ROCKY FLATS CITIZENS ADVISORY BOARD
MINUTES OF WORK SESSION
December 7, 1995

FACILITATOR: Reed Hodgin, AlphaTRAC

Linda Murakami called the meeting to order at 6 p.m.

BOARD / EX-OFFICIO MEMBERS PRESENT: Alan Aluisi, Jan Burda, Lloyd Casey, Tom Clark, Ralph Coleman, Mike Freeman, Tom Gallegos, Sasa Jovic, Michael Keating, Jack Kraushaar, Beverly Lyne, Tom Marshall, LeRoy Moore, Linda Murakami, David Navarro, Gary Thompson / Jeremy Karpatkin, Tim Rehder, Steve Tarlton

BOARD / EX-OFFICIO MEMBERS ABSENT: Tom Davidson, Eugene DeMayo, Kathryn Johnson, Albert Lambert

PUBLIC / OBSERVERS PRESENT: Kenneth Werth (citizen); Mary Holland (ECA); Seth Kirshenberg (ICMA); Jim LaVelle (CDM); Joe Rippetoe (IMAA); Lou Johnson (EPA); Al Teter (citizen); Howard Bachman (citizen); Ray Horton (citizen); Robert Warther (DNFSB); John Barton (Local 8031); Bob Pressey (RMI); Bob True (CDPHE); Mike Gasser (citizen); L. C. Keenan (Bio Ecologics); L. A. Helmerick (DOE/CED); Jim Stone (RFCC); T. DuPont (citizen); Kelly Coleman (CSM); Patrick Etchart (DOE); Jonathan Wade (citizen); G. E. Moore (citizen); Susan Johnson (NCSL); Kay Ryan (SWEIS); Delores W. H. Schierkolk (citizen); Carl Spreng (CDPHE); John Golden (CSM); Jill Paukert (K-H); Nancy Tuor (K-H); Allen Schubert (K-H); Peter Bierbaum (ERM); William P. Harroun (K-H); Gerd von Glinski (citizen); Doyle Corlis (citizen); Jill McLaughlin (K-H); Don Scrimgeour (CAB interim project administrator); Ken Korkia (CAB staff); Erin Rogers (CAB staff); Deb Thompson (CAB staff)

PUBLIC COMMENT/BOARD RESPONSE RE: EPA PLUTONIUM STANDARDS (Ken Korkia, CAB staff): At last month's Board meeting, a question was raised about the cleanup of radioactive contamination at Superfund sites. Ken contacted EPA and spoke with a person, a member of a working group at EPA, which is working on developing those standards. Ken distributed a two-page draft paper describing the working group's preliminary ideas for developing radioactive protective standards for cleanup. The working group has finished their work, and will next submit their work to the Office of Management and Budget. It will be published in the Federal Register, and the working group hopes to have the rules finalized by the winter of 1996. If anyone would like to get a copy, let staff know.

PANEL PRESENTATION: RISK ASSESSMENT AND RISK MANAGEMENT: A panel discussion was convened discussing risk issues: Jim LaVelle of Camp, Dresser & McKee and the Health Advisory Panel; Frazer Lockhart of DOE/RFFO; Diane Niedzwiecki of CDPHE; and Niels Schonbeck of Metro State College and the Health Advisory Panel. The panelists were asked to present their views in response to the following questions and scenarios developed by the Environmental/Waste Management Committee:

How does or should the theory and practice of risk assessment relate to the development of cleanup standards?

Frazer: From DOE's perspective, we are a user of cleanup standards more than a developer. What I've seen in development and working with some of the state Water Quality Commission efforts, is a very tight linkage between the science of the risk, and how they get applied to cleanup standards. DOE has to strongly consider the cleanup standards in our planning and budgeting more than development.

Diane: The result of risk assessment is often one of the primary determinants in whether a site is cleaned up or not. Because the state and EPA are charged not only with protecting human health but also the environment, there's another component that's often taken into account when developing standards. Those are called ARARs (applicable, relevant and appropriate standards), which is from the Superfund or CERCLA law. Often those standards are state standards - whether they're for air or water quality (most states don't have soil standards at the current time but are in the process of developing them). These standards are not only set to protect human health but also to protect environmental constituents like fish. Also such things as protecting against further degradation of the environment are taken into account when setting standards. Risk is only one component in developing standards. Risk managers who develop standards use the information that people like Jim or I develop to calculate risks. Risk managers take that information, combine it with technical feasibility considerations, economic considerations, political factors, whether something is legal or not, and use all that information to develop a standard. In 1983, the National Academy of Science made a recommendation that risk should be determined without influence by policy. That's why I don't work with that part of the health department - it's strictly regulatory; we're separate. Therefore, my calculations should not be politically or economically influenced too much. However, I also don't work in a vacuum. Because I work for a public health agency, a lot of my risk decisions tend to be more conservative than someone who works for Kaiser-Hill for example, or for any kind of industry.

Jim: I think it's reasonable to view risk assessment at sites where you're thinking about cleanup as trying to use the best science you have to make sure the remedy fits the exposure situation on that site. Generally you can't do a very good job of risk assessment unless you talk a lot with the people who are going to make the final decisions and work toward an understanding of what the exposure situation is at the site or might be in the future. In essence, what you're trying to do is gauge how much you have to do at a particular site in relation to the kinds of land uses currently there or that you expect might be there in the future, or that you want to be there in the future. You can't really design a risk assessment to answer questions about what cleanup standards are going to be unless you have discussed and made some decisions about what kinds of exposures you want to protect people or environmental receptors from. It might be useful to look at some of the newest thinking in terms of how risk assessment fits into the entire process of starting with a site where you think there's something there to ending up identifying that and generating a remedy. That very often ends up with a lot of up-front scoping where you make some decisions very early on about what it is that you want to protect, and then design data collection and risk assessment and risk presentation to meet those objectives that you set up at the beginning. To some extent, that is in conflict with the separation between risk management and risk assessment. That's somewhat artificial - not because the science of risk assessment should be influenced by the politics or economics of the situation - but because I think a risk assessor has something to offer in terms of how you might want to manage a site. I think that interaction is a beneficial one rather than one that's in conflict.

Niels: My basic job is as an academic so I look at it from a different perspective. Of course, I'm a consumer as well because I'm eight miles from Rocky Flats, so I have some personal interest. But I don't own any land around there. In terms of standards, you have to ask: from whose perspective do you set these? Therein lies the controversy and conflict. For example, industry would like to have proof of what actually causes disease and then pick the highest level that does not show disease so that they don't have to spend enormous amounts of money cleaning up. From an economic point of view, that's perfectly understandable. From the point of view of the individual, they want more guarantees than that; they want to have a very conservative estimate. The whole business of risk assessment, you have huge uncertainties. Remember the Challenger accident in 1986? Before the shuttle blew up, the estimate by NASA was that the chance of such an accident was 1-in-100,000. That was based on their analysis of the engines and all the parts, their guesses. The nature of assessment of risk is trying to predict the future of accidents, which is inherently an oxymoron - how do you predict accidents? After the Challenger accident - it was the 26th ride of the shuttle, the actual risk was one-in-26, which is a huge difference - now every year that we have a successful Challenger ride, the risk goes down. But how do you assess that and how do you predict the accident? The difficulty with, for example, plutonium is that we don't know mechanisms of plutonium nearly as well as we know the mechanisms of the engines of the Challenger. It's extremely difficult to find the right standard. I can give you examples if we have time later tonight with the problems inherent with plutonium and how different agencies approach it. You have to ask the question: what agenda do you want to follow?

What does the science of risk assessment tell us about practical problems such as

what might happen during a catastrophic event, or from airborne contamination that might be caused by workers disturbing the soil, or from the demolition of contaminated buildings?

Diane: Risk assessment is only as good as the numbers that you throw into it when you do your calculations - what you get out of it is only as good as what you put into it. If your models are accurate - if you consider every possible factor that might play a role in how soil contamination is spread around an area, or how much airborne contamination might result from moving Caterpillars around the site - if you could as accurately as possible determine those numbers, you're going to get better risk assessments. If there's a lot of uncertainty in your model, there's going to be a lot of uncertainty in the risk estimates that come from that model. Because risk estimates are basically estimates of uncertainty, there's also other factors that play a role, like how good are your toxicity factors. It depends on your model.

Jim: There's always a little bit of a philosophical problem in risk assessment. It's usually used as a regulatory tool. It's not used, and can't really tell you, what the incidence of disease in a population is or is going to be in the future. It really is a tool you can use to put yourself in the right range for a given exposure situation. It allows you to make some educated guesses as to how much cleanup would be necessary to protect people from a given exposure - but not so much about what will actually happen. There seems to be some searching here for an answer of what is going to be the health impact if a plane crashes into Rocky Flats, or if there's a high wind event during remediation. Risk assessment generally is not going to be able to answer that question. What it can do, one would hope, is to provide you with some general indication of how serious a problem could develop and perhaps tell you where you want to take precautions. Maybe it would tell you that you don't want to implode a building. But to actually answer: what are the health effects going to be - risk assessment isn't going to help you very much.

Niels: An earthquake or an airplane falling into Rocky Flats, or whether buildings should be imploded - all of this should be put into the context of time. Plutonium and its toxic effects are around essentially forever. We can calculate a time, such as a half million years, but that has no meaning to me. We're going to have to look at this for a long period of time. That changes how we make judgments about risk assessment. The way I look at it is: you look at the chances of an accident happening, and then you factor in the severity of the outcome. If the outcome is unacceptable under any circumstance, there's no point in doing risk assessment - you just make sure the accident doesn't happen. Of course, you can't do that. So the question is: how much plutonium is going to be dispersed. Risk assessment is certainly going to be able to give you ballpark estimates and it's important to do those calculations. But the calculation is going to have huge uncertainties, which is something most people who are helping make these decisions do not like, nor do they have a real working knowledge of what it means to say the chances are between 1-in-10 and 1-in-1,000 of something happening. Finally, if I take the example of weather prediction, there was a time when we thought that with computers we'd be able to predict weather far into the future. We now know that's impossible. In fact the theoretical analysis in the chaos theory is it is inherently impossible. If you want to know anything about the weather next week, you just have to wait until next week. You can predict what will happen tomorrow and a little bit about what will happen two days from now, but three or four days - you're only making a guess. Risk assessment with what's going on at Rocky Flats really has to take into account that you can't predict too far into the future. All of your plans have to be updated as you go along. An example of something that happened that we had no idea of is the spring rains and the effect of plutonium migration that Iggy Litaor discovered at the plant.

Frazer: I read the question as how well do these tools really compare to real life and the things that might happen. I have a more positive sense about that. When I look at the analysis that we do for assessing risk - particularly for the cleanup projects - I've seen a lot of focus on what actually happens. The examples here like disturbing the soil are some of the things that were looked at to try and make measurements - using factors that have been used in the construction industry, by the Corps of Engineers and other groups, to say how much dirt gets resuspended when you work with bulldozers, etc. - to factor those kinds of data into the analysis. The things that appear to be the major part of the work, the risk assessment process deals with fairly well. The difficulties come in with events that border on the incredible - when you're talking about major earthquakes or tornadoes that run down the center of the plant. The same analysis can be done, but since there are so many incredible events, you tend to pick one or two that seem to be worst-case. The other difficulty I see is that the science of assessing risk has a hard time dealing with the effects of multiple contaminants - the synergistic effects - which have been questioned at these meetings before. It's very true that 2+2 sometimes equals 5 or 6; it's also true on occasion that it equals 1 or 3. That analysis is very difficult and most of the risk methodologies try to deal with that by taking the ranges and always picking the more conservative ends - the 95th percentile or the far end of what would give the most conservative figure. That's one of the areas that the tools struggle with in terms of being objective - dealing with the various contaminants at a site like Rocky Flats that has dozens of different contaminants. It has to be done through conservatism.

Diane: At least two of the most recent incidents that have happened at Rocky Flats were not the result of some calamity, some totally unexpected event, they were the result of human error. It's one thing that always plays a role in accidents which often is not taken into account in estimating risk and projecting into the future what the risk is for plutonium being released from the site. It's a practical problem I think we all should consider.

For each of the following contamination scenarios, how does the consideration of risk factor into cleanup decisions, and what might those decisions be?

1) An area of soil is contaminated or a building is contaminated for which an air pathway

exists that allows for exposure to a human receptor.

Jim: Any time you have an existing exposure pathway, you're going to be more concerned. Perhaps any remedy that you put in place is going to be more aggressive. One has to consider the fact that just because there is a complete exposure pathway does not mean there's substantial risk. In many cases I've been involved with soil contamination (none involving plutonium), even though we know some dirt is lifted off the ground during high wind events and people do in fact breathe that material, the amount of material that is actually resuspended and the total amount of material that can actually be inhaled is extremely small. There's a lot of pollution that goes on, but not a lot that gets resuspended. This pathway often is not a very significant one. In the case of plutonium, you may have the exception to that rule, because all the work we've done on dose reconstruction seems to indicate the inhalation pathway is the one pathway that's most important. In looking at Rocky Flats, this may be a case where risk assessment points you in a direction that's counter to what happens at a lot of other waste sites around the country.

Niels: The way I interpret the question is how do our calculations figure into cleaning up the site, how we would clean it up and what the decisions would be. I would take the 903 pad as an example. The plutonium concentration in the soil was so high, they decided that the amount of dirt they'd have to take out was so large they just decided to put a cap over it to keep the plutonium from being resuspended in the air. If they were to dig that pad up and clean it up, because of the concentrations and the exposure pathway (inhalation, resuspension and the risk factor for actually getting plutonium in the lungs), people would probably have to wear full suits and masks and it's likely they would have to put a tent over the whole area in order to keep it from being transported off-site. That's one example of how risk assessment would be used in making decisions about whether to clean up a site and if so, what would you have to do. Another issue about this particular site is that there are unknowns. The records for where things were buried are not absolutely reliable. People can assume today that they know what is in a pit and start digging it up, then find out they were wrong.

Frazer: Looking at the problem of a soil pathway with a receptor, again the risk analysis depends on a lot of different factors - the contaminants and the concentrations. Along with that, it leads you to also look at both the short and long-term aspects of the risk. There are aspects involving both workers and public in a short-term scenario. The idea of digging up, even with tenting and other measures like that, there's still some release - it's inherent in digging up materials. There are some judgments that would come into play out of the risk analysis such as whether the short-term risks that are presented when you dig up offset the benefit of removing it. Sometimes it may indicate some method of dealing with the contamination - such as trying to fix it in place through chemicals or vitrification or some other technique, or cap it in place - would not remove the contamination. But if it's fixed and therefore doesn't have a pathway, you essentially eliminate the pathway piece of the receptor. That may be a better risk scenario. There are trade-offs that the tools do help you look at. The other piece that plays in on occasion - certainly with soil - is the ecological impacts. The science of risk analysis doesn't just look at the human receptors. In fact, if your solution for a soil contamination problem is to excavate in total to a depth of a foot or six inches, you may destroy an ecological system that would be very difficult if not impossible to replace - at least at that location. One correction on the 903 pad: before they capped it, they actually dug out about 18 inches of soil and shipped it to Idaho.

Diane: One thing I want to emphasize: state policy generally is that every complete pathway should be included in the risk calculation for deriving a standard - whether it's plutonium, which is often dispersed in particulate form, or whether it's a volatile organic compound. However, such factors as bioavailability do play a role in the toxicity of the chemical. At Leadville for instance, lead was borne about all over the area, but it turned out the type of complexation of the lead with the soil and the type of chemical form that the lead was in at that particular site made it less toxic, so it was less of a problem. Plutonium is a special case because the greatest amount of toxicity from plutonium comes from inhalation. When you swallow plutonium, it's not absorbed very much through your gastrointestinal tract. With plutonium, you really do have to be careful to take inhalation into account - to take into account every pathway that people could possibly be exposed.

2) There is groundwater contamination with a complete exposure pathway to a human receptor.

Niels: As I understand it, the groundwater is very close to the surface at Rocky Flats and in some places seeps out of springs. The actual hydrology is important; it's idiosyncratic from spot to spot. When you make your risk assessment and you look at the exposure pathway, you have to take that into account. Focusing on plutonium - although that isn't the only thing out there but it's the one I'm particularly interested in - plutonium tends to stay close to the surface of the ground, it doesn't seem to migrate down. So you'd have to wait for the water table to rise as it did this spring, which is a unusual event but did happen.

Frazer: In this scenario, it is one of the most direct uses of risk tools where the applications seem to be direct and obvious. Analysis does depend a great deal on hydrology - that's a key factor; the difficulty would be to understand where and how quickly the groundwater is moving. Even groundwater, with fairly complex movement in the geology, is more constrained and confined. It's moving underground so it's easier to analyze than problems with soil and air distribution, where essentially you get a puff of air and some dirt in the air and it can move about literally unconstrained. We see groundwater problems as being more direct. The risk analysis methodologies and standards can be applied more directly in comparison with soil.

Diane: For groundwater, if there is possibility of direct human exposure, you'd look at water ingestion, volatilization from basement air if the chemical is a volatile chemical, and volatilization from non-drinking water usage of the water. For example: when you run a dishwasher, a lot of water vapor goes into the air. Along with that water vapor, whatever organic chemical that is volatile and in the water also evaporates and goes into the house, then you breathe it. If there's no water ingestion or usage such as is proposed in the future for Rocky Flats, you still have to take in account things like volatilization of chemicals from basement air. For instance, office workers or anyone working in a building on Rocky Flats that has a basement, could possibly be exposed to volatile organic chemicals that get into the basement air from cracks in the basement, from either groundwater or from soil contamination.

Jim: I agree that this is an area where you can apply risk assessment results fairly directly. Unfortunately, you often can't clean up groundwater effectively. Oftentimes the application of risk assessment is to ensure that you can establish a boundary within which you can contain the contamination so it doesn't spread elsewhere; for instance, you may have to institute restrictions on groundwater use for people living in the area. It may be a time where risk assessment can be used to help reach decisions on whether or not the effort to do anything with the groundwater is really going to be effective. With plutonium in groundwater, I don't know how easy that is to clean up because it hasn't been a great problem in many instances. In other cases, such as metal contamination, it's extremely difficult to get rid of groundwater contamination. Sometimes you're left with one scenario: break the pathway by using a different water supply and try to take whatever actions are necessary to keep things from spreading around.

3) There is groundwater contamination but at the current time there is no complete exposure pathway.

Frazer: The problem of contamination without a pathway would seem to be an easy one. But in fact that gives us more problems because of the difficulty of predicting the future; it becomes very difficult to predict. It's almost easier to have a pathway because it's in front of you and you can document it and know how to respond, even if the response is just a barrier or some other approach. When there is no complete pathway, we're obligated to look at likely future scenarios, not just the current status. That challenges our technical ability, and begs the question of geologic shifts, major floods, etc. The basic tools of risk assessment are still applicable and still brought into play. It technically becomes more difficult because you are into a mode of predicting and you have to use the predictions of a likely future to see if there will be some pathway in the future to drive the final risk analysis numbers for that kind of scenario.

Diane: The problem with trying to decide future uses: no one really has very much control over that use, at least legally the state doesn't. Zoning is generally left to local communities. For instance, Superior decided it wanted to build a new development practically across the street from Rocky Flat, against the advice of the state and other local governments in the area. Because of that possibility, most often what the state would do in a situation where there's no current pathway is to try to use the most conservative estimates in calculating your risks, just so there's some cushion there in case something like that happens. Another thing that also needs to be taken into account is: where does the groundwater come to the surface, and what is the likelihood that someone could be exposed to the groundwater contaminants when they come to the surface in a seep? If it's coming to the surface at a seep on that outer buffer zone - which may be declared open space - what's the likelihood of someone eventually contacting it and getting exposed? In protecting groundwater standards, you also have to take into account protection of surface water standards. In general, right now those are maximum contaminant levels (MCLs).

Jim: I believe where you don't have a complete pathway, it's actually a little easier. The reason is you have more options. When there's a current exposure pathway, you're going to have to take steps right away to block that pathway; sometimes that leaves you very little that you can do. When there isn't a pathway, there's often many different options that you can take and still be protective. For example, where the groundwater that's contaminated is not potable, often you can establish a containment boundary or even establish that you can leave it in place and it won't effect water that is likely to be consumed by anyone at any time. Basically what you can do is design a remedy to protect a resource to whatever level you think that resource will be used. That allows you different options and time where you have something that will degrade (not plutonium obviously). But at Rocky Flats there are some organic contaminants in groundwater. There are some sites I've worked at where it's obvious the natural tendency is reducing concentrations dramatically. We're in a situation where there's no current exposure and over a couple of decades, it's certainly possible to make sure no one uses the groundwater. Overall I think it gives you more leeway in how you design a remediation.

Niels: What occurs to me about incomplete pathways is just human nature: if it isn't complete now, then we don't have to worry about it. You forget about the situation. There are a couple of scenarios that you could imagine where you'd run into trouble by forgetting. If a cleanup operation completed that pathway in some way - suppose you have groundwater contamination at a certain place but it's contained and it doesn't come up in a seep, and you happen to dig into it because you're building a new building. Suddenly it washes out and now you have a complete pathway. It's important to be vigilant about making sure that incomplete pathways are not forgotten in case they might be completed at another time. Another scenario of completing a pathway or generating a new one is plutonium. There is one isotope that decays quickly into Americium, which has slightly different chemical properties. So at a certain moment in time you know what the plutonium composition is, but then forget that within 80 years you're going to have a 50 percent increase in the alpha burden in the environment because of that, and you have forgotten there is a different pathway for the newly generated species. That's something to keep in mind.

4) Surface water contamination exists for which there is a complete exposure pathway to a human receptor (is there anything unique about surface water that would be different from what has been discussed already with the air and groundwater pathways).

Diane: With surface water, there are standards promulgated by the state that protect it. These are usually (but not always) based on human health risk, if the use of the surface water is ultimately drinking water. If the water is not used for drinking water, there are agricultural uses; those also have standards which are sometimes more strict and sometimes less strict than drinking water standards. Every stream in the state is classified as to its use. There are aquatic standards, such as cold water aquatic (mountain streams) or warm water aquatic (what the streams around Rocky Flats are classified). Those standards protect the types of fish, invertebrates or other animals in that type of water. Because there are already standards for protection of surface water, it's usually easier to regulate releases by industry into surface water because you have something promulgated in law to which you can measure values.

Jim: The biggest difference with surface water is so because you have aquatic communities. You can't always look just at human health as with groundwater, and in some cases soil. In applying risk standards, you would look at different sets of receptors. That brings up a set of problems that are unique to sites or regions. People are more or less the same across the country, but aquatic species certainly vary dramatically between states. So to generate a risk based standard in many instances becomes a more difficult thing to do.

Niels: The one thing about surface water in Colorado and at Rocky Flats is that it changes depth quite a bit. You can have just surface runoff. For example, Standley Lake receded last year significantly. What that means is you have a connection of pathways; that is, whatever was in the water now is in the soil and exposed to wind erosion. That's one thing you would have to take into account.

Frazer: I'd expand a little on the comments about its usage, as it opens up a broader band of possibilities of potential uses and scenarios to look at. Aquatic communities offer a lot more pathways: recreational uses like catching and eating fish, or people swimming in surface courses. There are different problems related to those water usages with uptake mechanisms that are different than groundwater. Groundwater typically comes through a well, or maybe seeps through basements and cracks - but presents a smaller grouping of things to analyze. Usages and potential scenarios need to be looked at so many different ways with surface water.

End of Part I of 12/7/95 minutes, **see Part II**