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Janet Cohen, Executive Director
SYRCL

Janet,

Presented below are my comments on several issues pertinent to the investigation and remediation of the Lava Cap Mine Superfund site.

Response to US EPA Region IX August 8, 2002, Letter to Janet Cohen in Response to G. Fred Lee's Comments on US EPA Documents regarding the Lava Cap Mine Superfund Site

In the winter/spring 2002, I provided detailed comments on several US EPA documents concerned with Lava Cap Mine Superfund Site investigation issues. Initially the US EPA did not respond to my comments. Subsequently, on August 8, the Agency provided responses to my comments. My responses to these comments are presented below.

One of the major deficiencies in the US EPA's responses to my previous comments is on the issue of the use of co-occurrence-based sediment quality guidelines in connection with evaluating the water quality significance of arsenic and other constituents at the Lava Cap Mine Superfund site. The comment by CH2M Hill on page 11, regarding the reliability of the MacDonald values is a distorted discussion of what is well-known in the literature. MacDonald, Long and Morgan, and others have repeatedly provided biased data sets to support their position that the guideline values have credibility. However, others who do not have a stake in these values, and who understand that total concentrations of a constituent in a sediment is an unreliable indicator of the toxic available forms, have repeatedly found that these co-occurrence-based approaches are unreliable. In fact, NOAA (O'Connor) has found that flipping a coin is more reliable in predicting sediment toxicity than the "sediment quality guidelines."

During the past year, I have been developing a report for the State Water Resources Control Board and Central Valley Regional Water Quality Control Board devoted to developing guidance for managing the excessive bioaccumulation of organochlorine compounds -- such as the legacy pesticides DDT, dieldrin, chlordane and toxaphene; PCBs; dioxins and furans (OCls) -- that is occuring in Central Valley waterbody fish. This report,

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the

California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002),

was completed in mid-December 2002. Since the primary reservoir for the organochlorine pesticides, PCBs and dioxins for excessive bioaccumulation is aquatic sediments, there is concern about how to evaluate the water quality significance of OCl residues in sediments, relative to the potential impacts on water quality. A number of individuals and agencies, including the US EPA Region IX, have been attempting to use Long and Morgan/MacDonald co-occurrence-based guideline values to evaluate the water quality significance of various types of chemicals, including OCls, in aquatic sediments. As part of my report, I provided a detailed discussion of why co-occurrence-based so-called "sediment quality guidelines" are technically invalid, and should not be used for any purpose. This discussion focused on all chemicals – not just the OCls.

Attached to these comments is a section of my report, which presents this discussion. As discussed in this report, the Aquatic Ecosystem Health and Management Society held their fifth international conference on Sediment Quality Assessment (SQA5), "Aquatic Ecosystems and Public Health: Linking Chemical, Nutrient, Habitat and Pathogen Issues," in Chicago in October 2002. I presented a paper at this conference concerned with the appropriate use of chemical information in a best professional judgment triad weight of evidence sediment quality evaluation. This paper will be published in the conference proceedings, which are scheduled to be printed in 2003. One of the issues discussed at this conference was the unreliability of co-occurrence-based sediment quality guidelines. Several internationally recognized authorities on sediment quality evaluation discussed this issue as keynote presenters at the conference. Further, A. Burton summarized a SETAC sediment quality workshop devoted to this topic. All of those who addressed this issue, including SETAC workshop conferees, agreed that co-occurrence-based sediment quality guidelines are unreliable and should not be used.

The US EPA should prevent CH2M Hill from using co-occurrence-based sediment quality guidelines at the Lava Cap Mine Superfund site. They are obviously technically invalid and should not be used.

While CH2M Hill asserts that the MacDonald guideline values were not used in any decision-making process, the fact that they are even included in the discussion is a serious technical flaw in CH2M Hill's approach, since it gives credence to a fundamentally flawed approach for assessing sediment quality.

Page 15 of the US EPA responses to my comments on their Lava Cap Mine reports, mid-page, on Surface Water Monitoring, states, *"...we feel that quarterly monitoring establishes a baseline of performance."* Contrary to the statement made by the US EPA, quarterly monitoring is not adequate to characterize surface water quality, especially in situations where stormwater runoff is an important component of the site.

Page 16, mid-page, states, *"EPA Response: EPA intends to follow standard engineering practice in designing any cap which may be required as part of the remedy. EPA has not yet*

selected a design life for the cap. Under CERCLA, every remedy where waste remains in place must be reviewed every five years." The US EPA did not indicate that the Agency does not necessarily have adequate funds to conduct a proper five-year review. This has been discussed by GAO, in terms of the adequacy of the Agency's approach toward developing remediation for Superfund sites.

Page 16, near the bottom of the page, states, *"EPA disagrees with Dr. Lee, and believes it is possible to construct a tailings disposal structure which protects human health and the environment."* The US EPA should not underestimate the importance of not following conventional engineering design approaches for landfills that, while permitted by the Agency, are obviously inadequate to protect the public and environment from adverse effects for as long as the landfilled wastes are a threat. It is my understanding that it is CERCLA's position that any remediation that is done, such as area landfills, will have to be protective, not for just a short period of time, as is typically done today, but for as long as the wastes are a threat.

Page 17, first line, while the US EPA states, *"EPA intends to select a remedy which is protective of human health and the environment,"* there is no indication that this remedy will be protective for as long as the landfilled wastes are a threat. This must be part of the approach. It is not necessarily incorporated into the current US EPA approach for the design, construction, operation and maintenance of landfills. This is the approach that is required under Title 27 of the state of California regulations governing development of landfills.

Page 17, mid-page, last two lines of the paragraph states, *"EPA intends to comply with regulations pertaining to the isolation of waste materials, should waste materials be left in place."* This is the issue of concern. The US EPA current regulations explicitly require protection of public health and the environment for as long as the landfilled wastes are a threat. Unfortunately, however, the Agency continues to allow the development of landfills that obviously cannot comply with this requirement.

Page 17, near the bottom, the statement, *"EPA will follow its standard Five Year Review process, which allows for additional response actions should landfill maintenance be required in future, or should a cost effective treatment technology, for example, become available at some point in future."* Again, this is a superficial statement, when considered in light of US EPA approaches on landfilling. How will the US EPA ensure that the five year review will be a comprehensive review, including further investigations to check to see if the liner and cover are in fact functioning properly, for as long as the wastes are a threat? There is no assurance that this will be done. This means that a significantly different design of the landfill containment system must occur, or the public in the Lava Cap Mine area will face the same problems in the future.

The statement on the last page of the August 8, 2002, letter, *"The plastic materials used today for conventional municipal and hazardous waste sites have an estimated life span from 200 to 900 years,"* is unreliable. This estimate is based on short-term testing and extreme extrapolation, involving the use of the Arrhenius equation, under conditions that are not appropriate. This paragraph is more of the propaganda that the US EPA uses in defense of its inadequate approach toward the landfilling of wastes. The US EPA's approach on this issue could readily lead to a major

confrontation if it believes that it is going to construct a conventional landfill cover or liner system near the Lava Cap Mine site, and then saddle the state of California and the local communities with its long-term liability.

Response to US EPA Region IX October 5, 2001, Letter to G. Fred Lee in Response to his Comments on US EPA Documents regarding the Lava Cap Mine Superfund Site

With respect to the October 5, 2001, comments on the need to be certain that tailings from the Lava Cap Mine are not influencing water quality in Rollins Reservoir, this cannot be based on a visual inspection of the tailings along the creeks leading to Rollins Reservoir. There is no question that tailings have reached Rollins Reservoir. The question is whether they have caused or contributed to water quality problems in the reservoir. This is the issue that needs to be addressed.

With respect to the issue raised on the second page with respect to stormwater monitoring, the study program at the Lava Cap Mine site being conducted by the US EPA has been and will continue to be significantly deficient. The US EPA will need to develop standby crews in the area to sample during stormwater runoff events. This is conventionally done, and it is essential in any credible program designed to examine the transport of pollutants in a setting like the Lava Cap Mine site.

On page 3, second paragraph, regarding the need for proper gaging of flows, the purpose of the gaging of flows is not to characterize the nature and extent of contamination, but to measure the transport of pollutants from the source areas to downstream areas. Ultimately, the remediation program will have to control this. As it stands now, without proper stormwater runoff monitoring, the US EPA does not have the information needed to even begin to design a proper management program. Regarding the expense, installation of gages is part of the expense of doing a proper investigation.

Overall, there are several major issues that still need to be adequately addressed in the Lava Cap Mine Superfund site investigation. One of these is the use of co-occurrence-based sediment quality guidelines for any purpose. Another is the deficiencies in conventional landfill design, operation, maintenance and inspection. The third is the need for stormwater runoff monitoring to establish the transport of pollutants during the time when the greatest transport is likely to occur. These are issues we will need to continue to discuss, to ensure that the US EPA understands the public's position on them.

The US EPA should be thanked for making their comments available. It is important that they respond to issues, to be certain that the Agency staff members understand the public's position.

Additional Comments on Lava Cap Mine Superfund Site Remediation Issues

The US EPA has divided the site into what they call "operating units," one of which is the mine site. Another is downstream of the mine site, which includes Lost Lake. A third is the

groundwater area. The Agency is going to aggressively pursue developing a remediation program for the mine site area. Their plan now is to have a proposed plan for remediation of this area available for general public review in about a year.

With respect to the groundwater area, considerable additional study needs to be done. At this time, the Agency does not have the funding to carry out this study. They are hoping to acquire it, although, under the Bush Administration, with his control of Congress, there are serious questions about the funding of remediation at all Superfund sites.

At a meeting last November between the US EPA and DTSC (Steve Ross), which I attended as a third party observer, we spent some time discussing ARARs, which are the regulatory requirements for the site. It is clear, as I suspected from the release of last spring, that the US EPA and its contractors are proposing to do the minimum necessary to just get by. While they claim that these are the regulatory requirements, their statements are not right. These are the minimum regulatory requirements. There is no prohibition in the regulations that states that the Agency cannot provide for greater protection than the minimum, especially where it is understood that the minimum is not adequate to provide protection of public health and the environment from the waste residues left at the site after the site has been "remediated."

If you or others have any questions on these supplemental comments, please contact me.

G. Fred Lee

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Encls.

Unreliability of Sediment Co-Occurrence-Based Approaches for Evaluating Aquatic Sediment Quality[1]

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Beginning in the 1980s, several individuals ignored the well-established fact that the total concentration of a constituent in sediments is an unreliable predictor of aquatic life toxicity. The most notable of the inappropriate approaches that have been advocated for evaluating sediment quality is the co-occurrence-based approach first developed by Long and Morgan. Long and Morgan (1990) proposed co-occurrence-based sediment quality "guidelines" to predict the impact of sediment-associated chemicals on aquatic life living within or upon sediments. The co-occurrence-based approach as used by Long and Morgan and others such as MacDonald (1992) involves compiling sets of sediment data that contain some information on sediment biological characteristics, such as laboratory measured toxicity, or benthic organism assemblages (numbers and types of organisms) and the **total** concentration of potential pollutants. The potential pollutants are those that are typically considered in water quality assessments that have been found in some other non-sediment-related situations to be toxic to aquatic life. The literature reported concentrations are ranked according to increasing concentration. The sediment concentration which has a so-called "effect" is used to develop a co-occurrence between a sediment chemical concentration measured as a total concentration and a water quality "effect."

Lee and Jones-Lee (1996a,b, 2002a) have provided a detailed discussion of the lack of technical validity of the co-occurrence-based approach for evaluating sediment quality. As they point out, this approach has a number of inherent, invalid assumptions. First, the approach presumes that there is a causal relationship between the concentration of each contaminant considered in sediment and the water quality impact of that sediment. Second, it presumes that the "effect" reported for each sediment was caused independently by each of the measured chemical contaminants in that sediment. Third, it presumes that no other chemical or condition not included in the database has any influence on the manifestation of the "effect" that co-occurs with the particular chemical of focus; ignored are several sediment-associated contaminants and conditions that are well-recognized to cause aquatic life toxicity, including ammonia, hydrogen sulfide, and low dissolved oxygen. Fourth, it presumes that the assessments made of "effects" of the sediments relate in some meaningful way to adverse impacts on beneficial uses of the waterbody in which the sediments are located.

In regulatory applications, co-occurrence information has been used or proposed for use, albeit incorrectly, to establish various "effects threshold" values. That is,

[1] Excerpts from Lee and Jones-Lee (2002b)

applying statistics to the ranked listing of co-occurrence information of a given chemical, it was determined for that data set the concentration of the chemical that has a given probability of co-occurring with an impact, or the lowest concentration with which "no effect" co-occurred for that set of sediments. Examples of these approaches are the "Apparent Effects Threshold" (AET), and numeric values developed from Long and Morgan's (1990) data presentation in the form of ER-L and ER-M values, and "Probable Effects Levels" (PEL) values derived from MacDonald's (1992) co-occurrence compilations. If a sediment contains a chemical in concentrations above the AET, PEL, or similar value, the sediment is considered by some regulators or proposed regulations to be "polluted," and to require special consideration such as "remediation," alternate methods of dredged sediment disposal, or control of permitted discharges to the waterbody of a chemical that accumulates in the sediments.

As discussed by O'Connor (1999a,b, 2002), O'Connor and Paul (2000), O'Connor, *et al*. (1998), Engler (pers. comm.), Ditoro (2002), Chapman (2002), Burton (2002), Lee and Jones (1992), and Lee and Jones-Lee (1993; 1996a,b; 2000, 2002), the co-occurrence approach is not a technically valid approach for assessing the potential impacts of chemical constituents in sediments. It has been well-known for over 30 years that the total concentration of a chemical constituent in sediments is not a valid measure of the toxic/available forms of constituents that can impact aquatic life through toxicity or cause other impacts. Further, and most important, co-occurrence is not a valid basis for simple systems with a limited number of constituents for evaluating the cause of a measured impact. Co-occurrence is obviously not valid for relating the concentrations of sediment-associated potential pollutants to observed laboratory-measured toxicity or altered organism assemblages in which the chemical constituent of concern is measured. In normal situations, there is no valid cause-and-effect relationship between the total concentration of a chemical constituent in a sediment and its responsibility for some measured "impact."

As more and more data were accumulated that showed that the Long and Morgan and MacDonald guideline values were not reliable predictors of sediment toxicity and other impacts, Long and his associates tried to improve the reliability of the co-occurrence-based approach by using the normalized summed quotients for several chemical constituents to establish the value for comparison with the biological characteristic of the sediments determined by their co-occurrence evaluation. While not discussed by Long and Morgan and others who advocate this approach, the magnitude of the normalized summed value depends on the constituents included in the data review. While for highly degraded areas there is some claimed success for the expanded approach, the expanded co-occurrence approach is also not valid to relate the concentration of a single chemical constituent or a group of constituents' impacts on sediment and overlying water quality/beneficial uses.

Even though it is well-recognized that the Long and Morgan (and, subsequently, MacDonald) co-occurrence approaches are not valid tools to evaluate the potential significance of a chemical constituent in a sediment, there is continuing use of the co-occurrence-based guideline values as regulatory goals upon which control programs, such

as TMDLs, are based. This arises from a lack of knowledge and understanding of sediment chemistry and toxicology/biology by those who are responsible and/or interested in sediment quality management.

Those who advocate use of co-occurrence-based sediment guidelines frequently claim that there are insufficient funds available to conduct the needed biological-effects-based evaluation of sediment chemistry and toxicology/biology to properly evaluate the water quality significance of a constituent in sediments. Since total chemical concentration data are frequently available for sediments, and since co-occurrence approaches superficially seem to provide a way to use these data in sediment quality evaluation, the co-occurrence-based approach receives use by regulatory agencies in order to provide some "information" on sediment quality without having to spend any significant amount of additional funds in sediment quality evaluation. There is also a strong desire by some to do something in addressing sediment quality even if there is an inadequate technical information base to enable a reliable sediment quality evaluation to be made. Such an evaluation would require detailed study of the sediments' aquatic chemistry/toxicology/biology.

One of the most significant recent inappropriate uses of co-occurrence-based approaches for regulating sediment quality has been proposed by the US EPA (2002c) Region 9. The Agency used the Buchman (1999) "NOAA Screening Quick Reference Tables (SQuiRTs)" to obtain TMDL targets for managing excessive bioaccumulation of organochlorine pesticides and PCBs in Upper Newport Bay, Orange County, CA, and its tributary San Diego Creek. The organochlorine chemicals of concern (for which there is excessive bioaccumulation in the Upper Newport Bay and its tributaries) are chlordane, dieldrin, DDT, PCBs and toxaphene. In discussing numeric targets for organochlorine TMDLs, the US EPA (2002c) states,

> *"As discussed in Section II, EPA evaluated the applicable water quality criteria and sediment and tissue screening levels to determine the appropriate numeric targets for these organochlorine TMDLs. We have prioritized sediment quality guidelines over tissue screening values and water column criteria. This decision is based on the following factors:*
>
> 1) *these pollutants are directly associated with sediments (i.e., fine particulate matter);*
> 2) *sediments are the transport mechanism for these organochlorine compounds from freshwaters to salt waters;*
> 3) *limited water column data are available to adequately describe the past or current conditions; and*
> 4) *attainment of the sediment targets will be protective of the water column criteria and tissue screening values."*

This approach and the reasoning in support of it are fundamentally flawed from several perspectives. First, the so-called "NOAA SQUIRT values" are co-occurrence-based values that evolved out of the Long and Morgan and MacDonald work. The

biological effect used to establish these values did not consider bioaccumulation. Further, critical human health bioaccumulation concentrations in edible fish are frequently far below any concentration that is adverse to the host organism (fish). There is no relationship between the co-occurrence values of Long and Morgan and MacDonald and the potential for a chemical constituent in sediments to bioaccumulate to excessive levels in edible fish tissue.

With respect to the first and second justification listed above in support of this approach, the fact that a chemical tends to become associated with sediments is not justification for using co-occurrence to predict excessive bioaccumulation. As far as the validity of the third justification, those familiar with bioaccumulation situations know that measurement of constituents of concern in the water column is not a reliable approach for predicting the bioaccumulation of organochlorine pesticides, PCBs, dioxins, etc. With respect to the fourth justification in support of this technically invalid approach, because of its fundamental unreliability, it is inappropriate to say that it is either under- or over-protective.

There is no reliable way to relate sediment concentrations of organochlorine pesticides and PCBs to excessive bioaccumulation of these chemicals in edible fish tissue except through site-specific studies. This issue is discussed in a subsequent section. The US EPA Region 9 has made a serious error in using the Buchman SQUIRT co-occurrence-based values. This approach should be immediately abandoned in favor of fish tissue target values developed by the CA Office of Environmental Health Hazard Assessment. These values are appropriate TMDL goals for managing the excessive bioaccumulation of organochlorine pesticides and PCBs.

The approach that should be followed in evaluating the water quality/sediment quality significance of a chemical constituent in sediments was defined by the US EPA and the Corps of Engineers in the 1970s for regulating contaminated dredged sediments. As discussed above, the US EPA/US ACOE (1991, 1998) developed dredged sediment quality evaluation manuals which provide detailed guidance on determining whether the management of a contaminated dredged sediment in a particular manner will impact water quality of the receiving waters where the management/disposal of the dredged sediment takes place. These agencies used a biological-effects-based approach rather than a chemical-concentration-based approach – e.g., rather than measure copper in the sediments and then speculate about the copper toxicity and its sediment/water quality impacts, the US EPA/US ACOE approach measures toxicity and then uses Toxicity Investigation Evaluations (TIEs) to determine its cause.

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