2/25/15

CONCERNING THE LEHR/OLD CAMPUS LANDFILL
(Response to February 10, 2015, public meeting at UC Davis)

I am a resident of Davis, California, and I am a retired inhalation toxicologist and biophysicist. On February 10, 2015, I attended the U.S. Environmental Protection Agency (EPA) public meeting concerning an old campus landfill located in the relatively remote southern portion of the UC Davis campus.

I am a member of the following scientific organizations: American Association for Aerosol Research, American Association for the Advancement of Science, American Conference of Governmental Industrial Hygienists, Health Physics Society, Radiation Research Society and the Society of Toxicology. I have over 200 scientific publications including many on the mode and mechanism of radiation and chemical carcinogenesis.

I am shocked and dismayed that the EPA wants the University to spend thirteen million dollars to "seal" this remotely-located 50-year old landfill because of possible tiny airborne emissions of isolated molecules of chloroform. These molecules would be rapidly dispersed and diluted into outdoor air. The location is remote from the main campus and surrounded by high fences and gates that are locked at night. The location is about a mile from the main campus and separated by a major highway, Interstate 80. Apparently very few people have access to or visit the site and it is very unlikely that anyone would ever be living on it or anywhere near it.

High levels of airborne chloroform have not been shown to be a human carcinogen and the Threshold Limit Value to protect workers is 10 parts per million working 40 hours per week (Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 2014.) I think that the levels of chloroform in outdoor air near the UC Davis landfill must be near zero but no measurement data were presented at the meeting.

In a 90-day chloroform laboratory inhalation study F-344 rats were exposed to high concentrations (up to 300 parts per million) without developing cancer. Also, there were no cancers in a rat study of up to two years at 90 parts per million. The authors note that chloroform is "nongenotoxic" (Templin et at., Fundamental and Applied Toxicology 32: 109-125, 1996).

Apparently the EPA envisions someone building a home at this site. That is certainly never going to happen at this remote location on land-grant University property. Even if that was possible, I believe there would be no meaningful cancer risk associated with volatile organic chemicals in the air at this site. The EPA so-called cancer risk calculations of one per 1,000 and one per 1,000,000 seem to be completely imaginary and quite meaningless because they are based on a faulty linear risk model.

Apparently the EPA is using the old discredited faulty stochastic model of carcinogenesis proposed by a biomathematician decades ago which incorrectly assumed that cancer starts when just one isolated living cell in the body is mutated to a precancerous state. If this were true, cancer risk would be proportional to dose of carcinogen, as assumed by the EPA, whether from chemical interaction or ionizing radiation. But it is not! Beginning with a paper in Science in 1980 (Science 208:61-64; 1980), it has been shown in many other studies that induced cancer in people, dogs, and mice is a rather precise function of life-time average dose rate in each species as a function of life span.

Carcinogenesis is a whole tissues phenomenon rather than the result of a single random mutation and it is not proportional to cumulative dose. The EPA risk factors are not meaningful since at low dose rates the time required to develop cancer will exceed the natural life span of the species. Modern cellular biology and dozens of cancer studies with experimental animals have proven that cancer risk is not proportional to dose but a rather precise function of dose rate for ionizing radiation or for chemical carcinogens. In one of my scientific publications I demonstrated the proper methodology for scaling cancer risks from laboratory animals to people for either ionizing radiation or chemical carcinogenesis (Health Physics Vol. 57, Supplement 1, pp. 419-432;1989.)

I believe that the appropriate and sensible course of action is the Remedial Alternative Solid Waste SW-1: No Further Action with a cost of zero dollars.

February 20, 2015

Otto G. Raabe, Ph.D.

[redacted]

Comments on US EPA Region 9 "Proposed Plan Summary and Public Meeting Announcement for the UC, Davis Areas Volume 1: Soil/Solid Waste and Soil Vapor at the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site"[1]

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February 17, 2015

On February 10, 2015 the US EPA Region 9 held a Public Meeting to review the US EPA Region 9's Proposed Plan Summary for the UC, Davis Areas Volume 1: Soil/Solid Waste and Soil Vapor at the Laboratory for Energy-Related Health Research [LEHR]/Old Campus Landfill Superfund Site. Prior to that meeting the US EPA had distributed a Fact Sheet dated January 2015 on its preferred cleanup alternative for the Proposed Plan. At public meeting the US EPA made available a hard copy of a set of PowerPoint slides titled, "'Welcome to the Proposed Plan Public Meeting for the Laboratory for Energy-Related Health Research (LEHR)/Old Campus Landfill (OCL),' UC Davis, February 10 (2015)" which David Stensby, the US EPA RPM for the LEHR site, read to the audience.

Mr. Stensby stated that the US EPA's Preferred Remedy for the LEHR landfills is the US EPA "Presumptive Remedy," i.e., capping the landfills. His PowerPoint slides described the Presumptive Remedy for the landfills as follows:

USEPA Presumptive Remedy for Landfills

- *Risk assessments for landfills may underestimate actual risk, since contaminants and the extent of contamination may not have been fully defined so a presumptive remedy approach was developed by USEPA*
- *The presumptive (assumed) remedy is containment (e.g., a landfill cap)*
- *Landfills do not need to be fully characterized to implement the presumptive remedy*
- *Capping will permanently isolate wastes from human and animal contact*
- *Land Use Controls include deed notices and fences to limit human access and protect the landfill caps*
- *Annual inspections and Five-Year Reviews are required*

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[1] http://yosemite.epa.gov/r9/sfund/r9sfdocw nsf/3dc283e6c5d6056f88257426007417a2/efced908ea6f070388257dd6006075e6/$FILE/51408552.pdf/LEHR%201_15.pdf

The US EPA Fact Sheet cited above and the PowerPoint slides provided the following information on the "EPA's Preferred Alternative" for LEHR landfill remediation as follows:

EPA's Preferred Alternative

- SW-6 – "Volatile Organic Compound (VOC) Hot Spot" Removal, Three On-Site Landfills with Multi-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring

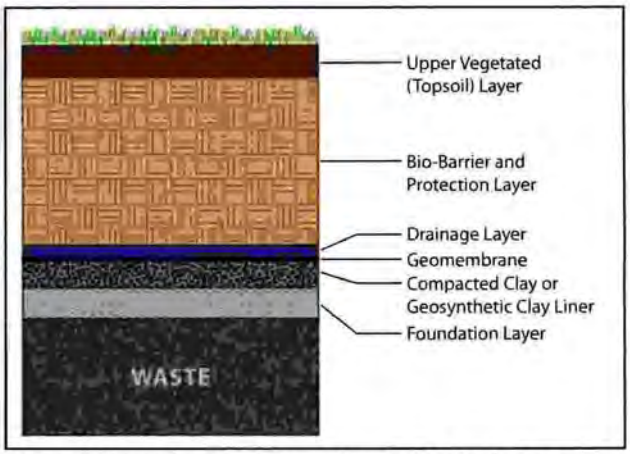

Figure 4: Cross-Sectional View of Typical Multiple-Layer Cap for a CAMU

This "preferred alternative" is basically a US EPA RCRA Subtitle D Landfill Cap, which relies on a plastic-sheeting geomembrane layer to keep water that enters the landfill cover from entering wastes. While the US EPA material claims, *"Capping will permanently isolate wastes from human and animal contact,"* it is well-known that capping cannot be relied upon to "permanently isolate" wastes from human and animal contact. As discussed in our writings on impacts of municipal solid wastes landfills (see the *Landfill Impacts* section website, www.gfredlee.com) the integrity and properties of a plastic sheeting layer in a landfill cap will deteriorate over time; over time their ability to prevent water that enters the top layers of the cap from passing through the plastic sheeting and entering the wastes in the landfill diminishes. If, as water enters the landfilled wastes, the wastes can still generate leachate when contacted by water, the leachate formed will leave the landfill through the bottom and cause groundwater pollution. Therefore, as long as the buried wastes can generate leachate **the US EPA "Preferred Alternative" for the LEHR landfills will only postpone – not prevent – the occurrence of additional groundwater pollution.** These issues are discussed with references to the professional literature in:

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). Last updated January (2015) www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf

As I (G. Fred Lee) commented at the LEHR public meeting, the US EPA does not have needed technical information concerning the current leachability of the wastes, active pollution of the groundwater, or ensured long-term reliability of its proposal, to justify causing the tax payers of California (the University of California, Davis (UCD) to spend about $17 million to cap the LEHR Old Campus Landfills with the proposed Presumptive Remedy cap. As I discussed at the meeting, it has yet to be determined whether or not the existing 40-year-old landfills are still producing leachate that is polluting the LEHR area groundwater. Placement of a reliable cap at this point would only delay further pollution from the landfills if they were still actively generating leachate that could contribute to groundwater pollution. However, if the landfills are no longer generating leachate that could contribute to groundwater pollution, a cap would not serve to delay, much less prevent, further groundwater pollution from the landfills.

I asked if there was recent information that shows that the existing 40-year-old landfills are in fact producing leachate that is polluting groundwaters. Mr. Stensby referred the question to Karla Brasaemle of the TechLaw firm, a technical consultant to the US EPA on the LEHR investigation. Ms Brasaemle did not answer my question; instead she presented an historical review of the landfill pollution of the LEHR site landfills area. While, as I discussed, there is no question that the LEHR landfills have, in the past, polluted LEHR-area groundwater, the key issue to developing technically valid remediation of the landfills is whether the existing landfills are still polluting the area groundwater. As I repeatedly discussed at the LEHR RPM meetings over five years ago while I was the TAG technical advisor to DSCSOC, information is needed on the current pollution, and that the existing groundwater monitoring has not adequately defined the existing pollution by the landfill. Based on the response of Ms Brasaemle and others at the February 10 meeting, there still have been no studies conducted to establish whether, or to what extent, the landfills are still producing significant amounts of leachate that are polluting groundwater.

In her response to my question on the existing groundwater pollution by the landfills Ms Brasemle also stated that additional groundwater monitoring studies are being conducted that would provide additional information on groundwater pollution at LEHR. Although she did not describe the nature of the monitoring studies additional information is clearly needed on the extent and nature or the existing landfill pollution, in addition to defining the current contribution of the landfills to the groundwater pollution. It is not clear that the additional groundwater pollution studies will provide the needed information to define the role of the existing landfills in contributing to additional groundwater pollution at LEHR.

Additional Deficiencies in the US EPA Presumptive Remedy
of Old LEHR Landfills with Subtitle D Landfill Caps and Unreliable Claims

"*Capping will permanently isolate wastes from human and animal contact."*

It has been well-known for more than two decades that nationally, the US EPA has failed to correct a number of major deficiencies in the "Presumptive Remedy" for former landfills. Many of those deficiencies are discussed in our "Flawed Technology" review, including the inadequate provisions for proper funding of post-remedy monitoring and maintenance to detect incipient failures of the landfill cap to keep the wastes dry and to repair deteriorated low-permeability plastic-sheeting layers in landfill caps. Also deficient is the recognition of, provision for, the large amount of money that will be needed to undertake groundwater cleanup caused by

additional pollution when the landfill cap no longer keeps the wastes dry. These funding deficiencies are imbedded in Subtitle D that requires only 30 years of postclosure monitoring and cap maintenance. A properly installed landfill cap with plastic sheeting layer can be expected to prevent entrance of water into the wastes only as long as the initial integrity of the cap is maintained. As discussed by Lee and Jones-Lee (2015), there are inescapable difficulties with achieving ideal cap installation. Once installed, even the ideally installed cap will be buried beneath cover materials – top soil and drainage soil layer – and not amenable to thorough visual inspection; the components of the cap that are relied upon for prevention of moisture passage deteriorate with time and with intrusion of outside breaches such as roots, animal burrows, erosion, etc. Since areas of breach and weakness cannot be reliably detected when they first appear, the first evidence of cover breach will be evidence of leachate development and passage through the system. By that time, more widespread deterioration of the cover can be expected to have occurred. In addition, since the cover is not amenable to careful visual inspection, once a breach is detected by leachate generation the source of the breach will not be known. The evidence of cover failure may not appear before the 30 years of mandated postclosure monitoring and maintenance; if the materials buried in the LEHR landfills are in fact still hazardous/deleterious and subject to leaching, the passage of 30 years does not render the materials nonhazardous or non-deleterious. If groundwater quality protection in the LEHR site landfills area is dependent upon the Presumptive Remedy landfill cover, it is to be expected that there will be need in the future for ongoing groundwater monitoring, additional groundwater remediation, and periodic installation of a new cap. While it is not possible to predict when the cover would lose integrity, it could be several decades to a hundred or more years. It has not, however, been determined whether the buried materials still contribute to groundwater pollution, much less that the Presumptive Remedy would be capable of protecting groundwater from further pollution if they do. The public should be informed of this situation at the time that the Presumptive Remedy is proposed rather than be provided highly misleading information and false assurances of the type that the US EPA provided of claiming, as it did at the meeting, "*Capping will permanently isolate wastes from human and animal contact."*

Recently we were asked to prepare a paper on long-term postclosure issues for municipal solid waste landfills, which was published as,

> Jones-Lee, A., and Lee, G. F., "Landfill Post-Closure and Post-Post-Closure Care Funding - Overview of Issues," WasteAdvantage Magazine 5(12):24-26 December (2014). http://www.gfredlee.com/Landfills/Funding_Issues_WasteAdvantage.pdf

That review discusses the large amounts of long-term funding that is needed to properly maintain a closed landfill so that it does not cause further groundwater pollution.

"Land Use Controls"

Mr. Stensby noted in his PowerPoint slides that part of the proposed plan is: *"Land Use Controls include deed notices and fences to limit human access and protect the landfill caps."* He did not discuss the significant problems associated with properly implementing adequate "land use controls" to, in fact, adequately and reliably *"limit human access and protect the landfill caps."* There is legitimate concern about the ability of organization or entities such as a university, governmental agency, or others to properly implement land-use controls at a closed landfills for the decades to hundreds of years during which the wastes in a Presumptive-Remedy-closed

landfill can still generate leachate when contacted by water. The adoption of the Presumptive Remedy proposed by the US EPA must include provisions that will ensure that the land-use control will be effectively carried out for as long as the wastes in the LEHR will be a threat to generate leachate when contact by water, effectively forever.

"Annual inspections and Five-Year Reviews"
One of the statements made by Mr Stensby in his PowerPoint presentation was, "*Annual inspections and Five-Year Reviews are required.*" That statement misleads the public concerning the ability of the LEHR site landfill cap inspections and reviews to identify incipient deficiencies in the cap and preclude the failure of the cap to keep the wastes dry and thereby prevent groundwater pollution. As discussed above, the integrity of the plastic-sheeting liner, a key element in a cap to preventing passage of moisture, is unavailable to inspection since it is buried below a top soil and drainage soil layer and cannot be visually inspected to determine if and where it has deteriorated. As discussed in our writings on landfills, those landfills with landfill leachate collection systems can reveal when plastic sheeting in covers has deteriorated and is no longer effective in preventing water from passing through the liner and generating leachate. However, since the LEHR site landfills do not have leachate collection systems, the failure of the landfill's plastic sheeting-based cover proposed by the US EPA as the Preferred Alternative will be found by additional groundwater pollution.

An important issue that needs to be considered is that the UCD LEHR landfills are not typical municipal solid waste landfills even though they received some campus solid wastes and other campus wastes. While conventional municipal solid wastes landfill can generate leachate for many decades or longer it is not clear that this applies to the LEHR old landfills. As discussed herein, there is need for current studies to determine whether the existing landfills are still significantly polluting the LEHR site groundwater.

Background and Experience of Dr. Lee
Landfill Impacts on Public Health & Water Quality
Dr. G. Fred Lee earned his bachelor's degree from San Jose State College in sanitary science/public health in 1955, his Master of Science in Public Health degree from the University of North Carolina in 1957, and his PhD degree in environmental engineering from Harvard University in 1960. For 30 years he served on the graduate civil and environmental engineering/science faculty of several major US universities where he taught and conducted about $5 million in water quality research, mentored the Masters and PhD degree work of 90 students, published about 500 reports and papers in professional journals, and actively undertook public service activities for regulatory, professional, and lay communities.

In 1989 Dr. Lee retired from his academic career and moved, with his wife, Dr. Anne Jones-Lee, to focus on private consulting and public service; he continues to serve as owner and principal of G. Fred Lee & Associates. Areas of his professional emphasis include domestic water supply water quality focusing on how land use in a water supply watershed impacts water supply water quality; investigation and management of surface and groundwater quality, stormwater runoff, contaminated sediments, land surface activities that impact groundwater quality, and use of reclaimed wastewater; and investigation and management of impacts of solid and hazardous waste, and hazardous chemicals including MSW and hazardous waste landfills, and Superfund

and other hazardous chemical sites. Since entering full-time consulting, Drs. Lee and Jones-Lee have developed another 600 papers and reports on their professional consulting activities. Many of their papers and reports are available as downloadable files from their website, www.gfredlee.com.

Dr. Lee became active in reviewing environmental impacts of landfills in his undergraduate course work in public health at San Jose State College in 1954. Since then he has been involved in the evaluation of public health and water quality impacts of about 80 landfills located throughout the US, several areas of Canada and other countries. This work has included, among other things, aspects of efficacy of engineered containment systems, groundwater monitoring, nature of leachate and impacts on groundwater quality, movement of leachate through saturated and unsaturated aquifers, reclamation of landfill areas, remediation of polluted groundwater, and regulatory aspects of solid and hazardous waste management. He has developed more than 90 professional papers/reports on his landfill investigations, which are available in the *Landfill Impacts* section of their website www.gfredlee.com.

In the 1980s, with research support of the US EPA Groundwater Research Laboratory, Dr. Lee began to investigate the properties of various types of landfill liners, including clay and plastic sheeting liners. He has continued to closely follow the professional literature on factors impacting the long-term integrity of landfill liners. A summary of current information on this issue is included in his "Flawed Technology" review cited above. As discussed in that review, among other aspects that limit efficacy, it is well-recognized that plastic sheeting (HDPE and LDPE and similar materials) undergoes free-radical attack that leads to polymer chain scission and the deterioration of the liner's ability to prevent water from passing through the liner. This is especially of concern in landfill caps where factors that lead to deterioration of the plastic sheeting are more severe.

The US EPA Presumptive Remedy landfill cap proposed could include a Geosynthetic Clay Liner rather than a Compacted Clay layer. As discussed in our Flawed Technology review (Lee and Jones-Lee, 2015) while Geosynthetic Clay Liners are being allowed to substitute for compacted clay liners it is well-known that the long-term integrity of such layers is less reliable than compacted clay layers.

Activities of DSCSOC and Dr. Lee at LEHR

For 15 years beginning in 1995, Dr. Lee served as technical consultant to the Davis South Campus Oversight Committee (DSCSOC) organized by Julie Roth and supported by a US EPA Technical Assistance Grant (TAG). As technical advisor to DSCSOC, Dr. Lee participated in the LEHR site RPM meetings and frequently made technical contributions to the discussions. He also prepared written comments for the public on the technical aspects, reliability, and adequacy of what was being done and found at the site, etc. As part of the public outreach aspect of his work, Drs. Lee and Jones-Lee developed and maintained the LEHR DSCSOC website [http://www.gfredlee.com/DSCSOC/dscsoc.htm] to provide the public with access to the papers and reports that they developed on LEHR site investigations/remediation. (Drs. Lee and Jones-Lee continue to maintain the DSCSOC website even though they have had no support and, until February 10, 2015, have had no contact with anyone associated with the LEHR site for the past five years.)

For 15 years, Julie Roth, Executive Director for DSCSOC, and Dr. Lee had a good working relationship with the US EPA Community Involvement Coordinators and the DSCSOC TAG was renewed with no difficulty. However, when D. Cooper became the US EPA Community Involvement Coordinator for the LEHR site he created conditions for renewing the TAG that were completely inappropriate and would have been impossible to meet. Despite attempts to overcome these difficulties, it became clear in the spring of 2010 that D. Cooper had no appreciation of how a TAG could and should be active in addressing the public's legitimate interest in reviewing the adequacy of the US EPA LEHR site investigation and remediation, and was creating unnecessary barriers to the renewal of the TAG, Julie was forced to terminate the DSCSOC participation in LEHR site activities; Dr. Lee's involvement in the LEHR site activities ceased. (As discussed on our website [www.gfredlee.com] Dr. Lee has been active as a technical adviser to the public on the adequacy of site investigation/remediation at a number of NPL sites, state hazardous chemical sites, and brownfield sites. Information on those activities, is available at http://www.gfredlee.com/Tag-Advisor-Work.html, illustrates our extensive experience and understanding of how to help the public participate in site investigation/remediation.)

Attached is a statement that J. Roth and Dr. Lee prepared in May 2010 explaining the circumstances of the termination of their activities at LEHR. It also includes a list of issues known in May 2010 that will need to be address in further investigation/remediation of the LEHR landfills, including the need to define the current pollution of LEHR groundwaters by the existing landfills. The unfortunate aspect of this situation is that owing to the termination of the TAG, the public in the Davis area has had no representation on the LEHR site investigation/remediation for nearly five years.

Developing Protective Landfills

Most of our more recent work on landfill impacts has been devoted to reviewing the impacts of improperly sited, developed, and/or closed landfills on behalf of governmental agencies, industry/commerce, and public citizen groups, and reviewing the adequacy of landfill regulations for protecting public health and environmental quality for as long as wastes represent a threat. As part of testifying at an Alberta Canada Appeal Board I was ask by a Board member how to develop protective landfills. Out of our experience, we developed guidance on aspects of landfill development that are critical to improving the protection of public health, groundwater and surface water resources, and the interests of those in the sphere of impact of a landfill for as long as the wastes in the landfill are a threat. This guidance is available as,

> Lee, G. F., "Developing Protective Landfills," Report of G. Fred Lee & Associates, El Macero, CA, January 19 (2013).
> http://www.gfredlee.com/Landfills/Sum_Developing_Protective_Landfills.pdf

As discussed therein, it is possible to develop landfills and to close existing landfills and provide protection of public health, the environment, and those in the vicinity of the landfill. That guidance addresses many of the issues that need to be considered in developing closure of an existing old landfill that is still polluting groundwater. If the LEHR old landfills are no longer producing leachate that is significantly polluting groundwater, then a considerably less-expensive approach to the closure of those landfills, such as the approach that UCD proposed at the LEHR meeting, may well be justified. It is clear, however, that if those landfills are still contributing to groundwater pollution, the US EPA's Preferred Remedy as presented cannot be

relied upon to provide long-term protection of groundwater from further pollution.

If there are questions on these comments please contact G. Fred Lee at gfredlee33@gmail.com.

These comments are unsponsored and were developed as part of our ongoing interest in supporting the public in developing technically valid, cost-effective remediation of the LEHR Superfund site.

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Termination of DSCSOC Activities at the UCD/DOE LEHR Superfund Site
Prepared by
Julie Roth, Former Executive Director of DSCSOC and
G. Fred Lee, PhD, BCEE, F.ASCE, Former TAG Technical Advisor to DSCSOC
May 14, 2010

In March 2010 Davis South Campus Superfund Oversight Committee (DSCSOC) terminated its representation of the public's interests through the Technical Assistance Grant (TAG) program in the matter of the University of California Davis (UCD) US Department of Energy (DOE) LEHR national Superfund site on the UCD campus. For the past 15 years, DSCSOC served as an active, diligent, and reasoned advocate for the public in its review of the adequacy of the investigation and remediation being undertaken at the LEHR site. During those 15 years, DSCSOC enjoyed a cooperative and supportive relationship with the US EPA sponsors of the TAG. However, in the winter/ spring of 2010, the US EPA Region 9 Community Involvement staff (D. Cooper) imposed conditions on renewal of the Technical Assistance Grant (TAG) that made it impossible for DSCSOC to apply for renewal of support to continue its activities.

As the last TAG contract period funds became exhausted, DSCSOC proposed to the US EPA that the US EPA provide a three-year extension of the contract to cover DSCSOC's continued participation in the LEHR site investigation/remediation process through the signing of the Record of Decision (ROD) for the LEHR site remediation. That requested extension, for $44,000 over 33 months, was less than that allowed under TAG support, but would have been sufficient to enable DSCSOC to continue to be an active participant in LEHR site Remediation Program Managers' (RPM) meetings, provide comments on issues of concern for providing public health and environmental protection in LEHR site investigation and remediation, review draft and final UCD and DOE reports, and participate in public meetings on site activities. It also would have enabled the continued posting of the results of DSCSOC's activities, and maintenance of, the DSCSOC website [http://www.gfredlee.com/DSCSOC/DSCSOC.htm].

With the same level of reasonable estimation of anticipated activities to be conducted under the TAG contract as it had provided with previous proposals for its TAG extension and renewal, and with record of 15 years of performance as a TAG recipient, DSCSOC submitted its proposed approach for a three-year contract renewal proposal in which we proposed to follow the approach approved by the US EPA in the spring 2009 for renewal of the previous TAG. The US

EPA Region 9 Community Involvement officer for the LEHR site responded by rejecting the DSCSOC proposed approach for renewal of the TAG as inadequate, and required that a complete detailed proposal be submitted imposing impossible conditions for the TAG renewal that DSCSOC identify the specific future activities that would be covered under the contract and delineate the amounts of time that would be spent of each of the tentatively scheduled UCD/US EPA/RPM activities. It was clear that such specificity could not be reliably provided since the future RPM activities had not yet been defined in the detail needed for DSCSOC to incorporate this information into its renewal application. Not only was it not possible to reliably provide the detail being newly required by the US EPA, but also incorporating such speculative detail of tasks, scopes of work, and time expenditures in the contract would not have been good-faith representation of the public interests. It could commit DSCSOC to undertake specific activities that could subsequently be revealed to not be cost-effective in representing the public's interests, and also could constrain and prevent DSCSOC from undertaking presently unforeseen work that should be conducted in the interest of the public.

Given the obstruction to what should have been routine contract extension placed by the US EPA Region 9 Community Involvement staff in its specious demands for speculative detail, in the winter of 2010 DSCSOC found that it had no choice but to terminate its activities at LEHR; it was impossible, and indeed would have been irresponsible, to provide the required "details" of the specific future DSCSOC activities.

DSCSOC's decision to terminate its activities at the LEHR Superfund site was also influenced by the significant delays, obstruction, and inattentiveness to the timely processing of the renewal of the previous TAG by the US EPA Region 9 Community Involvement officer. For more than six months the US EPA Region 9 Community Involvement officer for the LEHR site failed to act on repeated requests submitted by DSCSOC for renewal TAG information. During that period DSCSOC was repeatedly informed by the US EPA Community Involvement officer for the LEHR site that the TAG would be renewed but that he had not had time to process the application. While with that assurance DSCSOC continued its efforts in anticipation of forthcoming budget to cover them, after six months of being disregarded by the US EPA Community Involvement officer, DSCSOC notified the US EPA and the RPMs that under those conditions – of having no TAG renewal support and those responsible "not having time" to act on the matter – DSCSOC was terminating its activities that the LEHR Superfund site. Shortly thereafter DSCSOC received notice that the renewal of the TAG support had been awarded. However, the conditions of the renewal required that a considerable part of the renewal funds had to be used to pay for time that DSCSOC had devoted to LEHR activities during the six months that the US EPA Community Involvement officer indicated that the TAG would be renewed but did not act on the renewal. The DSCSOC activities during that period were at the same level as they had been during the previous 14 years of the contract.

As documented in reports on the DSCSOC website, there remain important issues in the development of the remainder of the site investigation, and especially of the remediation, approaches that are to be developed, into which the public should have input. First and foremost among these issues is the fact that the current US EPA Superfund and state of

California hazardous chemical site remediation regulations do not ensure full protection of public health and environmental quality. The current regulations are based on legislation that is often a compromise among competing interests including full protection, cost for investigation and remediation, and political considerations. Discussion of these issues is presented in some of the papers listed below. These issues are not widely discussed by the regulatory community or those being regulated, as they make the expedient "remediation" of sites more cumbersome. DSCSOC has brought these issues to the public's understanding, and could have continued to do so with continued TAG support. Other issues in which the public potentially affected by the LEHR site should have the opportunity to be involved with sound technical review and input include:

- reviewing the ongoing site characterization program with particular reference to identifying and monitoring for unknown/unrecognized pollutants at the LEHR site,
- reviewing the development of a groundwater remediation plan and its implementation for chloroform-polluted groundwater,
- reviewing the development of a groundwater remediation plan and its implementation for chromium-polluted groundwater,
- reviewing the development of a remediation plan for contaminated soil to ensure that soils and site remediation do not lead to increased stormwater pollution of Putah Creek by LEHR site stormwater runoff,
- reviewing the development of an investigation plan for characterization of the UCD landfills as a source of pollution,
- reviewing the development of a remediation plan for the three UCD landfills to provide a high degree of reliability for stopping current groundwater pollution and for maintaining the integrity of the landfill containment system for as long as the wastes in the landfills are a threat,
- reviewing the development of a stormwater runoff control plan to control mercury derived from CERCLA areas of the site with particular emphasis on developing fully functional BMPs to control mercury in the stormwater runoff to meet CVRWQCB water quality standards/objectives in the stormwater discharge to Putah Creek,
- reviewing and reporting on the adequacy of groundwater and surface water monitoring programs and reports including providing recommendations on how the monitoring should be conducted to more adequately define the pollution of the LEHR site groundwater and surface water.

Based on the experience of the past 15 years, there are issues within each of the areas named, as well as others that come to light, in which it is important for the public to have access to independent, high-quality technical input on their behalf – input of the level and type that DCSOC has been providing – as the development of the UCD ROD for the site progresses. Further, there will be need for this level of public input after the signing of the ROD, during the ROD implementation phase, to ensure to the extent possible with the level of TAG support provided that public health and environmental protection is achieved at the LEHR site. Without this level of independent review, the problems of the type that DSCSOC has detected and worked to remedy at the LEHR site could continue to occur at the UCD/DOE LEHR national Superfund site on the UCD campus. Some of the DSCSOC contributions to improving LEHR site

investigation and remediation include:

- causing ATSDR/US EPA to develop a program to investigate the impact of LEHR site stormwater runoff on Putah Creek fish, and the public health implications of the consumption of fish from impacted areas of Putah Creek,
- causing the Central Valley Regional Water Quality Control Board to list Putah Creek as a Clean Water Act Section 303(d) "impaired" waterbody due to excessive mercury concentrations in some Putah Creek fish,
- highlighting and discussing repeated failures of the RPM to require that UCD contractors use adequate analytical methods for determination of mercury in LEHR site stormwater runoff that violates the NPDES permit for mercury discharges to Putah Creek,
- discussing the need for, and failure of, those who manage lands next to Putah Creek, such as UCD and the city of Davis Department of Parks, to post signs along Putah Creek as suggested by ATSDR, CA Department of Health and OEHHA to warn those who eat some types of fish from the creek that the concentrations of mercury in the fish can be a threat to human health,
- discussing inadequacies in the monitoring of Putah Creek to evaluate the impact of pollutants derived from the LEHR site in the UCD Campus wastewater discharges to the creek that violate the CVRWQCB discharge permit for the wastewater discharges to the creek,
- defining the role of LEHR site stormwater runoff mercury in excessive bioaccumulation of mercury of Putah Creek fish that causes a human health threat to those who use Putah Creek fish as a source of food,
- better defining the constituents of concern (CEC) in the LEHR site groundwater,
- discussing problems caused by developing a stormwater runoff channel through the top of LEHR site landfill number 3 that exposed PCBs and other UCD wastes to stormwater runoff in the channel that is discharged to Putah Creek,
- discussing inadequacies in stormwater runoff monitoring from LEHR and recommending a modified monitoring approach based on US EPA guidance to more reliably assess the impact of LEHR site stormwater runoff-associated polluted on Putah Creek water quality,
- discussing the error made by the RPMs in developing a LEHR site assessment for ecological impacts through the use of co-occurrence-based sediment quality criteria,
- discussing errors made by ATSDR in conducting a LEHR site public health assessment,
- discussing errors made year after year in UCD contractors' annual monitoring reports, and the failure of the RPMs to require correction of those errors prior to acceptance of the reports by the RPMs and the placement of these reports in public libraries for public review,
- discussing the unreliable reporting of the efficacy of the UCD and DOE BMPs installed at the LEHR site in preventing discharges of mercury above the CVRWQCB discharge limit and deficiencies in the BMPs installed by UCD to control mercury in stormwater runoff from the LEHR site,
- discussing inadequacies in groundwater monitoring and modeling at the LEHR site,
- discussing the failure of UCD to develop a LEHR site landfill groundwater monitoring program that will adequately define the pollution of groundwaters by each of the UCD

landfills,

- discussing inadequacies in the design and operation of the UCD groundwater extraction and treatment system that led to the failure of this system that caused it to have to be abandoned due to plugging of the aquifer near the recharge well,
- causing the investigation of the old UCD wastewater treatment plant pollution of groundwater,
- discussing ramifications of the approach followed by the UCD administration for managing campus wastes by burial in shallow pits (called landfills) that were known since the 1950s to led to groundwater pollution. While that approach saved UCD some waste disposal costs at the time of disposal, it is now costing the CA taxpayers many tens of millions of dollars in LEHR site remediation,
- discussing that the UCD administration has in the past and continues today to approach campus waste management by doing the least amount that the regulatory agency staff will allow, rather taking a proactive approach to protect public health and the environment in management of UCD campus wastes,
- developing professional papers that have been published in national journals on inadequate superfund site investigations and remediation that were based in part on the situation at the LEHR site,
- making presentations at US EPA national TAG meetings on improving the reliability of Superfund site investigations,
- developing and maintaining the DSCSOC website.

The mishandling of the DSCSOC TAG renewal by the US EPA Region 9 Community Involvement staff should be reviewed by US EPA management in Region 9 and Washington, D.C. headquarters so policies and procedures can be developed to prevent these types of problems from occurring in the future at other Superfund sites. This mismanagement has cost the people affected by and concerned about the investigation and remediation of the LEHR Superfund site their voice in the process. Unless these problems are remedied, the public will stand to be denied the informed independent technical review and voice in the Superfund process that the TAG was established to provide.

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February 10, 2015

Mr. David Stensby
Remedial Project Manager
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, SFD-9-3
San Francisco, California 94105-3901

Dear Mr. Stensby:

The University of California, Davis (UC Davis) would like to comment on the U.S Environmental Protection Agency's (EPA) selection of Alternative SW-6 as the preferred remedy as documented in EPA's *Proposed Plan for the University of California, Davis Area, Soil Solid Waste and Soil Gas at the Laboratory for Energy-related Health Research/Old Campus Landfill Superfund Site, University of California, Davis, California* (Proposed Plan). As discussed below, UC Davis believes that the EPA's evaluation in the Proposed Plan may be, in some cases, inconsistent with the process described in the National Contingency Plan (NCP; 40 CFR 320) and with the evaluation of alternatives contained in the EPA-approved *Final Feasibility Study for the University of California Areas Volume 1: Soil/Solid Waste and Soil Gas* (Final FS Report; April 30, 2012). We believe that reconsideration of these evaluation factors supports the selection of Alternative SW-3 because it meets the NCP selection goal of being the most cost-effective alternative.

As outlined in the attached letter from UC Davis to the EPA dated February 22, 2013, UC Davis believes that Alternative SW-3 is protective of human health and the environment and is preferable to Alternative SW-6 due mainly to its improved short-term effectiveness and lower cost. Alternative SW-3 includes VOC "hot spot" and principal threat waste removal; installation of three on-site Corrective Action Management Units (CAMUs) with graded covers (at a minimum 1.5 percent slope to facilitate drainage and covered with a low permeability soil cover to reduce infiltration [thicknesses estimated between 2 and 3.25 feet] and a vegetative cover); developing and enforcing institutional controls; installing and maintaining drainage enhancements; and long-term groundwater monitoring.

Alternative SW-3 meets Applicable, Relevant and Appropriate Requirements (ARARs) identified for the site, specifically the post-closure monitoring requirements for inactive landfills under Title 27 of the California Code of Regulations. Decades of groundwater monitoring data from the site show that contaminant concentrations associated with the covered land disposal units are declining and that leachate production has ceased.

The main difference between Alternatives SW-3 and SW-6 is in the amount of material that must be imported to construct the CAMUs. Alternative SW-3 requires that an estimated 11,880 cubic yards of materials be

imported to construct a soil cap with a thickness between 2 and 3.25 feet, while Alternative SW-6 requires an estimated 44,540 cubic yards of material be imported to construct a cap with a maximum thickness of 4.5 feet.

The EPA's Proposed Plan does not include a detailed comparison of the short-term effectiveness of Alternatives SW-6 and SW-3. Based on information contained in Section 6.2.3.3 of the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* dated October 1988, EPA considers the evaluation of long term effectiveness and permanence to cover conditions after source/soil containment is met. Therefore, the EPA-approved FS Report evaluated short term effectiveness during the construction phase of the landfill remedy. The thicker cap included in Alternative SW-6 requires that an additional 32,660 cubic yards (or 1,633 truckloads) of material be imported to the site, resulting in more than 2.5 times the amount of greenhouse gas (GHG) emissions over Alternative SW-3. Additionally, implementing Alternative SW-6 will result in the use of nearly three times more energy than Alternative SW-3. As stated in the Proposed Plan in Section H, Criterion 5, Short-term Effectiveness, *"the number of truck trips, total mileage, greenhouse gas/vehicle emission, road dust and total energy use increase [progressively] from Alternative SW-3 to Alternative SW-10."* Correspondingly, the risk to the community, due to these emissions and increased traffic, would also be markedly higher for Alternative SW-6 than Alternative SW-3. The Final FS Report shows that the highway fatality risk due to accidents and vehicular emissions for Alternative SW-6 is approximately two times higher than for Alternative SW-3. We also note that the highway fatality risks for Alternatives SW-3 and SW-6 are between 2 in 100 and 4 in 100 (i.e., 2% to 4%), respectively, based largely on the number of trucks required to dispose of and import material during remedy implementation. These highway fatality risks exceed the site's contaminant-related excess cancer risk (e.g., <6 in 10,000 for a hypothetical onsite resident) by a factor of 100 or more. The short-term protectiveness of Alternatives SW-3 and SW-6 would be the same during installation of the remedy since site access will be controlled and pre-remediation risks for site workers and potential offsite receptors have been deemed acceptable by the EPA. Therefore, in accordance with applicable EPA superfund regulations (i.e., 40 CFR 300.430 (e)(9)(iii)(E) and according to the EPA-approved FS Report, the short-term effectiveness of Alternative SW-3 is more acceptable than Alternative SW-6. We note that Table 5 in the Proposed Plan incorrectly shows the opposite; in fact, it shows the short-term effectiveness of Alternative SW-3 as being unacceptable. A specific comparison of the short-term effectiveness of Alternatives SW-3 and SW-6 is provided below:

NCP Short-term Effectiveness Sub-criteria in 40 CFR 300.430 (e)(9)(iii)(E)	Specific Comparison of Alternatives SW-3 and SW-6
Short-term risks that might be posed to the community during implementation of an alternative	Alternative SW-6 results in a 100 percent increase in vehicular accident risk and transportation emission fatality risks to the community.
Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures	Both alternatives have equivalent worker exposure and effectiveness and reliability of worker protective measures.
Potential environmental impacts of the remedial action and effectiveness and reliability of mitigative measures during implementation	Alternative SW-6 produces 150 percent more greenhouse gas and consumes 170% more energy than Alterative SW-3. The effectiveness and reliability of the mitigative measures during implementation are equivalent for both alternatives.
Time until protection is achieved	Alternative SW-3 achieves protection (containment) sooner since less effort is required to install the cover.

Due to the greater thickness of the Alternative SW-6 caps, larger surface areas will be burdened to allow for adequate slopes for the edges of the CAMUs. Due to these grade changes and enlarged footprint of the caps,

nine existing buildings will need to be demolished and potentially replaced to implement this alternative. Only one building will need to be demolished to implement Alternative SW-3.

Although the cost of replacing these buildings are not considered in comparing alternative costs under the CERCLA process, they are real costs that California tax payers will incur if Alternative SW-6 is implemented.

Replacement costs for these buildings are estimated to be more than $3M.

The EPA's Proposed Plan does not include a detailed comparison of the long-term effectiveness of Alternatives SW-6 and SW-3. The only direct comparison of the two alternatives is provided in Table 5 in the Proposed Plan, which graphically depicts the acceptability of each alternative. Table 5 shows that Alternative SW-6 is somewhat more acceptable than Alternative SW-3 with respect to long-term protectiveness (i.e., EPA shows a one-quarter filled circle for Alternative SW-3 and a half-filled circle for Alternative SW-6). UC Davis believes that the long-term protectiveness of Alternative SW-3 is only slightly less protective than Alternative SW-6 if a bio-barrier is added to Alternative SW-3. We base this opinion on the fact that the landfills have not received waste for over 40 years and groundwater monitoring downgradient of the landfills shows no evidence of ongoing landfill leachate production. Thus, we believe that the added waste isolation provided by Alternative SW-6 will have little to no effect mitigating future migration of contaminants to groundwater. Alternative SW-3 provides adequate protection by re-grading the existing soil cover and adding new clean fill where needed. UC Davis plans to continue to use the site for research activities requiring controlled site access. Long-term groundwater monitoring provided in Alternative SW-3 ensures that groundwater will be protected.

Consistent with the information provided in this letter and the EPA-approved Final FS Report, and regulations contained in the NCP, and more modern perspectives on environmental stewardship, UC Davis believes that Alternative SW-3 is the most sustainable and cost-effective alternative that satisfies the EPA's Threshold Criteria of achieving overall protection of human health and the environment and meeting ARARs. The limited increased long-term effectiveness achieved by Alternative SW-6 does not justify its disproportionate higher cost and significant short-term impacts on students, faculty and staff on campus, the community at large, and the environment. Thus, in consideration of this information, UC Davis requests that the EPA reconsider the merits and cost-effectiveness of Alternative SW-3 in their final remedy selection decision.

UC Davis appreciates the EPA's consideration of this matter and is available to discuss this issue at your convenience.

Sincerely,

Jill Parker

Jill Parker
Associate Vice Chancellor for Safety Services
University of California, Davis

CC: John Bystra, DTSC
Durin Linderholm, RWQCB
Karl Mohr, Senior Associate Vice Chancellor
Sue Fields, Environmental Manager

Table 3. Comparison of Costs Alternatives SW-3 and SW-6 - Laboratory for Energy-related Health Research/Old Campus Landfill, University of California, Davis

	Alternative Components	SW-3 VOC "Hot Spot" Removal, Three On-Site Corrective Action Management Units with Graded Covers, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	SW-6 VOC "Hot Spot" Removal, Three On-Site Corrective Action Management Units with Multiple-Layer Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring
Pre-Remediation Capital Costs	Biological Survey	$86,304	$86,304
	Elderberry Mitigation	$270,000	$270,000
	Data Gap Investigation	$157,394	$157,394
	Decontamination Facilities[a]	$195,984	$582,436
	Building D&D (including disposal)	$94,688	$314,966
	Decommission Groundwater Wells	---	$624,402
	Clearing and Grubbing[c]	$52,025	$52,025
	Demolish LFU-3 N-S Drainage Channel	---	$5,026
Excavation and Backfill Capital Costs	ET PTW and Exploratory Trench Excavation and Backfill[d]	$125,480	---[e]
	LFU-1 PTW and Exploratory Trench Excavation and Backfill[d]	$285,662	$278,207
	LFU-2 PTW and Exploratory Trench Excavation and Backfill[d]	$310,177	$300,782
	LFU-3 PTW and Exploratory Trench Excavation and Backfill[d]	$72,889	$71,311
	ET Excavation and Backfill	---	$273,170
	ET VOC "Hot Spot" Excavation and Backfill	$234,122	$181,700
	LFU-1 Drainage Area Excavation and Backfill	---	$609,893
	LFU-1 Excavation and Backfill	---	---
	LFU-2 Excavation and Backfill	---	---
	LFU-2 VOC "Hot Spot" Excavation and Backfill	$196,258	$47,289
	LFU-3 Drainage Area Excavation and Backfill	---	$269,681
	LFU-3 Excavation and Backfill	---	---
	ST and HFSDA Excavation and Backfill	---	---
	WBH Excavation and Backfill	---	---
	Non-Impacted Area Excavation and Backfill	---	---
Materials Management and Disposal Capital Costs	Materials Management[m]	$472,652	$1,548,268
	Excavated Material Consolidation[n]	---	$50,438
	Off-Site Transportation and Disposal	$2,291,553	$2,425,318
CAMU Construction Capital Costs	LFU-1 Graded Cover/Cap	$256,367	$1,113,709
	LFU-2/ET/WBH Graded Cover/Cap	$383,333	$1,861,724
	LFU-3 Graded Cover/Cap	$88,118	$408,092
	WBH Cap	---	---
	Multiple-Layer Cap With Liner and LCRS	---	---
Post-Remediation Capital Costs	Install New Groundwater Wells[b]	$118,168	$297,551
	Storm Drainage[o]	$691,009	$687,484
	LFU-1 Drainage Channel/Swale	$29,823	$18,841
	LFU-3 Drainage Channels	$51,820	$116,775
	Building Reconstruction[p]	---	$423,616
	Total Capital Costs	**$6,463,826**	**$13,076,401**

Operations and Maintenance Costs	Institutional Controls	$1,144,900	$1,144,900
	Groundwater and Storm Water Monitoring[b]	$4,873,320	$4,383,323
	O&M Drainage System[q]	$200,901	$200,901
	O&M of Caps	$702,560	$1,300,501
	O&M of Leachate Collection and Recovery System	---	---
	Total O&M Costs	**$6,921,681**	**$7,029,624**
Periodic Costs	Periodic Storm Water Lift Station Repair	$12,225	$12,225
Periodic Costs	Five-Year Reviews	$173,297	$173,297
	Total Periodic Costs	**$185,523**	**$185,523**
Cost Summary	Total Project Duration (Years)	100	100
	Total Capital Cost	$6,463,826	$13,076,401
	Total O&M Cost	$6,921,681	$7,029,624
	Total Periodic Cost	$185,523	$185,523
	Total Present Value of Alternative[r]	**$13,571,030**	**$20,291,548**
	Contingent Action	$44,059	$204,046
	Total Present Value of Alternative Plus Contingent Action Costs	***$13,615,089***	***$20,495,595***

Notes:

Totaled values are rounded up to the nearest whole dollar.

[a] Includes temporary facilities for decontamination of personnel and equipment.

[c] Costs are related to the area to be cleared prior to remedial excavation or installation of a cap.

[d] PTW and Exploratory Trench Excavation includes the cost of a geophysical survey to be performed prior to excavation.

[e] The ET PTW and Exploratory Trenches will be excavated as part of the ET excavation under the Alternative indicated.

[m] Includes the cost of stockpiling and management of excavated materials, waste characterization sampling, and sifting/sorting waste streams.

[n] Includes the cost of consolidating non-PTW excavated material from on-Site excavations within the footprints of on-Site CAMUs and beneath the final caps.

[o] Includes costs of storm water detention basins and infrastructure for storm water conveyance from capped areas to the detention basins and final discharge.

[p] Includes the cost of constructing three warehouse type buildings at the Site, intended to replace the Geriatrics buildings, H-292 and H-293, and buildings H-253 and H-290.

[q] Includes O&M costs for storm water detention basins and associated infrastructure, in addition to storm water drainage channels/swales.

[r] Discount factor for present value analysis is 2.7%; the period of analysis is 100 years.

Acronyms/Abbreviations:

D&D - decommissioning and demolition
CAMU - corrective action management unit
ET - Eastern Trenches
HFSDA - Hopland Field Station Disposal Area
LFU - landfill unit
N-S - north-south
O&M - operations and maintenance

Table 2. Relative Comparison of Alternatives SW-3 and SW-6 - Laboratory for Energy-related Health Research/Old Campus Landfill, University of California, Davis

	Summary of Alternative	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-term Effectiveness
SW-3	VOC “Hot Spot” Removal, Three On-Site Corrective Action Management Units with Graded Covers, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	Hazardous material would be consolidated within three covered CAMUs. Sampling in the ST and HFSDA would better characterize risk in these disposal areas. The VOC "hot spot" areas would be excavated and hazardous material taken off-Site for disposal. PTW from historical and proposed trenches would be removed. Graded covers and storm water drainage enhancements would be installed to reduce infiltration. Development and enforcement of ICs and monitoring would be conducted to confirm long-term protection of human health and the environment.	A fraction of hazardous waste may be treated via *ex situ* solidification/stabilization prior to off-Site disposal; the actual amounts would depend on the hazardous characteristics of the waste. 76 LCY of material are assumed to be treated.[2]	Risks are associated with construction site hazards, air emissions, fugitive dust emissions, and vehicular traffic. 1,400 metric tons of GHGs, 1.8 metric tons of NO_x emissions, 0.8 metric tons of SO_x emissions, and 0.6 metric tons of PM_{10} emissions are estimated to be released. 22,400 MMBTU of energy are estimated to be used, equivalent to approximately 161,200 gallons of diesel. The estimated total fatality risk is 2E-02. This alternative would take one year to implement.
SW-6	VOC “Hot Spot” Removal, Three On-Site Corrective Action Management Units with Multiple-Layer Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	Hazardous material would be consolidated within three CAMUs. Sampling in the ST and HFSDA would better characterize risk in these disposal areas. The VOC "hot spot" areas would be excavated and hazardous material taken off-Site for disposal. PTW from historical and proposed trenches would be removed. The ET would be excavated and PTW sent off-Site for disposal; soil/solid waste would be completely removed from the ET North and consolidated within the CAMUs. Multiple-layer caps and storm water drainage enhancements would be installed to reduce infiltration. Multiple-layer cap maintenance would be required to limit infiltration. Development and enforcement of ICs and monitoring would be conducted to confirm long-term protection of human health and the environment.	A fraction of hazardous waste may be treated via *ex situ* solidification/stabilization prior to off-Site disposal; the actual amounts would depend on the hazardous characteristics of the waste. 95 LCY of material are assumed to be treated.[2]	Risks are associated with construction site hazards, air emissions, fugitive dust emissions, and vehicular traffic. 3,600 metric tons of GHGs, 3.2 metric tons of NO_x emissions, 1.1 metric tons of SO_x emissions, and 0.7 metric tons of PM_{10} emissions are estimated to be released. 60,500 MMBTU of energy are estimated to be used, equivalent to approximately 435,300 gallons of diesel. The estimated total fatality risk is 4E-02. This alternative would take one year to implement.

Notes:

Relative comparison: the rankings reflect the relative differences between the alternatives and are ranked on a scale of 0-5, where a higher ranking reflects a more favorable outcome for that category

[1] The total score is an average of the numerical rankings

[2] The estimated volume of waste treated *ex situ* is ten percent of the mixed and RCRA hazardous waste characterization volumes

Acronyms/Abbreviations:

CAMU - corrective action management unit

ET - Eastern Trenches

GHG - greenhouse gas

HFSDA - Hopland Field Station Disposal Area

IC - institutional control

LCY - loose cubic yards

MMBTU - million British thermal units

NO_x - nitrogen oxides

PM_{10} - particulate matter with a diameter less than 10 micrometers

PTW - principal threat waste

SO_x - sulfur oxides

ST - Southern Trenches

VOC - volatile organic compound

Table 1. Comparison of Elements Included in Alternatives SW-3 and SW-6- Laboratory for Energy-related Health Research/Old Campus Landfill, University of California, Davis

Element Number	Elements	SW-3	SW-6
1	Planning and oversight (includes documentation for H&S, QA/QC, construction site environmental controls); pre-remediation activities (includes land survey, decontamination facilities, pre-construction biological survey, and elderberry shrub cluster relocation)	X	X
2	Data gap trench investigations and sampling at the ST and the HFSDA	X	X
3	Institutional controls (ICs), including land use covenants and subsurface hazard notification	X	X
4	Install new groundwater monitoring wells	X	X
5	Post-remediation activities: storm water monitoring, groundwater monitoring, five-year reviews	X	X
6	Demolish one on-Site building; off-Site disposal or recycling	X	
7	Materials Management Plan (MMP) development and implementation	X	X
8	Confirmation sampling and backfill with clean fill	X	X
9	Dispose of known PTW off-Site from trenches in the ET, LFU-1, and LFU-2; backfill remaining non-PTW and impacted soil within trenches	X	X
10	Excavate additional exploratory trenches in the ET, LFU-1, LFU-2, and LFU-3; segregate and dispose of PTW off-Site; backfill remaining non-PTW and impacted soil within trenches	X	X
11	Excavate VOC "hot spots"; dispose of hazardous material off-Site, backfill non-hazardous material; in the eastern half of the ET VOC "hot spot" area, backfill with clean fill	X	X
12	*Ex situ* treatment of a fraction of the mixed waste and hazardous waste sent for off-Site disposal	X	X
13	Establish proper grades with low-permeability fill; plant vegetative cover; extend monitoring well casings to graded surface	X	
14	Surface water drainage enhancements across LFU-1, LFU-2, ET, and WBH; installation of extended detention basin	X	X
15	Installation of concrete-lined drainage channel along eastern edge of LFU-1 to 3 feet bgs; segregate and dispose of PTW off-Site, use remaining soil to grade and cover LFU-1	X	
16	Concrete-lined drainage channel along the eastern edge of LFU-3 sealed and maintained annually to limit infiltration through cracks	X	
17	Redirect drainage ditch south along perimeter of LFU-3	X	X
18	Surface water drainage enhancements across LFU-3; installation of extended drainage basin	X	X
19	Perform annual O&M on storm water infrastructure and caps; routine maintenance of drainage channels	X	X
20	Well decommissioning; installation of replacement wells		X
21	Demolish nine on-Site buildings; off-Site disposal of hazardous waste and recycling or on-Site disposal of non-hazardous waste in CAMUs		X
22	LFU-3: Excavate waste and contact soil below concrete-lined channel; segregate and dispose of PTW off-Site; place remaining waste under cap; replace concrete liner		X
24	Installation of vegetated swale along eastern edge of LFU-1; excavation to 10 feet bgs, segregate and dispose of PTW off-Site, place remaining waste under LFU-1 cap		X
26	ET: Excavate soil/solid waste and contact soil, segregate and dispose of PTW off-Site, return non-PTW soil/solid waste to excavation or beneath CAMU cap; ET North backfilled with clean fill		X
27	Grade and cover CAMUs with clean, low-permeability fill; install multiple-layer caps		X

Acronyms/Abbreviations:

bgs - below ground surface

CAMU - corrective action management unit

ET - Eastern Trenches

HFSDA - Hopland Field Station Disposal Area

H&S - health and safety

IC - institutional control

LFU - landfill unit

MMP - Materials Management Plan

O&M - operations and maintenance

PTW - principal threat waste

QA/QC - quality assurance/quality control

ST - Southern Trenches

VOC - volatile organic compound

WBH - Waste Burial Holes

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February 22, 2013

Mr. David Stensby
Remedial Project Manager
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street, SFD-9-3
San Francisco, California 94105-3901

Re: Preferred Alternative for the Final Feasibility Study for the University of California, Davis Areas, Volume I: Soil/Solid Waste and Soil Gas at the Laboratory for Energy-related Health Research/Old Campus Landfill Superfund Site, University of California, Davis

Dear Mr. Stensby:

The University of California Davis (UC Davis) would like to comment on the U.S Environmental Protection Agency's (EPA) potential selection of Alternative SW-6 as the preferred remedy for the soil/solid waste and soil gas areas at the Laboratory for Energy-related Health Research/Old Campus Landfill (LEHR) site as documented in EPA's letter dated January 29, 2013.

Based on this letter, UC Davis understands that EPA favors Alternative SW-6 because it:

- isolates waste from humans and animals,
- protects workers from radiological exposure,
- reduces infiltration, and
- optimizes diversion of storm water runoff.

As outlined in the Feasibility Study (FS) Volume I, Alternative SW-6 addresses these concerns by VOC "hot spot" and PTW removal, installation of three on-site corrective action management units (CAMU) with multiple layer caps, developing and enforcing institutional controls, installing and maintaining drainage enhancements, and groundwater monitoring.

UC Davis would like EPA to consider the selection of Alternative SW-3, VOC "hot spot" and PTW removal, installation of three on-site CAMUs with graded covers (graded at a minimum 1.5 percent slope to facilitate drainage and covered with a low permeability soil cover to reduce infiltration [thicknesses estimated between 2 and 3.25 feet] and a vegetative cover), developing and enforcing institutional controls, installing and maintaining drainage enhancements, and groundwater monitoring.

Per the National Contingency Plan (NCP) Code of Federal Regulations § 300.430(f)(1)(ii)(D), "Each remedial action selected shall be cost-effective, provided that it first satisfies the threshold criteria set forth in § 300.430(f)(1)(ii)(A) and (B)" of overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARAR). Each alternative presented in FS Volume I, except the No Action Alternative (Alternative SW-1), meets these threshold criteria.

Cost-effectiveness is then determined by evaluating three of the five balancing criteria noted in § 300.430(f)(1)(i)(B) to determine overall effectiveness: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. The elements comprising Alternatives SW-3 and SW-6 are compared in Table 1 (excerpted from Table 5-2 of FS Volume I, Elements Included in Soil/Solid Waste Alternatives) and a relative comparison of Alternatives SW-3 and SW-6 in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness is provided in Table 2. As is noted in these tables, there is little difference in the elements comprising these alternatives or in the overall effectiveness. Both alternatives remove the VOC-impacted soil and known locations of PTW, as well as excavating additional exploratory trenches for PTW (elements 9 and 10 on Table 1). Alternative SW-3 compares higher in short-term effectiveness with substantially less greenhouse gas emissions, total energy used, and gallons of fuel consumed, while Alternative SW-6 compares slightly higher in long-term effectiveness and permanence (Table 2).

A comparison of Alternatives SW-3 and SW-6 addressing EPA's preferences for Alternative SW-6 is provided below:

Isolates waste from humans and animals

Both alternatives rely on cover and institutional controls for waste isolation. The overall effectiveness of the isolation from humans and animals for each alternative is generally equivalent except Alternative SW-3 does not provide a biobarrier. A biobarrier could be added to Alternative SW-3 for approximately $400,000 (an increase of less than 10% of the total project cost).

Protects workers from radiological exposure

Under current site conditions, there is no radiological risk to workers unless they were chronically exposed to buried waste in a residential land use scenario. Both alternatives rely on cover and institutional controls to protect workers. The overall effectiveness of the radiological protection for Alternatives SW-3 and SW-6 is equivalent.

Reduces infiltration

Both alternatives rely on cover to reduce infiltration. Alternative SW-6 is more effective since it includes a synthetic liner. The Site landfill disposal units last received waste more than 30 years ago and the majority of the waste has been in place at the Site for about 50 years. Groundwater monitoring data from the Site show that contaminant concentrations associated with the uncapped land disposal units are declining and that leachate production has ceased. As such, the Alternative SW-3 cover system provides effective infiltration reduction under these circumstances. Given the anticipated longevity (i.e., >100 years) of the University of California system, any future releases will be addressed by the University, as needed.

Optimizes diversion of storm water runoff

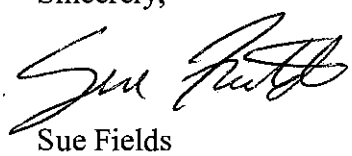
Both alternatives rely on cover and detention for diversion of storm water runoff. The overall effectiveness of storm water runoff optimization for each alternative is equivalent.

Per 300.430(f)(1)(ii)(D), overall effectiveness is compared to cost to ensure that the remedy is cost-effective. A remedy shall be cost-effective if its costs are proportional to its overall effectiveness. Table 3 provides a detailed comparison of cost between Alternatives SW-3 and SW-6; there is approximately a $6M difference in the capital cost of these similarly effective alternatives. The cost differential is found in pre-remediation costs of approximately $1.25M, excavation and backfill costs of approximately $1M, materials management and disposal costs of approximately $1.26M, and CAMU construction costs of $2.66M.

It is UC Davis's belief that Alternative SW-3 is the most cost effective remedy since it achieves an equivalent level of overall effectiveness (particularly if a biobarrier is added) as Alternative SW-6 at a substantially lower cost. Therefore, based on the remedy selection process in the NCP, UC Davis proposes that Alternative SW-3 be identified by EPA as the preferred alternative in the Proposed Plan.

UC Davis appreciates EPA's consideration of this matter and is available to discuss this issue at your convenience.

Sincerely,



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