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August 23, 2010

Mr. Ken Landau
Assistant Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Subject: Review of Department of Public Health Records Pertaining to SRCSD NPDES Permit Renewal Recommendation

Dear Mr. Landau:

On June 30, 2010, Sacramento Regional County Sanitation District (SRCSD or District) sent you a letter concerning a letter from the Department of Health (DPH) to the Central Valley Regional Water Quality Control Board (Regional Water Board) related to disinfection requirements for the Sacramento Regional Wastewater Treatment Plant (SRWTP) NPDES permit. This letter supplements our letter of June 30, 2010 (Enclosure A). In particular, it documents facts derived from a review of information that DPH considered in the development of the position stated in its letter of June 15, 2010. We believe that these facts further demonstrate that the DPH position is not well supported and that the DPH recommendation regarding treatment levels at the SRWTP is not necessary or appropriate to provide reasonable protection of recreational uses of the Sacramento River.

On July 7, 2010, SRCSD sent a Public Records Act (PRA) request to DPH, a copy of which is enclosed. (Enclosure B) All documents received from DPH in response are also enclosed, on CD. (Enclosure C) Hard copies of the documents from the CD that are referred to in this letter are also enclosed. (Enclosure D) Since DPH was requested to provide all documentation it had on this subject, it follows that the information in the PRA response represents all of the information used by DPH in the formulation of its position on the issue. (Enclosure E)

A chronology of events related to DPH's June 15 letter, based in part on review of the DPH records, is provided in Attachment A. In brief, the Regional Water Board first asked DPH in April 2009 to evaluate whether the SRWTP discharge posed a risk in the Sacramento River. DPH staff performed a preliminary evaluation and concluded that the risk to swimmers to infection from *Cryptosporidium* and *Giardia* due to the SRWTP discharge was significant (in the range from 9 to 60 percent). This risk analysis, which was reviewed by senior staff at DPH and was the subject of two initial meetings between DPH, Regional Water Board staff and SRCSD staff in mid-2009, was determined to be seriously flawed; it was ultimately abandoned. At these meetings, DPH staff indicated their issue of concern was with contact recreation activities in the vicinity of the discharge and not with municipal

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drinking water applications since all raw water intakes are several miles downstream from the discharge and any risk to municipal supplies are diminished due to attenuation, decay, etc. of the pathogens. With the urging and approval of the DPH and Regional Water Board, the SRCSD enlisted Dr. Charles Gerba, a national pathogen risk assessment expert, to perform a technically defensible risk assessment. Dr. Gerba prepared a report, dated September 2009 documenting his risk assessment work, and a second report dated February 2010 addressing DPH comments on the first report. The mutually agreed outcomes from Dr. Gerba's work, as summarized in the two reports, using conservative assumptions for exposure, are as follows:

- The risk to swimmers in the Sacramento River below the SRWTP discharge does not exceed USEPA national risk thresholds for recreational users.
- The Sacramento River upstream from the SRWTP does not meet a 10^{-4} risk threshold; therefore, the river will not meet a 10^{-4} threshold regardless of additional treatment implemented at the SRWTP.

Despite these findings, in its June 15, 2010, letter, DPH maintained its original position, first stated in mid-2009, that the SRWTP needs to provide additional treatment to reduce the risk of its discharge to recreational users of the Sacramento River. To more fully evaluate the basis for the position stated by DPH, the PRA response documents have been reviewed, with a focus on documentation related to the following questions:

1. Is the determination to use a risk threshold of 10^{-4} in assessing acceptable recreational risk an adopted policy or contained in written guidance issued by DPH?
2. What documentation exists for the DPH decision not to use the USEPA national criteria for assessment of risk to recreational users?
3. Does evidence exist to demonstrate why DPH expressed more concern with *Cryptosporidium* or *Giardia* associated with the SRWTP discharge as opposed to other sources in the Sacramento River watershed?
4. What rationale was used in the selection of assumptions for the DPH's initial risk assessment?

The following information exists in the PRA response related to each of the above questions.

1. Is the determination to use a risk threshold of 10^{-4} in assessing acceptable recreational risk an adopted policy or contained in written guidance issued by DPH?

The record clearly indicates that the proposed use of a risk threshold of 10^{-4} is not based on formal, adopted regulation or policy on this point. Email correspondence between DPH staff indicates uncertainty over the use of the 10^{-4} level as recently as March 15, March 26, and March 28, 2010. In fact, the March 28, 2010, email states clearly that DPH has used the less stringent USEPA recreational criteria in similar situations in the beach areas of California which, of course, experience considerable recreational use.

The concept of using a 10^{-4} risk threshold (which is commonly used to protect large populations consuming tap water) for the SRWTP renewal emerged during DPH's initial analysis of risk in April and May 2009, pre-dating the risk assessment work performed by Dr. Gerba.

In a May 21, 2009, email, a DPH staff member asserts that, "there is lots of recreation in this area of the river—waterskiing, jet boats, swimming." This statement is contradicted in a July 27, 2009 email from another DPH staff member, which states that, "a relatively small number of people actually get in the Sacramento River below the SRCSD outfall . . ." and that "we don't have a large population to protect from exposure to the effluent." In the same email, the same staff member states that the 10^{-4} risk threshold seems to be most appropriate for protecting large populations, and notes that the USEPA has defined acceptable risk to be "roughly 10^{-2} ."

Despite this logic for use of a less strict risk threshold than 10^{-4} , the record indicates that DPH staff has favored the 10^{-4} risk threshold for the following reasons:

- Downstream drinking water protection [email dated July 27, 2009, which states, "I am not convinced we have protected the downstream water uses if we accept EPA's number, since the threshold for drinking water is 10^{-4} ."], which contradicts statements by DPH staff at the two initial meetings between DPH, Regional Water Board staff and SRCSD staff in mid-2009,
- The risks posed by SRCSD are only a portion of the overall risk to recreators [email dated July 28, 2009]
- Recycled Water Regulations [email dated July 28, 2009]
- Precedent for other microbial risk evaluations by DPH [email dated July 28, 2009]
- EID risk assessment—REC-1—undiluted effluent in Deer Creek [email dated April 24, 2009]

DPH staff referred to two publications in developing its position regarding the risk assessment. These are:

- WERF report on risk assessment for reclaimed water, Water for Reuse—Evaluation of Microbial Risk Assessment, Techniques and Applications, Final Report (2004)
- Water Reuse—Issues, Technologies and Applications, Metcalf and Eddy/AECOM (2007)

Both of these references deal with risks associated with reclaimed water and are not directly relevant to the discussion of a discharge to a large river through a high rate diffuser, such as exists for the SRWTP discharge.

Internal communications within DPH indicate that part of the decision to use a 10^{-4} risk threshold is that, "there is a means to mitigate . . . (by requiring adequate treatment)" [email dated March 29, 2010]. These specific emails do not reflect awareness of exposure rates or costs, or any actual consequence for beneficial uses of requiring the proposed "mitigation."

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Importantly, DPH staff indicates in a March 28, 2010, email that DPH does not currently regulate bathing beaches (ocean or freshwater) using the 10^{-4} threshold. DPH staff states that they “will have to decide, for purposes of consistency, if we want to use this same acceptable risk level for fresh and ocean beaches that are affected by discharges. We now use EPA criteria.”

The problems with DPH’s proposal to assess the risks below the SRWTP discharge using a risk threshold of 10^{-4} are significant, as noted below:

- There are no drinking water sources in the vicinity of the discharge point—also, available data indicates that there is no demonstrated problem with *Cryptosporidium* at downstream water intakes. (See Attachment B.)
- DPH has not performed similar risk assessments and has no valid precedent for its determination. Assessments for recycled water and discharges into effluent dominated waters are based on risk associated with direct effluent contact. The facts pertaining to the SRWTP discharge are significantly different—contact in the Sacramento River is with highly diluted effluent, discharge occurs at bottom of river, limited opportunity exists for contact, and limited swimming or bathing use occurs. Notably, DPH’s letter to the Regional Water Board dated July 1, 2003 (Enclosure F) reflects the significance of dilution. There is no recognition of this prior position or justification for changing it.
- DPH does not use the same approach elsewhere in California to protect recreational users—the position it has put forward in its June 15, 2010, letter is inconsistent with prior determinations regarding an acceptable risk level for swimmers in other more intensely used recreational areas.

2. What documentation exists for the DPH decision not to use the USEPA national criteria for assessment of risk to recreational users?

In a March 29, 2010, email, a DPH staff member questions whether considerations of *Giardia* and *Cryptosporidium* merit use of a more restrictive risk threshold. He questions whether *Giardia* and *Cryptosporidium* “pose greater risks than ‘usual’ microbes of concern in recreational water, or that they should be managed differently? Would EPA have used different values in they were considering exposure to *Giardia* and *Cryptosporidium*?” However, there is no further discussion on USEPA criteria that would indicate that protozoa are of greater concern than other organisms which cause gastrointestinal disease.

In various emails, DPH staff question the use of USEPA criteria, but do not offer compelling rationale for the suggestion that the USEPA criteria are not sufficiently protective [July 28, 2009, email; March 29, 2010, email]. DPH staff referred to the ongoing review effort by USEPA regarding its recreational criteria. DPH staff indicated at the September 2009 meeting that USEPA was considering new criteria. Emails dated March 15, 2010, showed that DPH staff had reviewed the available information regarding the USEPA recreational criteria effort. In a subsequent email on March 15, 2010, one staff member stated his opinion that the risk threshold for USEPA recreational criteria will not be changed significantly from the 8 in 1000 level. Despite this information, the

June 15, 2010, letter questions whether the USEPA criteria risk threshold represents a level of risk that is “acceptable” to the public, with no apparent basis for this statement.

3. Does evidence exist to demonstrate why DPH expressed concern with *Cryptosporidium* or *Giardia* associated with the SRWTP discharge as opposed to other sources in the Sacramento River watershed?

In its June 15, 2010, letter, DPH states that the “human origin of these pathogens renders them more hazardous to swimmers,” and implies that the control of non-point sources is not possible. However, there is no evidence in, or referred to in, the PRA record to support those statements.

DPH does not acknowledge the contribution of sources other than SRWTP to background levels of *Cryptosporidium* and *Giardia* in the Sacramento River, despite Dr. Gerba’s analysis indicating that levels in the river upstream of SRWTP discharge do not meet the 10^{-4} drinking water risk level. DPH appears to focus on SRCSD as a source because, as stated in a March 29, 2010, email, “we have a known entity that can be considered responsible for the presence of *Giardia* and *Cryptosporidium*, and there is a means to mitigate their presence (by requiring adequate treatment).” DPH staff goes on to state erroneously that, “This appears to be different from typical recreational beaches, where there is likely no known contributor to microbiological contamination (and where swimmers themselves will contribute to the risk), and where monitoring, if present, is for ‘indicator’ organisms.” The previous statement is in direct opposition to rationale stated in the USEPA 1986 Criteria, where epidemiologic studies were conducted to assess risk to recreators at beaches impacted by wastewater discharges¹.

4. What rationale was used in the selection of assumptions for the risk assessment?

The conservative assumptions promoted by DPH were developed by DPH staff in April 2009. In an email on April 22, 2009, DPH staff members outline the method used to calculating an estimated risk of infection. Staff calculated the dilution of effluent into the river, and multiplied the median and maximum concentrations of oocysts in SRCSD effluent by the dilution factor to obtain a concentration of oocysts in the Sacramento River contributed by SRWTP effluent. Based on the assumption that one oocyst will cause infection, and based on an ingested dose of 100 mL river water, the concentration of oocysts in the river is simply multiplied by the ingestion volume to obtain an initial estimate of risk of infection ranging from 11% to 73%.

In an email dated April 24, 2009, DPH staff describes the source for the assumption of an infective dose of one oocyst:

“the infective dose ranges used in MWD’s Eastside reservoir risk assessment were 0-5 cysts for crypto, and 0-10 for giardia. We could use the midpoint of these ranges, rather than the extremes, but the estimated risk would still be well above the 1/10,000 goal we used for EID’s Deer Creek discharge.”

¹ USEPA. 1986. Ambient Water Quality Criteria For Bacteria – 1986. United States Environmental Protection Agency, Office of Water. EPA440/5-84-002.

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The report referred to, a 1998 study by Anderson, et al.² includes a table (Table 1, p. 3298) listing input parameters used in analysis. (Enclosure G) The table includes an "Infection Rate (%)" ranging from 0-5 for *Cryptosporidium* and 0-10 for *Giardia*, not the infective dose range. The infection rate refers to the percentage of the recreators who may be infected with *Cryptosporidium* or *Giardia* and subsequently release oocysts/cysts into the water. DPH staff misinterpreted the percentages presented in the table as being infectious doses (i.e., a discrete numbers of oocysts/cysts leading to infection).

The DPH staff member who performed the initial calculations [in the email dated April 22, 2009] asks additional DPH staff to check the calculations and assumptions. Additional DPH staff and management agreed with his approach, and one agreed that "the dilution calculation is appropriate for a rough risk determination," but states that "I'm not sure an infective dose of 1 organism is correct." (Email dated April 23, 2009.) Another DPH staff member defends the infective dose assumption on April 24, 2009, stating that, "data using results from studies involving human subjects exposed to *c. parvum* suggest that the dose necessary to cause infection varies but can be less than 10 organisms. FDA web site indicates that the dose is less than 10 organisms and, presumably, one organism could cause infection. I think that using a conservative assumption of one organism is probably reasonable and defensible." However, no specific scientific studies are mentioned, and there is no further discussion to validate the assumptions used in the risk calculation.

Dr. Gerba utilized a standard approach used for quantitative microbial risk assessment, which is based on a dose response relationship to calculation the probability of infection based on a log normal distribution, where $P = 1 - e^{-[rd]}$ (with d representing the dose of organism, and r representing a constant derived from dose response studies). Dr. Gerba cited multiple studies which indicate that not all oocysts present are viable and/or infectious, and presented ample support that an infectious dose of one organism is not used in risk assessments. There was no discussion in any subsequent DPH emails to defend the risk levels determined by the initial DPH calculations once Dr. Gerba's analysis was presented.

Furthermore, there is no mention in any of the DPH records that DPH considered illness (rather than infection) as an appropriate endpoint to determine risk. This is inconsistent with USEPA precedent, where acceptable risk levels are determined based on illness³.

The PRA record contains no consideration of implications of the DPH staff proposal as related to the California Water Code or the Regional Water Board's obligations under the Water Code. The Regional Water Board cannot ignore these issues.

In conclusion, DPH staff has failed to follow its own precedent in the use of USEPA criteria risk thresholds in similar recreational exposures. DPH reached a conclusion on this matter early on, based on a set of preliminary calculations which since have been abandoned as inappropriate. No consistent or clear logic exists behind the position to use the 10^{-4} drinking water risk threshold for contact recreation exposure. As is clear in the record and as is stated in the June 15, 2010, letter, the position appears to be motivated by a desire to compel advanced treatment at SRWTP. However, the

² Anderson, M., Stewart, M., Yates, M., Gerba, P. 1998. Modeling the impact of body-contact recreation on pathogen concentrations in a source drinking water reservoir. *Water Research* 32: 3293-3306.

³ USEPA. 1986. Ambient Water Quality Criteria For Bacteria – 1986. United States Environmental Protection Agency, Office of Water. EPA440/5-84-002.

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benefit of such treatment is largely ignored in the DPH record. Dr. Gerba's analysis shows that advanced treatment by SRWTP would not result in a meaningful reduction in risk in the Sacramento River. Clearly, the significant costs of the recommended treatment system were never considered by DPH.

For these reasons and those stated in our letter of June 30, we urge the Regional Water Board not to accept the recommendations of DPH regarding imposition of advanced treatment requirements at the SRWTP. Please contact Robert Seyfried of my staff at (916) 876-6068 or seyfriedr@sacsewer.com if you have any questions.

Sincerely,



Stan Dean
District Engineer

cc: Pamela Creedon, CVRWQCB, with attachments
Diana Messina, CVRWQCB, with attachments
James Marshall, CVRWQCB, with attachments
Kathy Harder, CVRWQCB, with attachments
Carl Lischeske, Department of Public Health, w/o attachments
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Prabhakar Somavarapu, SRCSD, w/o attachments
Terrie Mitchell, SRCSD, w/o attachments
Ruben Robles, SRCSD, w/o attachments
Robert Seyfried, SRCSD, with attachments
Dr. Charles Gerba, University of Arizona, with attachments
Tom Grovhoug, Larry Walker Associates, w/o attachments

Attachments: Attachment A: Chronology

Attachment B: Graphic showing bin classification of *Cryptosporidium* data at Delta drinking water intakes [taken from data contained in Sanitary Survey for State Water Project and USEPA data set provided to City of Vacaville in July 2010 by Bruce Macler of USEPA]

Enclosures: Enclosure A: June 30, 2010 Letter to Regional Board-Ken Landau

Enclosure B: DPH Public Records Request from SRCSD

Enclosure C: SRCSD Public Records Request Files From CDPH – CD

Enclosure D: Relevant documents on enclosed CD named above

Enclosure E: DPH Letter with PRA Response

Enclosure F: 07 01 2001 DHS Recommendations for WDR's

Enclosure G: Modeling The Impact Of Body Contact Recreation And Pathogen Concentrations In A Source Drinking Water Reservoir- Table I
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