Comments on Draft DOE Areas Feasibility Study Prepared by Weiss Associates, Dated February 22, 2006

Comments Submitted by
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April 27, 2006

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Julie,

Please find presented below my comments on the draft DOE Areas Feasibility Study Prepared by Weiss Associates, dated February 22, 2006. As indicated, many of the issues discussed below are issues that DSCSOC has previously raised in comments sent to the RPMs. The previous comments on these issues are on the DSCSOC website in the LEHR Documents Section, http://members.aol.com/dscsoc/doc.htm. The comments presented below focus on the adequacy of long-term protection of public health and groundwater quality from residual wastes that could be left at the LEHR site after the proposed "remediation." If you have questions or comments on the comments presented below please contact me.

Page ES-1 of the Executive Summary, first paragraph, mid-paragraph states,

> *"… or have constituents of concern (COC) concentrations in unsaturated soil that may impact ground water above background levels within the next 500 years."*

The arbitrary establishment of 500 years as the time that a constituent in the unsaturated zone could reach the water table needs to be reviewed. As DSCSOC has commented in the past, there are potentially significant problems with the approach that DOE/Weiss Associates have used in estimating transport of constituents of concern from the unsaturated zone to the groundwater table. Of particular concern is the apparent continued use of average annual moisture content of the soil column to predict rates of migration from the unsaturated zone, rather than the use of wetted front and preferential pathway transport. Both of these can greatly accelerate the rate of movement through the unsaturated zone.

Another significant factor that could influence the rate of movement of constituents of concern through the unsaturated zone is the use of pure solution partition coefficients. Partition coefficients can vary depending on the characteristics of the solid surface, the nature of the organics on the surface, as well as other constituents in the solution being transported. This can cause greater or slower rates of movement than predicted based on the approach that Weiss has used.

Page ES-4, under Technology Identification, Item 13 (Single-layer asphalt cap with plastic liner), there are a number of aspects of this approach that need to be properly evaluated. First, it should be recognized that an asphalt cap is not impermeable to water. It will develop cracks that can allow water to reach the plastic sheeting HDPE liner in the cover. Second, HDPE has a limited

period of time that it can be effective in preventing water from entering the underlying wastes and thereby generating leachate which can lead to groundwater pollution. A proper evaluation of the feasibility of this approach requires that a methodology be developed which can reliably detect when the HDPE liner loses its integrity and starts to allow moisture that comes in contact with the surface of the HDPE to penetrate through it. The failure of the HDPE liner is not detectable by visual inspection of the asphalt cap.

Further, the feasibility of this approach has to consider the fact that periodically, whenever the HDPE begins to fail to be an effective barrier to the transport of water through it, there will be need to provide substantial funding to remove the asphalt layer and the HDPE layer and replace both. It is my experience that, while some regulatory agencies will allow this capping approach since it appears to be cheaper than other remediation approaches, in fact, when properly evaluated with respect to how long the covered wastes will be a threat, this approach can be more expensive and far less protective than other remediation approaches.

Page 1-8 presents a discussion of Vadose Zone Modeling. The comments made on the Executive Summary section, devoted to modeling of the transport of pollutants from the unsaturated zone to the water table, are applicable to this section as well. There has been extensive discussion of these issues in previous DSCSOC comments, which are available from the DSCSOC website.

Page 2-1, under section 2.1 (Contaminants and Media of Concern), in the bottom paragraph, and elsewhere in this document, mention is made that,

> *"With high mobility compounds, such as nitrate and carbon-14 (C-14), these impacts may have already occurred or could occur in much shorter time frames."*

As DSCSOC has repeatedly pointed out, it is inappropriate to classify all carbon-14 compounds as highly mobile. The mobility of C-14 compounds depends on the particular compound in which the C-14 is located. There could be some compounds containing C-14 used on the UCD campus that have limited mobility. At this location and at other locations in the draft FS, there is need to correct the statement about high mobility of C-14 unless studies have been done that demonstrate the actual chemicals involved.

Table 2-3 provides ARARs that have applicability to the LEHR site. A specific ARAR that needs to be mentioned is the ARAR for mercury in stormwater runoff, where Putah Creek is listed as a Clean Water Act 303(d) impaired waterbody because of excessive mercury bioaccumulation. This, in turn, establishes the need for a TMDL to control input of mercury to Putah Creek to comply with, initially, a 50 ng/L CTR criterion. Ultimately that number could be decreased to a few ng/L in order to comply with the Central Valley Regional Board's and US EPA's current efforts to control mercury sources that contribute to the excessive mercury concentrations in Delta tributaries as well as the Delta and San Francisco Bay fish. That issue should be mentioned and discussed, since DOE has responsibility for part of the stormwater runoff from the LEHR site.

Page 3-3, top of the page under "Land-use controls limitations," a fourth bullet could be added to indicate that there can be problems with implementation. This is not necessarily a long-range

problem, but one where an individual will be assigned the responsibility of issuing permission which would allow activities that would be contrary to protection of human health and the environment from residual chemicals left at the site. It is my experience that, after time, those who are assigned the responsibility to issue permission for construction activities at a hazardous chemical site will not understand the importance of not disturbing the overlying soils over buried wastes and will allow activities that can result in buried wastes being brought to the surface.

Page 3-6, under "Phytoremediation limitations," another bullet could be added to indicate that soil-bound constituents could, through translocation, be released to the environment through leaves, flowers, or through vapor phase releases. This is an issue that DSCSOC has repeatedly raised that still has not been adequately addressed at the LEHR site.

Page 3-18 begins a discussion on the bottom of the page on Caps. There are several problems with this discussion that are summarized below.

In the second paragraph on page 3-19, a discussion is presented on the use of a soil barrier with a hydraulic conductivity no greater than 1×10^{-6} cm/sec. A 10^{-6} cm/sec soil layer is not very effective in preventing penetration of moisture through it. As discussed by Lee and Jones-Lee (2006), such a layer can allow the transport of water through it at the rate of over 1,000 gallons per acre per day. Further, it is well established that such layers develop cracks that can allow greater rates of water flow through them. In a study conducted by the state of Wisconsin on clay layers for landfill covers, it was found that cracks up to one-half inch wide extended 35 to 40 inches into the clay within three years. This cracking can be especially severe in dry climates, such as in the Davis area.

In the middle of page 3-19, a discussion is presented on RCRA Subtitle D cap design, where mention is made of a compacted soil layer having a permeability no greater than 10^{-5} cm/sec. Such a compacted soil layer is not effective in preventing moisture from penetrating into the underlying wastes.

Under "Capping advantages," the second bullet states that, *"Capping is a widely used technology with readily available designs, materials, and equipment."* While capping is widely used; its effectiveness in preventing moisture from penetrating into wastes is generally not reliably evaluated, especially over extended periods of time. In a Subtitle C or D landfill, it is possible to detect when the cap is no longer preventing moisture from entering into the wastes, since the landfill has a leachate collection system, where the amount of moisture in the leachate collection system is an indication of the cap's integrity. The use of a plastic sheeting liner in the cap can, if it is properly installed, be an effective barrier to moisture penetrating through the cap into the wastes. However, the plastic sheeting, such as high-density or low-density polyethylene, degrades over time and eventually will fail to prevent moisture from entering the wastes. One of the major problems with the use of plastic sheeting layers in caps is that they are typically buried under a soil layer, which means that there is no possibility of a visual inspection of the cap's integrity. If a plastic sheeting layer is to be used at the LEHR site, the issue of detecting the free-radical attack on the polyethylene liner material that leads to its failure needs to be addressed.

Under "Capping limitations" on the bottom of page 3-19, the last bullet states, *"Contamination remains at the Site and must be monitored to ensure no releases are occurring."* How will the capped wastes at the LEHR site (assuming this approach is adopted) be monitored to ensure that no releases are occurring? Failure to adequately develop a monitoring system to detect cap failure will be a significant deficiency in any capping approach for remediation of LEHR site wastes.

Page 3-25, in the third bulleted item (Clay and soil cap), states,

> *"However, a clay and soil cap might fail to prevent infiltration if plants or animals rupture the clay layer."*

As mentioned above, the issue that needs to be understood is that clay and soil caps have an inherent permeability that can allow large amounts of water to pass through them at their design permeability. Further, the design permeability of a clay or soil cap rapidly deteriorates due to cracking. If capping is to be used at the LEHR site, it should be with an effective cap that can be reliably monitored for its integrity for as long as the wastes are present in the area that is capped.

The last bulleted item on page 3-25 states that a RCRA cap would not be justified since *"DOE areas contamination does not pose enough risk to human or biological receptors or ground water resources to justify RCRA cap costs."*

I strongly disagree with this assessment. Basically, the apparent DOE approach toward capping is to install a cap that we know will fail in a short period of time, where failure will not be readily detected. This is not an acceptable approach for preventing further groundwater pollution by the residual wastes associated with disposal pits and landfills at the LEHR site.

Page 4-5, under "Long-Term Monitoring," item 4 states that, *"Ground water COC samples will be collected annually for 30 yrs in all of the DOE area wells."* This approach is not acceptable. Unless it can be convincingly demonstrated through monitoring that the residual wastes in the DOE areas are no longer present or are present at such low concentrations as to represent no threat to further pollution of groundwaters, there will be need to monitor groundwaters forever – i.e., for as long as the wastes in the areas are a threat to cause groundwater pollution. There is no justification for limiting monitoring to an arbitrarily established 30-year period.

Page 4-6, in the section under "Asphalt Cap," no mention is made of how the integrity of the HDPE liner in this proposed cap will be assessed. This must be addressed. Further, the notion that the cap must only be maintained for 30 years is inappropriate and unacceptable. The cap must be maintained for as long as the wastes under the cap represent a threat to cause groundwater pollution.

Page 4-10, top of the page presents the estimated costs for the asphalt and HDPE liner capping approach. These costs are low compared to the real costs that will have to be borne in maintaining this cap system for as long as the wastes underlying the cap represent a threat to cause groundwater pollution. For planning purposes, this period of time should be considered to be infinite (i.e., forever), since so long as the cap is maintained there should be no further

migration of the wastes under the cap; therefore, they will remain in the soil column, ready to be leached when the cap fails to prevent water from penetrating through it.

Page 4-27, under the section "Costs," some of these costs, such as Alternative 3 (cap, long-term groundwater monitoring and land-use restrictions), are unrealistically low compared to the real costs that will have to be borne to maintain the cap's integrity for as long as the wastes under the cap represent a threat to cause groundwater pollution.

The comments on the deficiencies in the discussion of the capping approach that apply to the radium-strontium area (section 4.4) are applicable throughout all of the locations in this FS where capping is discussed, and will not be repeated for each of these areas.

Appendix A presents cost estimates. As discussed above, some of the cost estimates that are presented in this draft FS are artificially low and do not consider the true costs associated with maintaining the cap system for as long as the wastes under the cap are a threat.

References

Lee, G. F., "Comments on 'Draft Site-Wide Risk Assessment, Volume I - Human Health Risk Assessment (Part C – Risk Characterization for UC Davis Landfill Units)' Prepared by Brown and Caldwell, August 12, 2005," Comments submitted to DSCSOC by G. Fred Lee, G. Fred Lee & Associates, El Macero, CA, September 8 (2005).
http://members.aol.com/dscsoc6/2005/BrownCaldwellCom9-8-05.pdf

Lee, G. F. and Jones-Lee, A., "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," Report of G. Fred Lee & Associates, El Macero, CA, December (2004), updated March (2006). http://www.members.aol.com/apple27298/SubtitleDFlawedTechnPap.pdf