

# Biodegradation of Petroleum Hydrocarbons: What Should be Monitored?

by Bart Simmons

In October, 1995, a team from the Lawrence Livermore National Laboratory (LLNL) and the University of California reported to the State Water Resources Control Board (SWRCB) on recommendations for changes to California's Leaking Underground Fuel Tank (LUFT) Program. The report included a recommendation to utilize bioremediation whenever feasible for the remediation of LUFT sites. The Air Force Center for Environmental Excellence (AFCEE) has developed a protocol<sup>1</sup> for the bioremediation of petroleum contamination which includes the water measurements listed in Table 1. The AFCEE guidance includes similar lists for soil and soil-gas. It includes some standard measurements; some which would require modification of standard procedures, e.g., including trimethylbenzene isomers with BTEX analysis; plus some non-standard measurements, e.g., ethane and ethene in groundwater. Clearly, if something like the AFCEE protocol were implemented, there would be a need for some additional standardization of sampling and analytical methods. The AFCEE protocol basically includes measurement of contaminants, electron acceptors (oxygen, nitrate, and sulfate), and metabolic products (ethane, ethene, carbon dioxide, and sulfide).

Table 1	
AFCEE Protocol for Water Measurements at Petroleum Contaminated Sites Being Bioremediated	
Aromatic hydrocarbons (BTEX, trimethyl benzene isomers)	Dissolved oxygen
Total hydrocarbons, volatile and extractable	Oxidation -reduction potential
Polycyclic aromatic hydrocarbons (PAHs) (optional)	Nitrate
Total fuel carbon (optional)	Sulfate
Dissolved organic carbon (optional)	Ferrous iron
	Dissolved sulfide
	Ethane, ethene
	Carbon dioxide
	pH
	Conductivity
	Alkalinity
	Chloride

## AFCEE Analytical Protocols for Ground Water<sup>1</sup>

LUFT monitoring may require tests in addition to the AFCEE protocol. For example, as discussed in the last column, MTBE is now required for monitoring at LUFT investigations in some regions of California, and may serve as a conservative tracer of contamination during bioremediation monitoring.

An unresolved question is whether bioremediation monitoring should include monitoring for additional metabolites. For example, benzylsuccinic acid, benzylfumaric acid and related compounds have been proposed for monitoring anaerobic bioremediation.<sup>2</sup> These compounds are not measured by traditional methods.

LLNL/UC and the Department of Defense (DoD) are planning a Petroleum Hydrocarbon Cleanup Demonstration Program, which would demonstrate a tiered risk-based corrective action process based on the American Society for Testing and Materials (ASTM) risk-based corrective action (RBCA) framework. This RBCA framework would also support a risk management strategy which depends heavily on passive microbial degradation of petroleum hydrocarbons.

Meanwhile, the SWRCB SB1764 Advisory Committee has also addressed the issue of biodegradation of

petroleum hydrocarbons. They found that current sampling and analysis is inadequate to assess the potential for intrinsic bioremediation. They recognized the AFCEE protocol, and also recognized the utility of biochemical markers such as benzoic acid or succinic acid derivatives.

The proposed LLNL/UC/DoD Demonstration Program would help to translate the preference for bioremediation and risk-based cleanup into practical protocols. A future column will address the risk-based corrective action process and the question of what risk-based measurements should be.

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<sup>1</sup> *Technical Protocol for Implementing the Intrinsic Remediation with Long-Term Monitoring Option for Natural Attenuation of Dissolved-Phase Fuel Contamination in Ground Water, AFCEE, Brooks Air Force Base, Draft, 1994.*

<sup>2</sup> *Beller, HR, W-H Ding and M Reinhard, Byproducts of Anaerobic Alkylbenzene Metabolism Useful as Indicators of in Situ Bioremediation, Environ. Sci. Technol., 1995, 29, 2864-2870.*

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## Branch Activities

### ***Sacramento Branch***

On January 31, the Sacramento Branch hosted Dr. Charles P. Remund of South Dakota State University, who lectured on Thermal Enhancement of Bentonite Grouts for Vertical Ground Source Heat Pump Systems. Dr. Remund gave an overview of the ground source heat pump industry, which is currently booming. GSHP systems are being incorporated in new home and building designs at a rate of 40,000 units per year (1994), and are anticipated to increase to 400,000 units per year by 2001. The Geothermal Heat Pump Consortium, who sponsored Dr. Remund's trip to California, is sponsoring research into the thermal properties of bentonite grouts used in GSHP installations, and examining issues of regulatory priorities for long term safety and groundwater quality protection. Dr. Remund showed slides of experiments documenting the potential conduits for migration of surface contamination into underlying aquifers. Dr. Remund also spoke of a data gap in the area of understanding thermal conductivity of soils, which leaves GSHP designs somewhat imprecise. He is working on the establishment of a thermal performance index which may be used to classify the ability of a soil to transfer heat based on texture alone. Dr. Remund left 3 reprints of his papers with the Sacramento Branch; interested parties may obtain a copies by contacting Tom Mohr.

The February meeting, sponsored by the law firm of Downey, Brand, Seymour, and Rohwer, featured a talk from George O'Connell and Craig Allison, both attorneys with Downey Brand Seymour and Rohwer, on Defending Environmental Enforcement Actions. Members in attendance were captivated with the at times chilling message of consultant liability for client's violations, and the increasingly frequent and aggressive prosecution of failure to comply with environmental statutes. A summary of their talk appears in this issue of Hydrovisions. Also in February, a small group of Sacramento Branch officers and members hosted Bill Knight, Executive Director of the American Institute of Professional Geologists (AIPG), for a luncheon to discuss the changing landscape of employment opportunities for geologists, and to discuss issues of professional registration. The AIPG certifies Professional Geologists, a distinction recognized throughout the United States, and useful for accessing opportunities to practice geology in Europe. Mr. Knight recommends geologists retool to become multi-disciplinary professionals proficient in management, engineering, and a variety of other combinations to make themselves more employable. We are also advised to be prepared to seize opportunities beyond our borders ... for more information, contact Bill Knight at 303-431-0831.

The Sacramento Branch held its March event at the Privatbrauerei Hubsch, aka Sudwerk, USA's #1 craft brewery, located in Davis. The focus of this event was the social benefits of the GRA, providing an opportunity for members to get acquainted and discuss issues in common. The Sacramento Branch will seek to conduct another social event later this summer at an El Dorado Hills winery.

The April meeting was sponsored by Law Engineering and Environmental Services, and was held on Thursday the 18th at the Royal Hong King Lim Restaurant, 419 J Street, Sacramento, with social hour beginning at 5:00 pm, and the regular meeting at 6:00. Our presentation featured a panel discussion of the Lawrence Livermore National Laboratories Report on California's Leaking Underground Fuel Tanks (Historical Case Analysis and Recommendations to Improve the Cleanup Process). The panel consisted of Dr. Brendan Dooher, a primary author of the LLNL Report, James Giannopoulos, Contract Manager with the State Water Resources Control Board, Gordon Boggs, UST Program, RWQCB, and Mr. Mike Keenan, Hazmat Specialist, Sacramento County Environmental Health. This event was co-sponsored by PEMA, the Professional Environmental Marketing Association.

On May 16, the Homestake Mining Company hosted a talk by Ray Krauss, Environmental Manager of the McLaughlin gold mine, located in the Coast Ranges at the Lake/Napa/Yolo County borders. Mr. Krauss discussed issues of water quality protection in open pit mining operations. Discussion focused on geology and economic mineralogy of the McLaughlin mine, the natural and human history of the McLaughlin mine property, the history of mercury extraction in the Coast Ranges and present day consequences and water

quality protection challenges, and general aspects of environmental management for large mining operations. On Saturday, May 18, Homestake Mining company hosted a tour of the McLaughlin Mine.

**Future Events:** June: Wayne Pearce, President of Phase Three Environmental management, will give an entertaining talk on presentations, the regulatory interface, and a look at the lighter side of an assortment of challenges we all face in the environmental industry. Member input to branch activities is welcome. Officers meet on the last Wednesday of each month at the Tower Cafe on Broadway, Sacramento. Call first to confirm meeting locations.

***Southern California Branch***

Many thanks to our April Meeting speaker, Mr. Ken Williams, Chief of the Pollutant Investigation Unit of the California Regional Water Quality Control Board, Santa Ana Region (RWQCB). Ken provided us with a General Overview and Preliminary Evaluation of Methyl Tert-Butyl Ether (MTBE) Data. Key points presented during Ken's talk are:

- MTBE advects with groundwater and plumes are typically 1.5 to 2 times the size of typical benzene plumes.
- Underground Storage Tank (UST) sites are the largest contributors for MTBE in groundwater.
- MTBE appears resistant to biodegradation in either aerobic or anaerobic conditions.
- Remediation of MTBE in groundwater is more difficult than other gasoline components, BTEX.
- Production wells in the City of Santa Monica screened at depths of 200 to 450 feet below ground surface had MTBE concentrations of 490 to 590 parts per billion in mid-March 1996. They have had to shut down three of their five production wells.
- The 1993/1994 USGS study found that MTBE was the second-most frequently detected groundwater contaminant in their National Water Quality Assessment Program.
- A statewide policy for MTBE has not been developed yet. UST sites may be required to analyze for MTBE. Implications to closed sites or property transfers has not been assessed.

The Southern California Branch's next Dinner Meeting will be held on Wednesday, July 17, 1996. Our keynote speaker will be Dr. Lorne Everett of Geraghty and Miller, who will be discussing the revised LUFT Manual. For meeting information contact Jim Carter at 714/ 447-6868.

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## Senior Environmental Consultant

### The Opportunity:

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## **The Growing Web of Environmental Criminal Liability: Are Environmental Consultants Next to be Entangled?**

*George L. O'Connell, Attorney*

*Craig C. Allison, Attorney*

In the early years of environmental regulation, criminal prosecutors typically focused their attention only on those who clearly and intentionally violated environmental laws, the notorious "midnight dumpers." No longer. In recent years, we have seen an explosion of environmental criminal investigations and prosecutions against companies and individuals. All too frequently, these cases are being pursued against those who are making good faith attempts to interpret and comply with the myriad of complex and often changing environmental rules. Alleged violations of environmental law in the past were typically handled administratively with the imposition of modest civil penalties. Increasingly, however, alleged environmental violations are being pursued in the criminal courts. And criminal prosecutions are not limited to actions against the company. Prosecutors are regularly seeking severe criminal sanctions, including substantial monetary penalties and jail time, against managers and higher levels who were in a position to prevent the alleged environmental violations, but failed to do so.

All signs indicate that the trend towards increased criminal prosecutions for environmental noncompliance will continue at both the federal and state level. The State Attorney General is in the early stages of working with the California District Attorney's Association to further strengthen environmental prosecutions by state prosecutors. Moreover, many district attorney's offices have full time environmental units staffed with deputy district attorneys who are knowledgeable about environmental laws, and committed to criminal prosecutions.

On the federal level, the United States Attorney's offices in Los Angeles and Sacramento have been bringing criminal indictments and are actively pursuing Grand Jury investigations in numerous environmental cases. Indeed, the United States Attorney for the Eastern District of California, which covers Sacramento and the Central Valley, has publicly announced that environmental crimes, together with medicare fraud, are the top priorities of his office. Further, the U.S. Environmental Protection Agency has hired several additional criminal investigators in Region IX. And nationwide, the FBI has assigned between 75 and 100 agents to work on environmental criminal cases. All of these developments illustrate the high priority given to environmental crimes by local, state, and federal prosecutors.

What is the significance to the environmental consultant or contractor of the government's zealous new efforts to criminally prosecute alleged environmental violations? Does the environmental professional need to worry about this recent trend of increased prosecutions in the environmental arena? The answer to this question is a resounding "yes." Part I of this article below discusses three undesirable ways in which the environmental consultant may unwittingly come in contact with environmental criminal laws:

1. When the consultant's own actions make him or her a direct target of a criminal investigation or prosecution;
2. When the consultant's advice is raised as a defense in a later criminal enforcement action against the consultant's clients; and
3. When the consultant is criminally prosecuted for providing a client erroneous advice on environmental matters.

Part II of this article, which will appear in a later volume of Hydrovisions, will identify some warning signs that may indicate that an environmental consultant's client is the subject of an environmental criminal investigation. It will also discuss the consultant's role in assisting counsel in the pre-indictment and pre-trial phase of defending a criminal environmental matter.

### **The Environmental Consultant as a Direct Target of a Criminal Investigation**

The government's increased aggressiveness in prosecuting environmental crimes has disturbing



implications for environmental consultants. Consultants need to be aware of the very real possibility that a consultant's own actions may become the focus of a prosecutor's next environmental criminal investigation.

All environmental consultants understand that much of their work is governed by environmental laws and regulations. Virtually all of these same laws also provide the government the option of seeking stiff criminal sanctions as an enforcement tool against violators of these environmental laws and regulations. For instance, many environmental consultants must contend with drill cuttings or produced water in connection with assessing or characterizing the contamination problem at a project site. This waste material may contain contaminants in concentration that render the waste "hazardous" under federal and/or state law. If so, numerous requirements are triggered concerning the labelling, handling, storage, transportation, and disposal of such "hazardous wastes." Failure to comply with these requirements may result in the consultant facing criminal charges if a zealous prosecutor learns of the violations.

It also would be a mistake to assume that consultants will be immune from scrutiny because the government has "bigger fish to fry" in the environmental area. In our experience, criminal investigators and prosecutors at both the state and federal level have not hesitated to closely scrutinize the work of environmental consultants and contractors. At least one environmental consultant is presently under criminal investigation for transporting a mercury contaminated waste without a manifest, and for disposing of such waste at an unpermitted landfill. In another case, a state agency has taken the position that an environmental contractor or consultant hired to clean up a contaminated site was the "generator" of the waste. It is the government's position in that case that the generator is the person who "caused" the activity or material to become regulated.

In short, we see no indication that the government intends to give the environmental consultant any sort of break in its quest to prosecute criminal environmental wrongdoing. Because environmental consultants are fair game in the growing arena of environmental crimes, there are three important points for the environmental consultant to understand and appreciate.

### **Knowledge That Conduct Was Unlawful is Not Necessary**

Most environmental crimes are considered to be "general intent" crimes. This means that the defendant can be convicted even if he does not realize that he was engaging in illegal or improper conduct. Although many state and federal environmental criminal statutes require the defendant to have "knowingly" engaged in the alleged improper activity, most courts have broadly interpreted the "knowing" element of the crime to mean that the defendant merely knew he was engaging in the conduct in question. See *United States v. Weitzenhoff*, 1 F.3d 1523 (9th Cir. 1993).

So, for example, courts have upheld felony convictions under RCRA for disposing of hazardous waste without a permit where the evidence showed that the defendant did not know that the material in question was "hazardous" within the meaning of the RCRA regulations or that the disposal location did not have a valid disposal permit. See *United States v. Hoflin*, 880 F.2d 1033 (9th Cir. 1989) (Government not required to show that defendant knew that facility lacked a permit as element of the RCRA disposal crime); See also *United States v. Hays International Corporation*, 786 F.2d 1499 (11th Cir. 1986). In the Hays case, the defendant was found guilty of a RCRA crime for knowingly transporting hazardous waste to an unpermitted facility simply because he knew what the waste was (a mixture of paint and solvent). The court did not require proof that defendant knew that the paint waste was a "hazardous waste" within the meaning of RCRA regulations.

Another court has held that the individual defendants' knowledge that sewage from a treatment plant was going into the ocean was all the government needed to show to obtain a felony conviction under the Clean Water Act. The government was not required to prove that the defendants knew that such discharges violated the law or the terms of the treatment facility's NPDES permit. Evidence that the defendants reasonably believed that such discharges fell within the terms of their permit was not relevant. See *United States v. Weitzenhoff*, 1 F.3d 1523 (9th Cir. 1993).

## **Criminal Sanctions Are Stringent**

Most criminal environmental statutes are serious crimes: they carry heavy criminal penalties, including lengthy periods of incarceration. The violation of any rule, regulation, or requirement governing the management of hazardous waste under California law, for instance, constitutes a misdemeanor offense which carries a fine of \$1,000 and imprisonment of up to six months. See Health & Safety Code §25190. Further, certain specific conduct involving the improper handling of hazardous waste triggers much harsher criminal sanctions. For instance, the knowing or negligent disposal or transportation of hazardous waste to a facility without a permit carries a criminal fine of up to \$100,000 for each day of the violation and imprisonment for up to three years under the California Health & Safety Code. See Health and Safety Code §§25189.5(b) and (c). Similarly, severe criminal penalties attach to violations of federal environmental laws, including the Safe Drinking Water Act, the Clean Water Act, and the Resource Conservation and Recovery Act. See, e.g., 42 U.S.C. §6928.

## **Conduct Need Not be Egregious to be Handled Criminally**

The government can and does file criminal charges in circumstances where no real harm to the environment has occurred and where no evidence exists that the defendants knew that their actions violated the law. Businesses have been threatened with felony charges under state law for such trivial events as allegedly failing to report the “spill” of incidental drippages of hydraulic fluid from heavy equipment at a quarry site. Such charges were threatened even though the drops of hydraulic fluid did nothing more than cause a stain on the surface of the soil no larger than the spots of motor oil present in most of our driveways.

In another case, the United States Attorney criminally indicted a business and its owner for placing inert concrete rip-rap along the banks of a river-front property without a permit from the Army Corp of Engineers. Charges were brought even though the riprapping actually served to enhance environmental protection by preventing silt and sediment from entering the river. Further, the fact that the businessman did not know that he needed a permit for this activity did not save him from criminal indictment.

## **What is The Significance of All This for the Environmental Consultant?**

All of this means that the environmental consultant must be constantly aware of the risks involved in non-compliance with the environmental laws. A hypothetical will illustrate this point:

Suppose an environmental consultant completes a site characterization project and elects to leave behind produced water or drill cuttings in sealed drums thinking that the material is not hazardous waste under Federal or California law. The consultant further believes that the property owner will properly dispose of the waste. Also suppose that the drill cuttings or waste water in fact contain levels of benzene or other contaminants which render the material a regulated hazardous waste.

Under both state and federal law, the “abandonment” of hazardous waste is considered a “disposal” for purposes of criminal penalties. See California Health & Safety Code §25113. If felony charges are later brought against the consultant for the improper “disposal” of a hazardous waste, the fact that the consultant did not realize that the waste was “hazardous” or that leaving it behind was a type of “disposal” likely would not be a defense. Further, in our experience, the fact that the hazardous waste was safely contained in sealed drums and did not cause any environmental damage would be of little value in dissuading the government from criminal prosecution. Finally, arguments that the property owner should have been responsible for the proper disposal of the waste likely would have little bearing on the consultant’s potential criminal liability for the abandonment of the hazardous waste.

The above scenario serves to demonstrate just one of the many possible ways that an environmental consultant may gain unpleasant, first hand experience with environmental criminal laws. The work of the environmental professional is regulated by numerous and varied laws and regulations. As most consultants can attest, many such laws contain technical and arcane requirements, and do not always comport with common sense. Yet many of these same laws contain very serious criminal penalties. And, at an alarming rate, prosecutors are quick to seek such criminal penalties against companies and individuals alike who



have not followed these requirements to the letter.

## **A Consultant's Faulty Advice to a Client May Have Hazardous Consequences**

An environmental consultant may also unwittingly be exposed to the criminal justice system if a client who is charged with an environmental crime defends himself with the claim that he engaged in the allegedly wrongful conduct on the advice of the environmental consultant. Further, under such circumstances, the prospect exists that an overly zealous prosecutor may consider the consultant's environmental advice to be so faulty that he pursues criminal charges directly against the consultant for "causing" a violation of environmental laws. This possibility is not far-fetched; there are signs prosecutors are moving in this direction.

## **The "Advice of Professional" Defense**

Generally, a defendant's otherwise unlawful conduct is excused where he reasonably relied on the advice of his attorney that his conduct was proper and lawful. Although this defense has typically been limited to the "advice of counsel," courts recently have recognized a defense based on the advice of other qualified professionals. A defendant may be able to avoid criminal liability for tax fraud, for instance, by showing that he reasonably acted on the advice of his accountant. When such a defense is raised, the government and the defendant are usually granted an unhampered right of access to the advisor's entire file and the advice given will be closely evaluated and critiqued. It is never a pleasant experience for a professional to have his or her advice called into question under such circumstances.

In view of the legal issues inherent in the advice and recommendations given to clients by environmental consultants, we are beginning to see the emergence of an "advice of environmental consultant" defense in some environmental criminal matters. Property owners and companies generating waste frequently turn to environmental consultants to answer questions of a legal nature, such as:

Is my waste stream "hazardous?" Is the pond on my property a "wetland?" Have I spilled a "reportable quantity" of a hazardous material?

If a consultant renders advice on such issues and the client relies on it, such advice will undoubtedly be raised as a defense to any future enforcement actions.

## **Faulty Advice May be Considered Criminal**

With the number of environmental criminal cases multiplying every year, an aggressive prosecutor may well attempt to take the "advice of professional" defense one step further and seek to hold the environmental consultant directly liable for environmental crimes committed by the client in reliance on the consultant's advice. Indeed, we have already seen a disturbing case of this sort filed against environmental attorneys by the Solano County District Attorney's Office.

In 1991, the Solano County District Attorney's office charged a San Francisco law firm and a 28 year old associate with three felonies for advising a client who filed bankruptcy that it should not remove drums of hazardous waste after being evicted from the site it was leasing. The prosecutor claimed that by giving this erroneous advice to "abandon" the waste, the law firm knew or reasonably should have known that it was "causing" a disposal of hazardous waste. While this case was eventually dismissed by the court, it does send a chilling signal of the willingness of eager prosecutors to prosecute faulty advice by environmental professionals.

For example, as many of you undoubtedly are aware, various state and federal statutes require the "immediate" reporting of a spill of a hazardous substance in excess of a specified "reportable quantity." The case law demonstrates that the government has not hesitated to file criminal charges against businesses who fail to observe these reporting requirements. And if a consultant were to incorrectly advise a client not to report a spill, such conduct might well come within the scope of criminal statutes.

It goes without saying that any advice or recommendation given by an environmental consultant must be sound. The consultant can only do so by staying well informed of ever-changing environmental laws and

regulations. Further, while some judgment must be exercised, it is usually advisable to document in detail the thought process and rationale underlying a consultant's advice or recommendations. If, for instance, the consultant advises a client that a spill need not be reported because it did not involve a reportable quantity, the consultant's documented summary of observations and calculations would be very useful. Similarly, the consultant should closely document information received from clients as well as the advice given, so that the basis for such advice is well documented. And if there are any doubts or uncertainties, the consultant should be sure that qualified environmental counsel is involved to review the situation.

### **Conclusion: The Bottom Line**

The Government has shown an increased willingness to respond even to minor violations of environmental laws with criminal charges. Further, courts have broadly construed the criminal provisions of these laws to allow convictions even if the person charged did not know his or her action was unlawful or improper. Thus, it is more important than ever that environmental consultants continuously stay informed of, and rigorously observe, all environmental rules and regulations governing their work. Taking such rules and regulations lightly in this day and age is a high risk gamble which could have devastating criminal consequences for your company and you personally as the person in charge of your company's consulting activities.

*George L. O'Connell is a senior partner at the Sacramento law firm of Downey, Brand, Seymour & Rohwer where he specializes in the defense of White Collar Criminal Matters and Complex Civil Enforcement Actions. Craig C. Allison is a senior associate at Downey, Brand, Seymour & Rohwer and is principally involved in environmental litigation, including private cost recovery actions and environmental criminal defense. Copyright © 1996 George L. O'Connell and Craig C. Allison. All rights reserved.*

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## GRA On-Line!

*by Jim Graham*

Come visit GRA on the Internet! Our home page address is <http://www.cwo.com/~gra>. The site is currently under construction, but is available for examination. Our Web page currently provides membership information, our mission statement and Branch Activities. Web Page visitors can send messages to our Executive Director, Jim Graham, who currently oversees the maintenance and development of the page. The objective for the Web Page is to keep you abreast on GRA's activities, legislative issues, technical issues, and positions being considered and to provide you a forum to state your opinion on issues they affect you and your business. When fully developed, the Web Page will allow interaction with GRA members on technical issues, legislative matters, and other topics as they arise. You will be able to direct your responses to current issues directly to the individual responsible for that topic. For example, responses to technical issues will go directly to Robert Nicholson, the Chair of the GRA Technical Committee. Because the site will be changing during construction, please visit it often to see the page develop. When the page is developed, we will be updating the information contained on the page at regular intervals. Legislative information will be posted at regular intervals and updated as needed. New technical issues will be discussed and updated periodically. Check in with the page on a regular basis to see what's new with GRA. Drop a note providing us with your comments on articles read in Hydrovisions. Pose questions to the various contributors in Hydrovisions. Contribute articles to Hydrovisions. Think of the possibilities. See you on the Internet!

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# Lawrence Livermore National Laboratory Report Survey

*Prepared by GRA Technical Committee*

GRA is currently evaluating the Lawrence Livermore National Laboratory (LLNL) report entitled, Recommendations to Improve the Cleanup Process for California’s Leaking Underground Fuel Tanks (LUFTs) and a companion document entitled, California LUFT Historical Case Analyses. We have prepared this survey to provide our membership with the opportunity to comment on the methods, conclusions and recommendations contained in these reports. This information would then be used to assist GRA in developing a position on the report. Results of the survey will be presented in our next edition of Hydrovisions.

## **Background**

LLNL was contracted by the California State Water Resources Control Board (SWRCB) to perform a historical evaluation of the fate and transport characteristics of petroleum leaks in California. Information acquired through this evaluation was to assist the decision making process for LUFT cleanup policies. The LLNL report made three primary recommendations:

1. Passive bioremediation should be used as a remedial alternative whenever possible.
2. SWRCB policies should be modified to allow for risk-based decision making for LUFT cleanup.
3. LUFT cleanups that emphasize passive bioremediation should require risk-based decision making.

For this survey, we have listed key sections of the LLNL report and are requesting that respondents circle a number from 1 to 5 where provided, with a 1 representing a Strongly Disagree and a 5 representing a Strongly Agree with the LLNL report. Questions listed under LLNL Study Conclusions have been subdivided to permit the respondent an opportunity to comment on the specifics of the LLNL study and/or their experience. Respondents are encouraged to provide additional comments as needed either on the form or on a separate sheet.

1. Strongly Disagree
2. Somewhat Disagree
3. Undecided
4. Somewhat Agree
5. Strongly Agree

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## **LLNL Study Design**

The LLNL study approach included an evaluation of LUFT procedures, environmental fate and transport of petroleum constituents, and applicable LUFT cleanup characterization and cleanup technologies.  
Was the approach thorough? 1 2 3 4 5

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The evaluation methods included a comprehensive review of scientific literature, evaluation of available information from various agencies and institutions, evaluation of white papers submitted to the SB 1764 Advisory Committee, and analyses of e studies.  
Were the Study methods appropriate? 1 2 3 4 5

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The study included historical case analyses. These were conducted following development of criteria to collect specific sites for analysis, development of a database to organize key data, and statistical analysis of the data.  
Do you agree with the methods used to evaluate existing LUFT data? 1 2 3 4 5

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## **LLNL Study Conclusions**

The LLNL arrived at several conclusions based on their evaluation of 271 study sites that met data quality criteria for the study. Each conclusion is listed below for your consideration. Is the conclusion "Fuel Hydrocarbons Have Limited Impacts On Human Health Or The Environment" supported by the research conducted during the study? 1 2 3 4 5

Has your experience been consistent with this conclusion? 1 2 3 4 5

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Does the report demonstrate that The Cost Of Cleaning Up LUFT Fuel Hydrocarbons Is Often Inappropriate When Compared To The Magnitude Of The Impact On California’s Groundwater Resources? 1 2 3 4 5

Has your experience been consistent with this conclusion? 1 2 3 4 5

Does the report support the conclusion that LUFT Groundwater Cleanup Requirements Are Derived From Policies That Are Inconsistent With The Current State Of Knowledge And Experience? 1 2 3 4 5

Has your experience been consistent with this conclusion?1 2 3 4 5

Does the report support the finding that Current Understanding Of Passive Bioremediation Processes In The Subsurface Environment Is Not Reflected In The Present LUFT Cleanup Process? 1 2 3 4 5

Has your experience been consistent with this conclusion? 1 2 3 4 5

Does the report confirm that There Are Few Situations Where Pump And Treat Should Be Attempted? 1 2 3 4 5

Is it Technologically and Economically Infeasible to reach Maximum Contaminant Levels (MCLs) of 1.0 ppb for benzene using pump and treat or other actively engineered groundwater remediation alternatives? 1 2 3 4 5

Has your experience been consistent with this conclusion? 1 2 3 4 5

Does the report substantiate A Risk Based Corrective Action (RBCA) Framework Offers a Common Decision-Making Process to Systematically Address LUFT cleanup? 1 2 3 4 5

Has your experience been consistent with this conclusion? 1 2 3 4 5

Do you agree that Modifications Would Be Necessary For The ASTM RBCA Framework To Be Used In California? 1 2 3 4 5

Do you agree that A Common, Systematic Decision-Making Process Using Standard Procedures Will Reduce Inconsistencies In Soil Cleanup Requirements? 1 2 3 4 5

Do you agree that TPH Measurements Should Not Be Used To Predict Benzene Concentrations? 1 2 3 4 5

Lastly, on a related topic, but one that is not discussed in the LLNL report: What are your thoughts on the recent focus of regulatory agencies on Methyl Tert Butyl Ether (MTBE) an oxygenated fuel additive used to burn cleaner fuels, that is very persistent and advects with groundwater? Apparently, MTBE plumes in groundwater are larger in maximum concentrations, larger in areal extent, and have a greater mobility than the typical Benzene, Toluene, Ethylbenzene and Total Xylene (BTEX) plumes. Agencies are currently considering requiring that soil and groundwater samples at UST sites be tested for MTBE, and that MTBE plumes be characterized. Please provide your written thoughts.

**Some Information About You**

Your professional focus, such as regulatory agency, regulated industry, water purveyor, environmental consultant, attorney, academia, etc.:

Number of years in this profession:\_\_\_\_\_

Your GRA

Branch: \_\_\_\_\_

Percentage of work that involves

USTs: \_\_\_\_\_

Additional Comments (attach additional sheets as needed)

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Thank you very much for participating in this survey. Please send your completed survey response to:

**LLNL Survey Response, GRA**

P.O. Box 1446

Sacramento, CA 95812

Members can also respond to the survey via GRA's web page at <http://www.garc.org>

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## PRESIDENT'S MESSAGE

*By Susan Garcia*

How quickly the first portion of 1996 has vanished! Seems like just a short time ago that the GRA Board of Directors met to discuss our 1996 Budget and forth coming events. A lot has happened within these past few months that are worthy of note and require some commendations.

- GRA develops a Web Page on the Internet! Special thanks to Jim Graham (GRA Executive Director), Kent Parrish (State Vice President), Tom Mohr (Sacramento Branch President), and all other individuals who helped design the page. Our Web Page is currently in the preliminary stages, but ultimately, we see it as a mechanism to keep our membership abreast of upcoming events, topics of interest, and membership information. We also see the Web Page as a way for our membership to provide comments to us. Our objective will be to encourage bulletin board exchanges for our membership. We are exploring Web Page advertisements from groundwater suppliers to defray the costs for updating the page. Our internet address is <http://www.cwo.com/~gra>.
- GRA issued a preliminary review draft of the USEPA Grant Groundwater Basin Management Guidance Document. Special thanks to Anthony Saracino, Carl Hauge, Steve Bachman and Kevin Neese for their efforts in preparing this document. Thank you to all those individuals who took time to provide constructive comments. Review comments for this document are currently being incorporated and a final document is expected later this year.
- GRA has become a member of the Association of California Water Agencies (ACWA) and Anthony Saracino has been appointed to the Groundwater Committee as GRA's representative. As members of ACWA, GRA members will be eligible for member discounts at ACWA functions and events. Anthony Saracino recently represented GRA at ACWA's Spring Conference in Monterey. Anthony provided an overview of the USEPA Grant Groundwater Basin Management Guidance Document. Be looking for an overview on the conference and Anthony's presentation in the next issue of Hydrovisions.
- GRA's Technical Committee is preparing a technical response to the Lawrence Livermore National Laboratory (LLNL) report. See our survey contained in this issue of Hydrovisions. Please take the time to respond to this survey so that we can appropriately represent you.
- GRA's Fifth Annual Meeting is scheduled for October 10 and 11, 1996 at the Wyndham Garden Hotel in Costa Mesa, California (in southern California, near Newport Beach, Anaheim, and John Wayne Airport). Our theme for this meeting is Multi-Disciplinary Solutions to California's Groundwater Issues. Be looking forward to such topics as Proposed Revisions to the Clean Water Act (such as arsenic standards); Reclaimed Water Issues; Effective Implementation of MTBE Policy—Implications on the Groundwater Industry; Superfund Updates; and much more. Our Call For Papers was sent out earlier this year. We currently are still accepting abstracts. Individuals interested in speaking or exhibiting at the Annual Meeting should contact me at (714)444-5515.
- Our annual training seminar is tentatively scheduled for November 1996. Please contact Brian Lewis for additional information.
- Our 1997 Annual Meeting will be in San Francisco. The meeting is currently being planned. Individuals interested in helping organize this event should contact Anthony Saracino.
- GRA is planning a retreat in 1997 to discuss our five year and ten year goals for the organization. Individuals interested in organizing this event should contact David von Aspern.
- The California Groundwater Map jointly developed by GRA and the Water Education

Foundation is currently available from the Water Education Foundation at (916)444-6240.

- Hydrovisions new editor is Jim Graham. Individuals interested in submitting technical articles should contact Jim at (916)444-1380.

I hope this overview of GRA's recent accomplishments and future plans helps members appreciate the use of their annual membership fee. Please feel free to comment on this article or other items of interest via e-mail. My internet address is 73661.1162@compuserve.com.

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**Profit and Loss\***  
*January through December 1995*

<b>Income</b>		
Advertising Income		\$ 700.00
Contributions Income		
Unrestricted	<u>\$ 547.00</u>	
Total Contributions		\$ 547.00
Grants		\$ 42,340.24
Interest		\$ 641.87
Membership Dues		\$ 27,795.00
Program Fees		<u>\$ 17,504.47</u>
<b>Total Income</b>		<b>\$ 89,528.58</b>
<b>Expense</b>		
Association Promotions/Develop		\$ 436.56
Bank Service Charge		\$ 3.00
Contract Labor		
Grant	\$ 15,528.83	
Membership	\$ 4,155.48	
Contract Labor Other	<u>\$ 788.73</u>	
Total Contract Labor		\$ 20,473.04
Licenses and Permits		\$ 100.00
Meeting Expense		
Annual Meeting	\$ 262.88	
Director's Meeting	\$ 727.85	
Seminar	\$ 314.32	
Meeting Expense-		

Other	<u>\$ 11,863.59</u>	
Total Meeting Expense		\$ 13,168.64
Office Supplies		\$ 142.09
Postage and Delivery		
Hydrovisions Mailing	\$ 1,039.89	
P.O. Box	\$ 63.00	
Postage and Delivery-Other	<u>\$ 3,626.76</u>	
Total Postage and Delivery		\$ 4,729.65
Printing and Reproduction		
Hydrovisions	\$ 8,699.50	
Letterhead	\$ 705.77	
Seminar Materials	\$ 5,918.61	
Printing and Reproduction-Other	<u>\$ 991.08</u>	
Total Printing and Reproduction		\$ 16,314.96
Professional Fees		
Accounting	\$ 385.00	
Executive Director	<u>\$ 7,500.00</u>	
Total Professional Fees		\$ 7,885.00
Supplies		\$ 898.00
Telephone		\$ 878.71
Travel and Entertainment		
Entertainment		
Executive Director	\$ 70.00	

Total Entertainment	\$ 70.00
Meals	\$ 427.60
Travel	<u>\$ 1,250.47</u>
Total Travel and Entertainment	<u>\$ 1,748.07</u>
Total Expense	<u>\$ 66,777.81</u>
Net Ordinary Income	<u>\$ 22,750.77</u>
Net Income	<u>\$ 22,750.77</u>

**\*unaudited**

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