Properties of Emerging Contaminants, Southern Nevada Water Authority).

2001. Ion Exchange

2002. One Pass Ion Exchange

2004. Fluid Bed Reactor Biological Treatment.

2006. Initial Phase of in situ Biological Treatment.

The multiple treatment processes indicate an exponential remediation, ie, each identical removing pass removes the same percentage of the contaminant existing prior to the pass. For example, break a loaf of bread in two, break each remaining half into halves-keep repeating the process which results in

smaller and smaller pieces and less quantity per energy input. Final result: some bread(or contaminant) always remains.

The Tucson Water Dept is presently serving the citizens of Tucson diluted tertiary treated, recharged water from Las Vegas and Lake Mead via the lower Colorado River and CAP Canal. A sustainability of total annual input water to Tucson Water Dept. providing for growth must consider the ultimate fate of two contaminants: total dissolved solids (TDS) and perchlorate (pharmaceuticals and endocrine disrupters are being evaluated). Both contaminants shall increase their concentrations with time unless wastewater is transported out of Tucson Water's inventory. Sustainability must have a boundary; otherwise, a Pima County Wastewater Treatment Plant would have to be designed to process an infinite flow of wastewater. For sustainability, a designation of a TDS standard by the Tucson City Council

Treatment Plant is needed to plan and build treatment facilities.

For the perchlorate contaminant, monthly monitoring of the Avra Valley blend is needed. CAP does not, and is not required by the Central Arizona Water Conservation District (CAWCD) to monitor perchlorate. The CAWCD requires CAP to have CAP water and the blend at Avra Valley to be monitored and the monitoring to be performed by a laboratory licensed by the Arizona Department of Health Services(ADHS), Office of Laboratory Licensure and Certification using ADHS approved methods. Note the accountability separation between operator (CAP) and monitor (laboratory).

Monitoring for perchlorates, by a laboratory defined, supra, or a Tucson Water Quality Dept, is indicated for the Avra Valley blended water. Perchlorate monitoring data is needed to determine: 1. whether Tucson Water is within the US EPA Reference Dose of 0.7 ug/L., and 2. design and treatment requirements for removal of perchlorates from tertiary treated, recharged, potable water from Pima County wastewater effluent.

For sustainability, the wastewater flow of 45,000,000 gal/day=60,626 acre feet into the Santa Cruz River is recharged for use by Tucson Water:

<u>Annual Source</u>	<u>Acre-Ft</u>
Avra Valley natural recharge	~17,500
Tucson Basin natural recharge	~66,000
CAP Water Allocation	144,000
Total Input	227,500
Less effluent into Santa Cruz River	0
Less evaporative losses	?
less other losses	?
Remainder: Total recycled*	?

*This remainder, if positive, is the water available for future residential, industrial, and commercial growth.

A continuation of the 45,000,000 gal/day into the Santa Cruz River would reduce the Total Input, supra, to 166,873 acre-ft. The use of gray water in the residence increase of 218,00 households between 2008 and 2030 would further decrease the 166,873 acre-ft to 137,983 acre-ft and significantly reduce the acre-ft possibly available for growth.

Decisions are needed, boundary conditions determined, plans made with flexibility for changes (additional water sources, et al), and citizen approval obtained. Cooperation between the City of Tucson and Pima County is essential- perhaps the time has come for joint study sessions with Pima County Supervisors, Tucson Mayor, and City Councilpersons in attendance.

Respectfully,
Clyde H. Stagner, a Tucson citizen.

From: cstampingr@dakotacom.net [mailto:cstamping@dakotacom.net]
To: info@tucsonpimawaterstudy.com

Subject: Fw: TW Webmail

Dear Sirs,

Research of documents yielded zero results- quantification of water supplied was prolifically related to individual and residential water usage. This data is necessary for inclusion in computations for annual credits and debits in a sustainability analysis

-clyde

----- Original Message -----

From: cstampingr@dakotacom.net

To: TW_Web1@tucsonaz.gov

Subject: TW Webmail

Dear Sirs;

What was the 2007 annual total water, in gallons, supplied by Tucson Water Dept, to each of the following:

Commercial (Potable Water)	_____
Commercial (WasteWater Effluent)	_____
Industrial (Potable Water)	_____
Industrial (WasteWater Effluent)	_____
Gov`t (Potable Water)	_____
Gov`t (WasteWater Effluent)	_____
Other (Potable Water)	_____
Other (WasteWater Effluent)	_____

Sincerely,
Clyde H Stagner

From: cstampingr@dakotacom.net [mailto:cstampingr@dakotacom.net]

To: info@tucsonpimawaterstudy.com

Subject: Fw: After quality, quantity sustainability

----- Original Message -----

From: cstampingr@dakotacom.net

To: mcweb@tucsonaz.gov

Subject: After quality, quantity sustainability

Dear Mayor and Council Members,

Since state agencies are involved, this request is sent to the Mayor and Council instead of the applicable city entity.

Under the provisions of Permit No. 71-564896.0001,CAP is required to estimate the daily evaporation(Ref: Permit Conditions; 4,Monitoring Requirements; d, Operational Monitoring Requirements, ii-) from the wetted areas, in acres, within the Avra Valley Recharge Project for recharge basins:RB-1,RB-2,RB-3,and RB-4. Is this evaporative loss of water from these recharge basins debited to Tucson`s annual 144,000 Cap water allocation? If so, what was the total annual 2007 CAP reduction in acre-feet?

For all Tucson Water Dept. supplied open water recharge basins/open water storage areas/recreational ponds, lakes/other ,what is the total water evaporation in acre-feet from their wetted surfaces, individually identified, as specified in, "Evaporation from Open Water Surfaces ,in Arizona, by Keiyh R. Cooley,1970 (Ref: Permit No. 71-564896.0001, cited supra.

From swimming pool surface areas determined from Pima County Health Dept. swimming pool permits, what is their annual loss of potable water, in acre feet, due to evaporation.

What was the 2007 annual total wastewater effluent, in acre-feet, supplied to Commercial, Industrial, Government, and others. For each of the above identities, what was the total estimated evaporative loss in annual acre-feet? If the total acre-feet supplied does not equal the total evaporative loss, what was the disposition of the difference in quantities?

This information is essential for water sustainability debits and credits.

Respectfully,
Clyde H. Stagner, a Tucson citizen

From: Angie Gelsinon [mailto:angie@kaneenpr.com]
To: Melaney Seacat; Nicole Ewing-Gavin; Nicole Fyffe; Sabrina Cotta
Cc: Liz Beamer
Subject: Tucson HABOOB:Perchlorate

Comment Recieved. Response sent.

Info-clyde

----- Original Message -----

From: cstampingr@dakotacom.net
To: info@tucsonpimawaterstudy.com

Subject: Tucson HABOOB: Perchlorate

Dear Study Members,

1. Tucson Health Considerations:

The USEPA has not designated an MCL for perchlorate (Ref: Tucson Water Dept., Mitch Basefsky).The USEPA is in the process of assessment for a drinking water perchlorate MCL. On 18, Feb, 2005, the USEPA issued a reference dose (RfD) for perchlorate which is 0.0007 mg/kg/day and a numerical estimate of a daily oral exposure based on body weight. The human population is not likely to experience harmful effects during a lifetime but it is a threshold for producing effects (Ref: USEPA Glossary). The RfD is not a mandatory compliance contaminant level. Voluntary compliance is indicated for drinking water:

A. To protect the health of Tucson citizens consistent with the findings of the National Academy of Sciences (Ref: Groundwater and Drinking Water, USEPA: Final Chemical Spill-19,Groundwater Plume Interim, Record of Decisions, Apr,2006, Section 2.10.2).

B. To avoid lawsuits similar to that filed in California because of Colorado River Perchlorate contamination (Ref: Groundwater Recharge, Perchlorate and the Colorado River. The estimate limit of quantification (LOQ) is 0.5 ppb for drinking water (Ref: Weitz and Luxenberg, PC, lawyer advertisement on the internet).

The drinking water equivalent of the RfD of 0.0007 mg/kg/day is 24.5 ppb based on one human body weight of 70 kg and 2 liters of drinking water consumed per day (Ref: Testimony, Benjamin H. Grumbles, USEPA, May 6,2008)

The dose of perchlorate to infants varies from that of adults. For example, in general, infants need daily drinking water equal to 150ml/kg of body weight (Ref: NIH, Human Water Consumption). An infant weighing 10 kg needs 1500ml daily:

$$10 \text{ kg} \times 0.7 \text{ ug/kg/day} = 7 \text{ ug/day}$$

$$\text{and } (7 \text{ ug/day}) / (1.5 \text{ L/day}) = 4.67 \text{ ug/L}$$

which is the maximum perchlorate concentration in drinking water for this infant to avoid exceeding the consumption of the RfD of 0.7 ug/kg/day.

Foods with higher content of water, such as produce, would be expected to contain higher levels of perchlorate, a highly soluble chemical, and contribute more to the overall dietary exposure to perchlorate than food with lower water content. The results of this assessment do not represent the total human exposure to perchlorate (Ref: Preliminary Estimate of Perchlorate Dietary Exposure Based on FDA 2004/2005 Exploratory Data, US Food and Drug Administration, May, 2007). When the average child consumes perchlorate contaminated drinking water either alone or with perchlorate contaminated food, the amount of ingested perchlorate has the potential to exceed nearly every one of the proposed final drinking water standards, except the Massachusetts standard of 2ppb, thereby subjecting them to the adverse health effects of perchlorate (Ref: FDA Reports Perchlorate Widespread, Millions of Children at Risk from Exposure Levels, US House of Representatives, US Committee on Energy and Commerce, Jan.22,2008).

Examples of Perchlorate Total concentration for food and drinking water on the same day are:

B. Tucson Water Dept. maximum concentration of 11.9 ppb cited in 2001 Annual Quality Water Report:

Age (yrs)	Wt (kg)	Food** (ug/kg)	Drinking water			Daily Total (ug/kg)
			(L)	(UG)	(ug/kg)	
6-11mo*	9.4	0.29	1.4	16.7	1.77	2.06
6	23	0.28	0.748	8.9	0.387	0.774
25<35	64.6	0.11	2.10	5.67	.0877	0.198

*In general, infants need 150mL water/kg body weight-a person needs 1/2 ounce of water for each lb of body weight (Ref: NIH Human Water Consumption: Mayo Clinic, Wellness and Water Intake).

**US Food and Drug Administration Total Diet Study, Journal of Exposure, Science, and Environmental Epidemiology, 2008.1-10).

Table 1

C. Las Vegas: SNWS-River Mountains Smith Water Treatment Plant 2008 Water Quality Summary: Perchlorate Average Value of 3ppb:

Age (yr)	Drinking Water		Total daily Intake	
	(L)	(UG) (ug/kg)	(ug/kg)	(ug/kg)
6-11mo	1.4	4.2	0.447	0.737***
6	0.748	1.79	0.078	0.358
25<35				
Female	2.1	6.3	0.098	0.208

***Exceeds RfD

Table 2.

2. Sources of Perchlorate:

In May,1999,ADEQ monitoring showed 11ppb of perchlorate throughout Arizona (Ref: ADEQ).Latest results from Willow Beach, Az., show levels of perchlorate in the 4ppb range (Ref: ADEQ) The primary sources of the perchlorate are the two locations of abandoned perchlorate production for rocket fuel located in the vicinity of Las Vegas, Nev. Perchlorate travels from these locations to the Las Vegas Wash, thence to Lake Mead, thence down stream in the lower Colorado River before entering the CAP canal and traveling to Tucson. The Lower Colorado River, which stretches from Lake Mead to the Mexican border, had measurable concentrations of perchlorate over its entire length (Ref: Perchlorate Treatment technology Update, EPA542-R-05-015, May, 2005. In 2000, the perchlorate concentration, at the Las Vegas drinking water intake from Lake Mead, averaged 24ppb (Ref: Automated System Measures Flow Direction, Velocity in Wells, USGS).

The State of Arizona has an advisory level of 14ppb-1998 health based guidance level to be reviewed after EPA issues final RfD-which EPA did in Feb, 2005.

3. Perchlorate Treatment and Removal:

Perchlorate clean up is in progress adjacent to Las Vegas. The drinking water cleanup level range established by USEPA is 4ug/L to 18 ug/L (Ref: Section 111.12 Ground Water Cleanup Levels; Section IV-1.2) Hoover Dam concentration in 2005 was 4ppb and < or = 4ppb at the Colorado River Aqueduct:

California entry for Colorado River water and near Colorado River water entry to CAP canal (Ref: Clean Colorado River Alliance: Recommendations to address Colorado River Quality, 2006).

Once dissolved, the perchlorate anion is extremely mobile and very stable, requiring decades to naturally degrade and can have advection flow. The use of conventional water treatment technologies has proven to be largely ineffective for perchlorate removal because of its low reactivity, low volatility, and high solubility (Urbansky, 1999). Perchlorate is very chemically stable under normal groundwater and surface water conditions (Urbansky, 1999). Under these conditions, the recharge of perchlorate contaminated water results in similar perchlorate contaminated water upon withdrawal from the aquifer.

Ex situ biological treatment of perchlorate includes selection of appropriate electron donor and bioreactor configuration: the State of California Dept. of Health Services has accepted the use of biological treatment to remove, or reduce, perchlorate from source water that might be used as a potable water supply (DHS, 2002). The reference for this paragraph is: Final, Perchlorate Treatment Technologies Literature Review Overall Unit 1 Expend Treatability Study; National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, Ca, EPA ID# CA9800013030).

CAP water at the Mark Wilmer Pumping Plant. Parker, Az, had a May, 2006, perchlorate level of 2.1 ug/L. The San Xavier Pumping Plant had a May, 2006, level of 2.3 ug/L of perchlorate. The levels of perchlorate in CAP water vary with the seasons, Colorado River Flow, and water levels in Lake Mead.

3. Conclusions:

A. Perchlorate is flowing into Tucson drinking water via the CAP water recharge blend at Avra Valley. The Tucson Water Dept's remediation consists only of blending with Avra Valley groundwater. Tucson Water Dept. has stated that it will increase the % of Cap water in the blend which will increase the perchlorate level in Tucson drinking water. There are no available monitoring results by Tucson Water Dept. showing monitoring of the CAP water blend for perchlorate.

B. With a continuation of the discharge of 45 million gallons of effluent, as presently treated, into the Santa Cruz River, the Pima Waste Water Treatment Plant effluent flow shall eventually contaminate the AK-Chin reservation with perchlorates-an invasion.

C. In Tucson, the 2001 daily intake of perchlorate exceeds the RfD for infants and six year olds exceeds the USEPA RfD (Table 1.) The 2008 Las Vegas Water Quality Report perchlorate level causes the infant dose to exceed the USEPA RfD (Table 2.) The citizens of Tucson are drinking diluted waste water from Las Vegas, Nevada.

D. An independent Tucson Water Quality Department (or a Tucson/Pima Water Quality Laboratory) responsible for drinking water (and waste water) monitoring, sampling, measuring, reporting, publishing, analysis, and assessment separated from the quantity operator is indicated. How many other stable chemical contaminants are traveling the water recharge route? Las Vegas water treatment plants are monitoring pharmaceuticals and endocrine contaminants-will any of these disrupt biomass treatment? Due to testosterone from Las Vegas, male fish in Lake Mead are becoming effeminate? Shall this happen in Tucson?

Respectfully,

Clyde H Stagner, a Tucson citizen