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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

5 127TH MEETING

6 + + + + +

7 THURSDAY,

8 JUNE 21, 2001

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10 ROCKVILLE, MARYLAND

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12 The Advisory Committee met at the Nuclear
13 Regulatory Commission, Two White Flint North, Room
14 T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. B. John
15 Garrick, Chairman, presiding.

16

17 COMMITTEE MEMBERS PRESENT:

18 B. JOHN GARRICK, Chairman

19 GEORGE M. HORNSBERGER, Vice Chairman

20 MILTON N. LEVENSON, Member

21 RAYMOND G. WYMER, Member

22

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24

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1 ACNW STAFF PRESENT:

2 JOHN T. LARKINS, Executive Director-ACRS/ACNW

3 LYNN DEERING

4 JAMES E. LYONS

5 RICHARD K. MAJOR

6 AMARJIT SINGH

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1 P-R-O-C-E-E-D-I-N-G-S

2 (8:30 a.m.)

3 CHAIRMAN GARRICK: Good morning. The
4 meeting will come to order. This is the third day of
5 the 127th Meeting of the Advisory Committee on Nuclear
6 Waste. My name is John Garrick, Chairman of the ACNW.
7 Other Members of the Committee are George Hornberger,
8 Milt Levenson and Ray Wymer.

9 During today's meeting the Committee will
10 discuss the Memorandum of Understanding for
11 Cooperation on Multimedia Environmental Models. We
12 will be working on reports and we will be briefed on
13 the Sequoyah Fields planning and procedures.

14 Jit is the Designated Federal Official for
15 today's initial session. This meeting is being
16 conducted in accordance with the provisions of the
17 Federal Advisory Committee Act. The Committee has not
18 received any comments or requests for time to make
19 oral statements from members of the public. Should
20 anyone wish to do so please make your wishes known to
21 one of the Committee's staff members. And it is
22 requested that the speakers use the microphones,
23 identify themselves and speak clearly.

24 Okay, I guess unless there's some other
25 opening remarks, our first agenda item today is on the

1 Memorandum of Understanding for Cooperation on
2 Multimedia Environmental Models. The Committee Member
3 that's been designated as an elitist on this
4 discussion is Ray Wymer, so Ray, we can proceed.
5 DR. WYMER: I'm really interested in what
6 you have to say. In particular, if it's possible, you
7 might compare and contrast this with the other
8 computer models that have been developed. Some place
9 along the line we'd like to get into that, so please,
10 commence.
11 MR. OTT: I don't know if we'll be able to
12 do that today, however, in discussing one of the
13 Working Group proposals later on, that might come up.
14 In fact, it's a little premature. What we're talking
15 about today is the very first steps in this particular
16 activity.
17 I'm William Ott, the Systems Branch Chief
18 of the Radiation Protection, Environmental Risk, and
19 Waste Management Branch in the Office of Research.
20 It's the longest one in the office.
21 (Slide change.)
22 MR. OTT: Let me give you a little
23 background on how we got to where we are today. For
24 the past five or six years, there's been a lot of
25 discussion mostly on a one to one basis between a lot

1 of the federal agencies that are actively involved in
2 trying to model fairly complex environmental systems.
3 The Department of Energy has a significant
4 responsibility in this area, the Environmental
5 Protection Agency, the Army Corps of Engineers has a
6 significant responsibility with regard to a lot of
7 military sites that have to be cleaned up and not too
8 surprisingly many of these models have very, very much
9 in common, but each one of these agencies has been
10 going off and developing tools to help them do their
11 assessments on their own. There's been the usual
12 collaboration, the usual consultation at scientific
13 meetings and things like that, but there hasn't been
14 a lot of very direct and intense cooperation or
15 coordination on more than in most cases the bilateral
16 basis.
17 The last couple of years, that has changed
18 with regard to EPA, DOE in which they're both jointly
19 funding some activities to develop some of these
20 complex tools. DOD has also joined in that effort and
21 we have gone into it as well.
22 In March 2000, a little over a year ago,
23 there was a workshop hosted by the NRC on
24 Environmental Software Systems Compatibility and
25 Linkage." That was held here. In the evening after

1 one of those sessions, a lot of the scientists that
2 were here and some of the managers got together and
3 they said this has been a really productive meeting.
4 There were many agencies involved. There were members
5 of the private sector involved in that meeting and
6 they said we ought to do something to formalize this
7 arrangement, keep it going and maybe make it stronger.
8 So out of that there was a recommendation
9 put together, "The relationship between the federal
10 agencies involved should be formalized." And there
11 was also a statement made that "No one agency or group
12 should be in charge of this collaborative effort
13 towards a unified system." The effort needs to be a
14 collaboration of equals. They didn't want a single
15 agency to be driving this thing with somewhat
16 parochial interests.
17 (Slide change.)
18 MR. OTT: That got us started and to a
19 certain extent the staff from the Commission, having
20 had a lot of experience in developing bilateral
21 Memorandum of Understandings with the Corps of
22 Engineers -- not the Corps of Engineers, the USGS and
23 the Agricultural Research Service, took a lead to put
24 together a straw man, so we've been intimately
25 involved in the organizing phase of this MOU.

1 There's been an ad hoc organizing
2 committee which has been primarily consisting of
3 members of the USGS, excuse me, not USGS, EPA, DOE,
4 Corps of Engineers and NRC and about midway through
5 the organizing effort, both the USGS and ARS who are
6 intimately involved with the other agencies in the
7 group found out about it and said this sounds like a
8 real good idea and we want to become involved, so that
9 original group of four agencies grew very quickly to
10 six in the organizing phase.
11 (Slide change.)
12 MR. OTT: Of those six agencies, the MOU
13 was first signed in I believe January or February.
14 Since then five of the agencies have signed. The
15 sixth agency is expected to sign next Monday. The
16 first steering committee was held earlier this week
17 and even though we didn't have that sixth signature
18 yet, we wanted to get started, so we scheduled the
19 meeting and we held it this Monday and Tuesday in the
20 auditorium, again hosting it here at the NRC in
21 Rockville.
22 Again, other organizations have found out
23 what we're doing and they've expressed interest.
24 We've had contacts from the Natural Resources
25 Conservation Service, the National Oceanic and

1 Atmosphere Administration, Cooperative State Research
2 Education and Extension Service and the Bureau of
3 Reclamation. At least two of those organizations sent
4 members to our steering group meeting on Monday and
5 Tuesday. We had an attendance of about 30 to 35
6 people all totaled, over the two days of the meeting.
7 These are the agencies that are currently
8 involved. For the Environmental Protection Agency,
9 Gary Foley, who is the Director of the National
10 Exposures Research Laboratories. He's headquartered
11 in Research Triangle Park, North Carolina and is the
12 Director of four EPA laboratories in different parts
13 of the country, I believe. There's Athens, North
14 Carolina, one in Columbus and a third one out in
15 Colorado, or fourth one.
16 The U.S. Army Corps of Engineers, Mark
17 Dortch from the Engineering Research and Development
18 Center in Vicksburg, Mississippi, formerly known as
19 the Waterways Experiment Station.
20 George Leavesley from the Water Resources
21 Division of the U.S.G.S. He's headquartered out in
22 Denver.
23 Teresa Fryberger from the U.S. Department
24 of Energy from the Office of Research/EM.
25 Agricultural Research Service, Dale Bucks.

1 And I'm the member for the NRC.

2 CHAIRMAN GARRICK: Is there reason that

3 DOD is not represented at the steering committee

4 level?

5 MR. OTT: DOD is represented by the Corps

6 of Engineers.

7 CHAIRMAN GARRICK: Oh, okay.

8 (Slide change.)

9 MR. OTT: I'm going to very quickly go

10 through the highlights on the MOU just because you've

11 already read it, but there are certain things and I'll

12 point out a couple things that I don't even have in

13 writing here. Most of this is verbatim from the MOU,

14 but bulletized so that I can, you can focus on small

15 bits of words in there that actually have significant

16 meaning.

17 The purpose is to establish a framework

18 for facilitating cooperation and coordination among

19 the participants in research and development of

20 multimedia environmental models. The focus of this

21 MOU is research and development.

22 There is specific language in there to

23 avoid entanglements in regulatory issues. Every

24 agency realizes that much of what we do is because we

25 have to make regulatory decisions or some other kind

1 of decision, but the entanglements between some of
2 these agencies when they start arguing about nuances
3 and policy can be mind numbing. It can hold things
4 up. So we didn't want to get entangled with those
5 kinds of decisions and that affects one of the things
6 that we're recommending in regard to one of the
7 working group proposals later on.
8 Software and related data bases -- I
9 didn't put it up there. There it is.
10 (Slide change.)
11 MR. OTT: You've got this. It includes
12 development, enhancements, applications and
13 assessments of site-specific, generic and process-
14 oriented multimedia environmental models. It is
15 written very broadly.
16 The impetus for this MOU came out of
17 people talking about linkages and software, but it was
18 concluded by the organizing committee at a very early
19 stage that cooperation in multi-media environmental
20 modeling should be much broader than just looking at
21 linkages, because there's interest in these agencies
22 that correspond over a wide range of interests. So
23 the language in the MOU was made broad deliberately to
24 encourage and facilitate cooperation across a wide
25 range of issues.

1 How effective we'll be at doing that, I
2 don't know. There's obviously a strong component in
3 the initial organizers and those participating in the
4 first few meetings that are very, very strongly
5 focused on framework models and on the issues that go
6 with databases and quality assurance and quality
7 control, exchanging modules and that kind of thing.
8 But there is also a strong interest in science behind
9 those modules and improving those modules with better
10 science and better understanding of processes. And of
11 course, it's as they pertain to human and
12 environmental risk assessment.
13 (Slide change.)
14 MR. OTT: This MOU is intended to provide
15 a mechanism for the cooperating federal agencies to
16 pursue a common technology in multimedia environmental
17 modeling with a shared technical basis. That does not
18 mean we're trying to develop a single model.
19 There are a lot of people out there that
20 realize the modeling frameworks that have been
21 developed, each have their own particular advantages
22 and while there's a significant benefit from being
23 able to exchange information and even modules between
24 these frameworks, it's probably not achievable to say
25 that one framework is any better than any other

1 framework.

2 We would hope that there would be a
3 convergence in technology such that the module
4 available to one are available to all and you may have
5 a nonproliferation of individual modules. People may
6 focus on specific modules that are best for evaluating
7 a given kind of process or a given type of site
8 condition and in that way we will come to this common
9 technology. But that doesn't mean that we'll just
10 necessarily have a single model.

11 DR. WYMER: Can you give us a sense of
12 what some of the modules might contain?

13 MR. OTT: We'll discuss that a little bit
14 later. I'll let Ralph address that. I've got
15 representatives for both first two working groups with
16 us here today. When you get to detail, I'll let them
17 chime in.

18 The cooperating agencies are to seek
19 mutual benefit from our R & D programs and seek to
20 ensure effective exchange of information between staff
21 and contractors.

22 You and a lot of other people always ask
23 us do we know what's going on in other federal
24 agencies and we always come back with the same answer.
25 We go to meetings. We meet on a bilateral basis and

1 things like that. And I think it's always
2 unsatisfactory to you and it's probably always
3 unsatisfactory to us. This MOU gives us a much more
4 robust way of putting together groups that across five
5 or six agencies will be knowledgeable of what's going
6 on in specific areas and I think we'll be able to come
7 to you with a much stronger answer about how well
8 we're doing in canvassing for federal agencies and
9 making certain that we are taking consistent
10 approaches and using each other's information and
11 data.
12 CHAIRMAN GARRICK: Just in passing, Bill,
13 and in the spirit of plain language, I can't imagine
14 a less communicable term than multimedia environmental
15 modeling. Has there been any discussion of that?
16 MR. OTT: No, as a matter of fact, there
17 hasn't. The people that are --
18 CHAIRMAN GARRICK: First, it's difficult
19 to understand what it is, and second, it's easy to
20 confuse with something else that's is entirely
21 different, especially if there's interest in the
22 public understanding of what we're doing.
23 MR. OTT: It will be almost impossible to
24 change at this point.
25 CHAIRMAN GARRICK: I understand, but I

1 just wanted to say that in passing is that --

2 MR. OTT: I appreciate it. I've struggled

3 with it myself in terms of anticipating questions on

4 what do you mean by a multimedia model. How will you

5 define it and it's not an easy question to answer.

6 But the wording is sort of captured in the MOU right

7 now, so we're locked into it.

8 (Slide change.)

9 MR. OTT: The R&D programs referred to

10 include development and field applications of a wide

11 variety of software modules, data processing tools,

12 and uncertainty assessment approaches for

13 understanding and predicting contaminant transport

14 processes including the impact of chemical and

15 non-chemical stressors on human and ecological

16 health."

17 That's probably the closest you're going

18 to come to a comprehensive decision definition of what

19 we mean by multi-media environmental models.

20 DR. HORNBERGER: And that doesn't say

21 anything about several media.

22 MR. OTT: Right.

23 (Laughter.)

24 (Slide change.)

25 MR. OTT: The MOU designates point of

1 contact within each one of the agencies. Those are
2 the people that I've listed before. These are the
3 responsibilities for the points of contact.
4 DR. WYMER: So this focuses on transport.
5 MR. OTT: This focuses on what you have to
6 do to assess the risk to the environment or to human
7 populations from contamination and how you get from
8 contamination to making that risk assessment.
9 DR. WYMER: Now this specifically says
10 transport.
11 MR. OTT: It says transport, but that's we
12 get to the --
13 DR. HORNBERGER: But they mean reactive
14 transport. It is transport, but they include
15 biogeochemistry.
16 MR. OTT: Yes. It's not design to exclude
17 anything. It's designed to be inclusive, rather than
18 exclusive.
19 DR. WYMER: It's quite different, say from
20 RESRAD, that kind of stuff, wouldn't even be included
21 in this because it doesn't involve transport.
22 MR. OTT: RESRAD would be included to the
23 extent that number one, Argonne elects to participate
24 and to the extent that Argonne would like to
25 modularize RESRAD to the point that it could be a

1 contributor to the process.

2 DR. WYMER: I see.

3 MR. OTT: Because what we're now talking

4 about is frameworks that have modular components and

5 could exchange those components. And the people that

6 I've talked to are most interested in the final end of

7 RESRAD, the part dose calculation, the health effects

8 model.

9 The part that leads up to the health

10 effects model in terms of the calculations of

11 transport and things like that are not much more

12 sophisticated than D & D. It's a very, very simple

13 site model and there are multiple versions of RESRAD

14 currently and almost all of them are monolithic.

15 They're not subdividable into pieces. So if Argonne

16 and RESRAD were to become a part of this, there would

17 have to be a decision made at some point to change the

18 approach, the monolithic approach to it. And I"m not

19 certain that DOE or the RESRAD developers want to do

20 that.

21 That's something that has to be their

22 decision.

23 (Slide change.)

24 MR. OTT: The Committee met on Monday and

25 Tuesday. It actually becomes official on next Monday

1 when the final signature is obtained. But the points
2 of contact have got responsibilities that probably all
3 of us don't appreciate yet in terms of the additional
4 work that it may entail which is promoting technical
5 coordination, identifying programs of mutual interest,
6 identifying funding for those programs, if they're in
7 the interest of the individual agency and I should
8 point out that the MOU is very specific, that it does
9 not commit any resources other than the individuals
10 that are gong to service on the Steering Committee.
11 Everything that is done after that is because it's in
12 the mutual interest of the federal agencies to
13 participate.
14 If they decide to allocate funds, it's
15 because they see a benefit from putting funds into a
16 given project. If they put FTEs into it, it's because
17 they determine that FTE should be expended towards
18 achieving the goal of the working group. And there's
19 no guarantee that in any given effort all the agencies
20 will participate. So there are a lot of nuances in
21 there that were done to get cooperation because it
22 becomes much more difficult, as soon as you start
23 committing agencies to funds and resources in years
24 beyond the present year.
25 We're supposed to assist in arranging for

1 supplementary interagency agreements, facilitate the
2 coordination and exchange of R & D data and serve as
3 members of a steering committee.
4 (Slide change.)
5 MR. OTT: The purchase of the steering
6 committee. This will end my going through the text.
7 That's the purpose as stated in the MOU. Coordinate
8 joint research efforts under the MOU. That's the
9 responsibility of the steering committee.
10 (Slide change.)
11 MR. OTT: Now I'd like to go into what we
12 did on Monday and Tuesday. And I believe we sent the
13 agenda to you. I know Lynn and Andy got copies of the
14 agenda. As the first meeting, we thought it would be
15 appropriate for the agencies to make presentations on
16 what their programs consist of and as I'll repeat
17 here, there was still a very strong focus on
18 multimedia frameworks, the things like frames and MMS
19 and MIMS and all these acronyms that we've got a list
20 of in here which are large systems that allow the
21 interchange of modules and layering of systems and so
22 that you can develop very site specific models from a
23 fairly genetic set of process modules.
24 We did the same thing in that meeting that
25 I just did here. We went through this list of

1 highlights. Unfortunately, my computer crashed on
2 Monday night, so I did it without having vu-graphs.
3 Then there were presentations by each participant on
4 their program objectives and plans. They were focused
5 on modular framework activities.
6 The USGS talked about their Modular
7 Modeling System. The ARS talked about the Object
8 Modeling System that's been jointly developed between
9 the ARC, the NNRCS and the USGS. The Army talked
10 about the ARAMS which is the Army Risk Assessment
11 Modeling System and their Land Management System. The
12 Land Management System is just one of a system they
13 call XMS. There's Groundwater Management System,
14 Surface Water Management System, the Land Management
15 System and they lump them all together and call them
16 XMS, but there's GMS, LMS and SMS. And EPA talked
17 about 3MRA-HWIR and MIMS.
18 The last discussion was with regard to
19 what is being done by four of the agencies right now,
20 DOE, EPA and the Corps of Engineers, with advice and
21 consultation from NRC. That's on FRAMES. FRAMES is
22 where we have elected at this time to put our
23 resources to replace the effort that we had going
24 forward previously on SEDS.
25 DR. WYMER: What's FRAMES?

1 MR. OTT: FRAMES is the PNNL framework for
2 doing modular modeling. It includes the MEPAS model
3 for health effects and Ralph could give you a lot more
4 detail on what's in FRAMES.
5 We don't have a contract with PNNL on
6 FRAMES yet. We expect to have something in in the
7 next fiscal year.
8 We discussed the proceedings of the March
9 workshop that I referred to before. That workshop,
10 the proceedings are in draft form. We expect them to
11 be published in I guess a month to 6 weeks. When the
12 Windows proceedings are published, we'll get a copy to
13 the Committee. Gene Whalen made a presentation on it.
14 The proceedings has not been scrubbed. It's very,
15 very faithful to the contributions to the workshop
16 from each one of the individual participants. Each
17 one's contribution is reproduced as it was received
18 aside from minor editorial corrections. There was no
19 attempt made to alter the technical content of any of
20 that work.
21 (Slide change.)
22 MR. OTT: There were two working group
23 proposals discussed. The coordinating, the organizing
24 committee decided that fairly early on that working
25 groups would be probably the primary working element

1 under this MOU and we decided if we were going to have
2 working groups we were going to have some kind of a
3 standard format for proposals. So we drafted a format
4 and very soon got reaction back that this should be a
5 two-stage process because the proposals are coming
6 from one or two individuals and we decided that the
7 final proposal for a working group ought to be a
8 working group product.
9 So what we have is the -- a Phase I
10 process that puts forward a concept, identifies an
11 area where the agency are each doing their own thing
12 and there would be significant benefit from
13 cooperation and coordination. And they put together
14 their ideas in some kind of an indication of where
15 they think this should go and bring it to the steering
16 committee and the steering committee then decides
17 whether they want to go forward with the working group
18 and if they do, then the working group is comprised of
19 a larger number of people representing all those that
20 are interested from the participating agencies. And
21 they will put together a Phase II proposal which will
22 be a firm description of where the working group
23 thinks it can go over the period of the MOU.
24 So we had two proposals, two Phase II
25 proposals advanced, one on software system design and

1 implementation for environmental modeling. This again
2 follows very closely on that March 2000 workshop.
3 It's still talking about software and linkages and how
4 we make these models talk to each other.
5 The primary proposer in this case was
6 Gerry Laniak from EPA-Athens, Ralph Cady is going to
7 be our participant in that working group.
8 The second one was on uncertainty and risk
9 analysis. George Leavesley was the proposer. Tom
10 Nicholson -- actually, George Leavesley and Tom are
11 joint proposers on that one.
12 And this is the one where the difference
13 in concepts between -- on risk between the agencies
14 was considered to be something that we didn't want to
15 get bogged down in. We knew that they needed, each of
16 the agencies needs a certain amount of information to
17 do their risk assessments, but each of the agencies
18 quite often interpret risk differently and we don't
19 want to get into the regulatory dialogue that might
20 accompany that problem. We want to stay with the
21 technical side of it in terms of providing all the
22 information up to the risk assessment.
23 CHAIRMAN GARRICK: Did you find some
24 agencies that resisted risk analysis period?
25 MR. OTT: We had actually nobody saying

1 that they objected to risk analysis, only that --
2 there was acknowledgement that they don't all treat
3 risk the same way. And everybody agreed that it would
4 be confusing and probably delay progress if they tried
5 to do anything about standardizing an approach to
6 risk.
7 CHAIRMAN GARRICK: Right.
8 MR. OTT: So we backed off of that. And
9 that will be in instructions that we send to them. We
10 discussed EPA concerns on peer review and QA/QC.
11 Very early in the signing process, EPA
12 expressed very strong reservations about the EPA
13 because they thought that the peer review and QA/QC
14 statements in the MOU were not substantive enough.
15 There was a concern amongst the organizers originally
16 that the USGS, Corps of Engineers, NRC, EPA, all have
17 their own peer review and QA/QC procedures.
18 And we wanted to make certain -- we felt
19 that if we tried to change those in the context of the
20 MOU that we would get severe reaction from any number
21 of agencies unless a given individual agency's view
22 prevailed. So we elected to adopt a fairly general
23 attitude of each agency will continue to do its own.
24 EPA wanted something stronger because EPA
25 has had troubles with their Science Advisory Board

1 over QA/QC and peer review procedures for products out
2 of their research program. So this was a concern of
3 theirs from the very beginning and one of the
4 conditions of getting EPA to sign the MOU was that we
5 would consider doing something as a steering group
6 with regard to peer review and QA/QC. So that that
7 was the motivation for the discussion on peer review
8 QA/QC and I'll tell you in a moment what we decided to
9 do about it.
10 We discussed a bunch of administrative
11 issues, organization of committee, frequency of
12 meetings, how to deal with request to join.
13 (Slide change.)
14 MR. OTT: What did we do? The first thing
15 we tried to do in order to make the meeting more
16 palatable for those who were really only interested in
17 doing, listening to the technical side of it and
18 didn't want to deal with the business aspects was he
19 had a business session Monday evening, which was not
20 as well attended as the general session. But anyway,
21 these are the things that we did. And some of this
22 stuff is purely administrative.
23 In keeping with this idea of not having
24 one particular agency in the lead, we adopted the
25 approach of a rotating chair. We're going to rotate

1 the chairmanship of the steering committee in the same
2 order in which the agency signed it. Since the NRC
3 signed it first, we are the first chair and I will
4 serve as chairman through December of this year. We
5 will center the service of the chairman on the annual
6 meeting. The MOU requires an annual meeting of the
7 steering committee. And in December, I will turn over
8 the chairmanship to Gary Foley from EPA. Next
9 December, he'll turn it over to one of the other
10 agencies and so on through the process.
11 The steering committee will meet at least
12 semi-annually, primarily because we have an annual
13 meeting and six months after the annual meeting we
14 have to change chairmen, so it sounds reasonable to
15 have a meeting when we change the chairman.
16 All those meetings except the annual
17 meeting, we will try to do a telecon. There's a
18 statement in the MOU that the agency should try to
19 make maximum use of electronic communication to try to
20 facilitate this without having to get people all
21 together and travel all over the place. So we're
22 going to see if we can do that. It worked very well
23 with the organizing committee.
24 We were having telecoms about every two
25 weeks at one point, every two to three weeks and

1 discussing what was happening in the agencies,
2 assigning procedure, the agenda for the upcoming
3 steering committee meeting. These lasted about an
4 hour. Were usually very productive and it was working
5 very well. Gary Foley from EPA expressed the concern
6 that semi-annually wasn't often enough, especially at
7 the beginning of the MOU, so I said okay, Gary, you
8 and I for the first year can agree to hold meetings
9 quarterly. So we will at least meet quarterly or as
10 needed, which means if something comes up we need to
11 address, then the Chairman will schedule another
12 telecom and we'll deal with it.
13 Because we've had all that interest from
14 other agencies, because of the way these MOUs are
15 done, if another agency comes in, all of a sudden we
16 have to put together an amendment to the MOU and send
17 it back to the people that signed it to begin with and
18 every time that happened we have to go back for
19 another signature. At least four different agencies
20 talking about coming to us to join, we decided to put
21 together an amendment to the MOU that would allow the
22 steering committee itself to accept additional
23 participants. So we're going to circulate that to the
24 original signers and hopefully after that all we have
25 to do is get a petition or an application from another

1 federal agency and the steering committee can vote on
2 it and the chairman can sign it and the other agencies
3 can sign it and we're gone. So we did that in the
4 interest of efficiency.
5 DR. WYMER: I see that this is an
6 inter-agency thing, but is there any consideration to
7 given to foreign participation, those people know a
8 few things too.
9 MR. OTT: Foreign? There's interest in
10 not only the international, but in the private sector.
11 What we have to worry about is the Federal Advisory
12 Committee Act, so we will welcome participation, but
13 as consultants and advisors and that kind of thing.
14 I don't think that will be a problem, but we hope to
15 get a larger group of technical experts involved from
16 that perspective.
17 And that sort of leads into this next one,
18 because --
19 MR. LARKINS: If it's all government
20 employees, it's less of a problem with FACA than if
21 you bring in outsiders.
22 DR. WYMER: Yes, I see.
23 MR. OTT: And the working groups will all
24 be required to be only federal employees, but they'll
25 be permitted to have consultants and advisors that are

1 non-federal employees. That's how we're going to deal
2 with that.
3 (Slide change.)
4 MR. OTT: We're going to form an ad hoc
5 group and this one, each of the agencies has agreed to
6 provide a participant for to work on a position
7 statement for the steering group on QA/QC. There was
8 significant resistance to amending the MOU with regard
9 to peer review and QA/QC. So we decided that we'd put
10 together a group and see if we could put together a 1
11 to 2-page statement discussing peer review and QA/QC.
12 EPA had proposed an amendment, but -- an addendum, but
13 that was not received well by the majority of the
14 members of the steering committee.
15 Both of the working group proposals were
16 approved, both of them with minor reservations. The
17 one from Gerry Laniak on software system design and
18 implementation was considered to be so broad that it
19 was not--
20 CHAIRMAN GARRICK: Bill, this is not that
21 we don't like you.
22 MR. OTT: I understand.
23 (Drs. Garrick and Hornberger leave for
24 another meeting with Chairman Meserve.)
25 MR. OTT: The Chairman always come first.

1 Was considered to be too broad, so we requested that
2 the working group focus and prioritize when they
3 prepare their Phase II proposal.
4 The working group proposal for uncertain
5 and risk analysis, there was some discussion of this
6 problem on the way individual agencies treat risk and
7 it was decided to approve the Phase I proposal, but
8 that risk be treated as the reason for doing this
9 work, not as something to be debated. So the risk
10 focus will be as a we need to provide this for risk
11 and the discussions will be what we need to do risk,
12 not how to harmonize the various treatments of risk
13 between the agencies.
14 And they suggested that retitling the
15 Phase II proposal might be appropriate in terms of
16 something like uncertainty and estimation techniques.
17 (Slide change.)
18 MR. OTT: Now the next two pages actually
19 go into what's in these two working group proposals in
20 a little bit more detail, not in the same detail as
21 what I provided to the Committee.
22 Let me point out that these are draft
23 proposals right now, so I did not make them available
24 to the public. The vu-graphs, the part that's here is
25 available out there.

1 What I did here was excerpt some
2 statements out of the proposal to give you a flavor of
3 what's in them.
4 (Slide change.)
5 MR. OTT: The proposal on software system
6 design is addressing design and specification of
7 extensible scheme and if you had problems with
8 multi-media, you might have trouble with extensible
9 scheme as well, for the exchange of data and results
10 between multi-medium, multi-pathway modeling
11 components, thus supporting component of framework
12 interoperability and sharing of components and
13 frameworks. Basically, that means the
14 interchangeability of modules and data.
15 And one of the primary issues with that
16 interoperability and interchangeability is QA and QC
17 and tracking the pedigree of the data, tracking the
18 pedigree of the analytical techniques.
19 (Slide change.)
20 MR. OTT: The areas in system software
21 design that could be included and this is why the
22 Committee decided that this particular working group
23 might be biting off more than it could chew, included
24 GIS linkage, conceptual modeling tools, visualization
25 tools, flexible database connectivity, component

1 software testing and QA, framework testing and QA,
2 uncertainty analysis tools and analysis reporting
3 tools.
4 (Slide change.)
5 MR. OTT: The second working group
6 proposal was uncertainty and risk analysis. And while
7 I know it's been a very strong concern of this agency,
8 and in the Office of Research and to a certain extent
9 MNSS for a number of years, it appears to be coming
10 more important to other agencies out there as well,
11 particularly as they start going from point estimates
12 of parameter and using distributions and looking at
13 the distribution of results.
14 The goal here was to develop a common
15 understanding of various ways to address uncertainty
16 by identifying, evaluation and comparing sets of
17 existing tools for assessing uncertainty and risk
18 within multimedia environmental model applications.
19 Evaluate newly developed techniques such as the UUCODE
20 developed by Dr. Mary Hill and others; MOCOM developed
21 by Drs. Hoshin Gupta and Louis Bastidas and the GLUE
22 code developed by Drs. Keith Beven and Jim Freer for
23 parameter estimation and uncertain analysis.
24 (Slide change.)
25 MR. OTT: Develop parameter estimation

1 methodologies for use with available digital
2 databases. Establish the degree of applicability to
3 all multimedia models and proposed steps for enhancing
4 general applicability.
5 (Slide change.)
6 MR. OTT: As we just approved those two
7 working groups Monday night and we don't have all the
8 people together yet, but I will say that after this --
9 I'm missing a vu-graph. That's all right.
10 The last vu-graph only has four words on
11 it. It says opportunity and opportunity was a word
12 that was used a number of times at the meeting. A lot
13 of the people there see this an opportunity that they
14 haven't had before of collaboration with people.
15 Cooperation and coordination are two things that have
16 been lacking in this area for a number of years.
17 The MOU now gives us a mechanism for
18 ensuring cooperation and coordination and provides an
19 opportunity far beyond that which was envisaged in the
20 March 2000 workshop. In that workshop, we were
21 talking primarily about this linkage of interchange,
22 but in broadening the concept of this MOU, we have
23 provided an opportunity which is much broader than
24 that. And I would hope that would have cooperation in
25 a number of the science-based areas as well.

1 Of the two working group proposals we have
2 one which is science based in terms of the uncertainty
3 and risk assessment approach and the other one which
4 is technology based in terms of looking at the
5 frameworks and the interchangeability and linkages and
6 the interoperability of the models.
7 Everybody came away from the meeting
8 saying there are exciting possibilities here. There
9 was a lot of enthusiasm at the meeting. We've had a
10 lot of enthusiasm. I did have it. I'm sorry.
11 There's been a lot of enthusiasm within
12 our office for the last 6 months. There's been
13 enthusiasm that's been evident on the organizing
14 committee and the telecons. And there was enthusiasm
15 evident in that room and there were a lot of people
16 there that haven't bene part of the organizing
17 process.
18 And there were people there from other
19 parts of the agencies. There were some negatives.
20 But the negatives were from people that were concerned
21 about you might say protecting their particular
22 bailiwick because when you do this, you're opening the
23 doors to anybody to get access to your models and if
24 you're trying to sell them, you suddenly start to
25 worry that you're affecting your economic viability

1 and you're worried about other people taking your
2 module and misusing it and essentially affecting its
3 reputation in the public.
4 DR. WYMER: There's a certain aspect of
5 professional anonymity involved too.
6 MR. OTT: Right. So there were concerns
7 expressed, but there were far more optimism and far
8 more excitement expressed than there was concern and
9 there was some of the people out there in the audience
10 and we tried to get maximum participation of
11 everybody, not just the steering group and people in
12 the audience were rising to defend the concept and say
13 how valuable they thought it was.
14 So we're kind of excited. It's the very,
15 very first step in a fairly long road, but we were so
16 excited about it, we wanted to come and give you guys
17 a bird's eye view of what we're doing.
18 DR. WYMER: Well, we appreciate that.
19 It's a big, big thing, Bill.
20 MR. OTT: It is. There's no question that
21 it's a big thing. But these agencies are out there
22 doing this and they're doing it independently and
23 these systems don't talk to each other. There are
24 databases that USGS has that would be invaluable to
25 these other agencies. There are modeling capabilities

1 at USGS. Modeling capabilities that the Corps of
2 Engineers has that we weren't particularly aware of up
3 until a year ago and their capabilities extend to
4 computational tools for preparing environmental impact
5 statements, in terms of doing a broad range of
6 assessments, habitat assessment, standard pollution
7 assessment.
8 One thing you could say about it is from
9 NRC's perspective, we may be the tail wagging the dog.
10 We're probably the smallest agency involved with the
11 least amount of resources and the most narrowly
12 focused interest in terms of radiation protection.
13 Two of the other agencies both the
14 Department of Energy and the Environmental Protective
15 Agency also have a radiation interest. But they also
16 have enormous interest in nonradioactive pollutants.
17 And there's a tremendous amount of capability out
18 there just looking at assessing nonradioactive
19 pollutants and as this agency becomes more active in
20 assessing new sites for new activities, for instance,
21 if the reactor program does reinvigorate and we have
22 to start doing substantive impact statements on new
23 sites, then things like the capability that the ARAMS
24 system and the XMS system has with the Corps of
25 Engineers might be a significant benefit to this

1 agency in terms of the preparation of environmental
2 impact statements.
3 DR. WYMER: One of the things that comes
4 to mind is from the point of view of the NRC
5 specifically. The question comes up to my mind, at
6 least of what would be the applicability of something
7 like this, the results that come out of something like
8 this to evaluating something like DOE's modeling
9 efforts in the Yucca Mountain repository and will
10 anything come out of it soon enough to be of any use?
11 MR. OTT: Well, there are a lot of
12 different time frames involved with Yucca Mountain.
13 DR. WYMER: That certainly is true.
14 MR. OTT: So there are certain -- some of
15 those time frames we certainly would have results that
16 would be of value, but I sat in last week on the
17 meeting between the NWTRB and the Commission in which
18 they were reiterating their latest annual report on
19 the Yucca Mountain program. And one of their focuses
20 was again uncertainty analysis in the TSPA.
21 DR. WYMER: Absolutely.
22 MR. OTT: And the work that we're
23 proposing to do on uncertain analysis and parameter
24 estimation techniques, I would think would be
25 extremely relevant to their concerns. Their concerns

1 in the high level waste program concerns. I would
2 hope that eventually they would get involved in
3 cooperating with us as a part of this entire effort.
4 In terms of whether other parts of the
5 program will become of value, it all depends on
6 whether we get as much enthusiasm from other segments
7 as we have from the technology based part of the
8 program.
9 I have spoken with our USGS contractors in
10 the area of geochemical modeling and suggested that
11 since chemical effects in the near field are a
12 significant factor, not only for radionuclides, but
13 for nonradioactive pollutants, things like heavy
14 metals and those kinds of contaminants, that this
15 might be a very appropriate topic for a working group
16 in terms of figuring out ways of working a more robust
17 treatment of chemical effects into these multimedia
18 models.
19 DR. WYMER: With something like this, I
20 think it's obvious it's going to get big and therefore
21 ponderous. It will be complex. Is there any thought
22 given to setting it up right at the outset so that it
23 can -- so that a simple -- so it can be used in a
24 graded way, simply so that you don't have to go
25 through the whole complexity of what will eventually

1 come out.

2 MR. OTT: It's difficult to say that we've
3 consciously done that. I think the way that we have
4 organized it in terms of working groups, the committee
5 itself, when we reviewed the two working group
6 proposals were very concerned about the feasibility of
7 the proposals and putting it together as a Phase I and
8 Phase II process in terms of concept and then getting
9 a working group together to actually define it and
10 prioritize it, I think will help us make certain that
11 what the working groups attempt to do is feasible.

12 The steering committee itself is supposed
13 to be a coordinator. I hope that we won't be an
14 impediment. We want to facilitate and help these
15 groups of collaborators to get together and have a
16 reason, a justification for this collaboration. The
17 MOU gives us that and the more people that find out
18 about it, the better and if they go through the
19 steering committee, I think the steering committee
20 will attempt to make certain that the working groups
21 themselves have doable functional statements.

22 DR. WYMER: There's a very broad -- I'm
23 stating the obvious, but there's a broad spectrum of
24 applications of something like this from the very
25 quite simple to the very complex.

1 One of the things that is sort of an
2 analogous situation to come out in connection with
3 decontamination and decommissioning activities, that
4 is the SRPs are written in such a way that they cover
5 all possible cases and some of the meetings I've been
6 in where the users have made their comments and say
7 you know, it's complex, how do we -- what part do we
8 use or how do we use it? Do we have to use the whole
9 darn thing or can we use a stripped down version or
10 just what in the world is expected of us. And I think
11 the same thing is going to come up here. And I just
12 wondered if you'd paid attention to that.
13 MR. OTT: I think it's fairly clear that
14 the concern that's being addressed here is the complex
15 situations. I think when you look at codes like D and
16 D and RESRAD, we as an agency recognize that there are
17 a lot of cases out there that don't require this kind
18 of effort. It's when the site gets large and complex,
19 when the contaminant becomes complex, when it's either
20 distributed non-homogeneously over a significant area
21 or through a significant volume. That's when all of
22 a sudden you start needing very sophisticated
23 techniques to do the analyses.
24 I think that most people would agree that
25 we have tools to handle the simple situations. And I

1 would hope that the people that come in with simple
2 situations will continue to be directed to the simple
3 tools.
4 DR. WYMER: I was going to note as perhaps
5 you need some sort of selection of criteria for the
6 level of tool.
7 MR. OTT: I would hope that -- I thought
8 that the Standard Review Plan was going to address
9 that in terms of an iterative process and let's start
10 simple and not get complex unless we really have to.
11 DR. WYMER: One other thing. What is
12 FRAMES?
13 MR. CADY: I'm Ralph Cady in the Office of
14 Research. FRAMES stands for Framework for Risk
15 Analysis in Multimedia Environmental Systems and it is
16 a framework for linking together individual models of
17 individual media. Now by media, air pathway, air
18 would be one media; groundwater, service water would
19 be other individual media.
20 DR. WYMER: When you say risk analysis you
21 mean everything that inputs the risk analysis?
22 MR. CADY: Correct. And so it's a
23 framework for linking individual models for individual
24 components for in this analysis.
25 DR. WYMER: It's a structure that these

1 things fit into.

2 MR. CADY: Correct.

3 DR. WYMER: That helps a lot.

4 MR. CADY: Whereas D and D and RESRAD,

5 it's one homogenous model. They're not distinct

6 components and within FRAMES, you would have distinct

7 components, one air pathway model. One groundwater

8 model. So on and so forth and within those, you might

9 select from a series of air pathway models.

10 And this framework would allow the linkage

11 between the air pathway to the human exposure and so

12 on.

13 MR. LEVENSON: Let me just follow up on

14 that. Does this question from ignorance, does FRAMES

15 specify what has to be in a model or a module before

16 you would accept it and the context of the question is

17 could I use FRAMES to put together four or five

18 modules, a couple of which have conservation of mass

19 internal to the module and some which do not? Or does

20 FRAMES control that kind of a problem?

21 MR. CADY: FRAMES itself does not. FRAMES

22 does not require anything about the individual models.

23 If you were foolish enough to put a model that's not

24 as conservative into FRAMES and it allows that

25 flexibility, you could do that. It's not the

1 developers of FRAMES' responsibility to put the models
2 in. A user can put them in. So you can come up with
3 all sorts of unrealistic models potentially.
4 Hopefully, we will establish a pedigree,
5 the sorts of things that we envision in there, and so
6 we might have a suite a models that are NRC models and
7 most likely they'll be similar to DOD and DOE and EPA
8 models, but there's nothing to say that a general user
9 out there couldn't put a model that's not as
10 conservative into the system. Essentially, what
11 FRAMES does is essentially it's the connections
12 between models that is controlled by FRAMES. So as
13 long as a model produces data or results compatible
14 with other models in the system, then it could be
15 plugged in
16 DR. WYMER: Well, the FRAMES is really
17 very descriptive of what it is.
18 MR. CADY: Correct.
19 MR. OTT: But there is a significance
20 concern within the community that any component or
21 module that's used be properly pedigreed. In other
22 words, that you know whether it conserves mass or
23 conserves --
24 DR. WYMER: It's the QA/QC.
25 MR. OTT: It's the QA/QC issue, right.

1 And that's one of the things that's a very real
2 concern for all the developers is when they talk about
3 interoperability models, they're also talking about
4 knowing the pedigree about the models and the data,
5 because each independently is important.
6 DR. WYMER: What is meant by peer review?
7 How will that function?
8 MR. OTT: It was interesting. In Gary
9 Foley's statement, he very clearly indicated that
10 there's a degree of independence associated with peer
11 review and EPA's concept and there were people that
12 were talking about the QA/QC and peer issue and they
13 were saying well, peer review has to be something that
14 we do all along the way.
15 And I think in the end, everybody
16 realized, there are two aspects to peer review. There
17 is a peer review aspect that needs to be done along
18 the way in terms of consulting with other experts and
19 stuff. But in the final analysis, you need to go out
20 and get somebody that hasn't been involved with it to
21 do the peer review.
22 DR. WYMER: Exactly.
23 MR. OTT: So that concept is there. It's
24 acknowledged. And I'm certain that it will come into
25 the position that is adapted by the steering group

1 after this ad hoc group gets a chance to sit down and
2 look at the peer review and Qa/QC question.
3 DR. WYMER: I would hope that we would be
4 able, if the MOU becomes broad enough in terms of the
5 other agencies that we might be able to work out
6 something with say the National Academy to have an
7 interest in performing a peer review function.
8 MR. OTT: Yes, they did report a while
9 back on peer review within the Department on Energy
10 and so there's some background on that.
11 You have a dispute resolution --
12 DR. WYMER: Not yet, we haven't had any
13 disputes, -- well, we did have a dispute to resolve on
14 the QA/QC, but we don't have any specific dispute
15 resolution function. We did discuss whether we wanted
16 to lower the bar for approval of working group
17 proposals. And we did. We lowered it to majority of
18 the members of the steering committee. So as long as
19 four of the participating agency representatives think
20 a given working group proposal is a good idea, it will
21 be approved by the steering group.
22 Everything else that we did and I assume
23 everything else that we do in the future right now is
24 being done unanimously, and we did approve those two
25 working groups unanimously. There were no dissenters

1 in anything that we did in the future.

2 I wouldn't count on it being true in the

3 indefinite future either, but I was surprised. I was

4 expecting EPA to be a little less enthusiastic than

5 they were because of the problems that we had on

6 QA/QC, but they were extremely enthusiastic and it

7 came up afterwards and we're talking about Tom

8 Nicholson about the next phases and that kind of thing

9 and meting next year and I think EPA is going to be

10 a very strong partner in this.

11 Tony Wolbarst was there both days of the

12 meeting. He's not part of the research side of EPA.

13 He's part of radiation regulatory side of it. He at

14 one time was hoping to do one of the jobs that he

15 wants done and we've been very careful to say that

16 we're not going to do that.

17 He has a concept called MARMOD-MARPAR

18 which is something that he has discussed with our

19 Deputy Executive for Operations which is a way of

20 harmonizing the positions of EPA, DOE and NRC from a

21 regulatory perspective on the kinds of models that

22 ought to be used and that kind of thing.

23 They have backed off on their desire of

24 trying to do this for models and are now focusing on

25 being able to do it for parameters, which is probably

1 much more doable for parameters, which is probably
2 much more doable. They have to define those
3 parameters in terms of scenarios which might be under
4 consideration and there was some discussion of this
5 the other day and I made the observation. Somebody
6 was saying this is MARMOD and this is -- we said no,
7 it's not MARMOD.
8 And I said this may allow MARMOD. I said
9 if we are successful in this MOU, MARMOD may be
10 possible. If we aren't successful in this MOU, MARMOD
11 is not possible. If the science can't get together
12 and converge, then there's no way the regulators are
13 going to get together and converge.
14 DR. WYMER: That's for sure.
15 MR. LEVENSON: Yeah, I've got one comment
16 and a couple of questions. My comment is I think that
17 we really don't need to ask Bill whether the results
18 will be available in time to help with Yucca Mountain
19 since Yucca Mountain's period of compliance is 10,000
20 years.
21 (Laughter.)
22 DR. WYMER: Well, the heat is turned down
23 a good deal after the first 10 or 15.
24 Two questions, one of which is a very
25 simple one. Has there been discussion in this context

1 of doing something that may be almost equally
2 important and that is sharing the databases.
3 MR. OTT: Yes, databases are a part of
4 this effort.
5 MR. LEVENSON: They are a part of the
6 effort.
7 DR. WYMER: I think you mentioned that
8 actually.
9 MR. OTT: It's actually in the MOU that
10 databases are part of this cooperation/coordination.
11 MR. LEVENSON: The second is somewhat a
12 more complex question because on this kind of an issue
13 I don't have much faith that QA/QC does anything and
14 that is setting the standards in the following
15 context, QA/QC generally makes sure that what you do
16 conforms the specifications. If I specify I need a
17 pressure vessel for 250 psi, QA/QC can assure that
18 that vessel meets that, but it does nothing if, in
19 fact, I really should have had a 500 psi pressure
20 vessel.
21 And so my question is as part of this
22 activity, is there going to be an effort to identify
23 what should be the minimum contents and I'll get back
24 to my broken record point because for instance in the
25 TSPA some of the modules have conservation of mass,

1 conservation of energy and some don't. And even those
2 that do have it, aren't necessarily compatible. So I
3 think there's a number of very fundamental things
4 where somebody has got to -- if you don't set
5 standards, then going, plugging modules together, I
6 mean you wouldn't dare plug in somebody else's module,
7 no matter how much it's been QC'd to his standards,
8 unless you know that his standards include the things
9 that you want in your module.
10 MR. OTT: I don't know how this ad hoc
11 committee is going to come down int he final analysis.
12 There are two concerns that I have. One is that QA/QC
13 over code is different than QA/QC over collecting data
14 and using data.
15 DR. WYMER: Absolutely.
16 MR. OTT: And I hope that we are going to
17 address both questions.
18 But one thing that is clear is that
19 there's a very strong concern about documentation of
20 QA/QC record of both data and models and I would think
21 this kind of a concern about whether a model conserves
22 mass can very easily be put into the QA/QC record. I
23 mean there's no reason why we couldn't adopt the
24 position that says hey, there are certain issues that
25 really need to be addressed and your QA/QC record

1 should have information on that.

2 MR. LEVENSON: That's my point. I think

3 for this to really be effective, you'd have to have a

4 standard list of checkpoints because some people would

5 include them in the QA/QC, others won't.

6 MR. OTT: There was an interesting

7 presentation by Carl Castleton who is with the DOE,

8 not DOE, EPA-Athens office, on QA/QC for models and

9 how they are now building QA/QC checks into modules so

10 that they can check the data as it comes in and look

11 for inconsistencies in the data, establish numerical

12 tests and they said that in several instances this has

13 saved them months of time where in the past they might

14 have taken the data set and just used it as input and

15 then got anomalous results and thought oh wow, there's

16 something wrong with the model.

17 They did preanalytical QA/QC checks on the

18 data and detected problems on the data sets that were

19 being used to implement the models, corrected them

20 before they got in. It saved them a significant

21 amount of time. So apparently work being done in the

22 modeling community now that's allowing internal

23 QA/QC'ing at the time the models are run, which is an

24 advancement.

25 MR. LEVENSON: I'm not sure you've

1 convinced me that that's a good thing to have happened
2 because I know in connection with WIPP, there was a
3 case where the data didn't conform to the model and
4 needed up rejecting 100 percent of the data because
5 the assumption was made that the model was right.
6 MR. OTT: Well, I think that what you
7 don't want to do, you don't want the automatic checker
8 to throw out data. What you want it to do is identify
9 data so that you can then do a direct check of it
10 yourself. And there are lots of instances where
11 investigators have been known to say well, that data
12 isn't consistent with my concept of what's going on
13 so, I'm going to throw it out.
14 This was done early -- probably 10 or 15
15 years ago when some of the initial work on the basalt
16 waste isolation project was being done on container
17 materials and DOE was looking for information on
18 uniform corrosion.
19 So they throw out all of the specimens,
20 all of the information that indicated that there was
21 localized corrosion. Well, it turns out the localized
22 corrosion was the primary mode of failure.
23 Yeah, I realize that you can't throw out
24 data automatically, but you can identify data that is
25 inconsistent automatically and then look at it to see

1 what its pedigree is and to see whether it's good data
2 or not.
3 DR. WYMER: I'd like to explain as you
4 may be know why John and George ran out. They had a
5 meeting with the Commissioners and as you know,
6 there's not a whole lot of flexibility when you meet
7 with those people.
8 MR. OTT: I understand that. John said
9 that at the opening of the meeting.
10 DR. WYMER: Okay. We know what you're
11 going to be doing over the next 5 years now, Bill.
12 MR. OTT: You know what I'm going to be
13 doing for the next 5 months,
14 DR. WYMER: Oh, is that right?
15 MR. OTT: I'm the chairman. I'm the
16 chairman of this operation for six months which may be
17 the worst time to be chairman of this particular
18 operation.
19 DR. WYMER: But you're not going to get
20 out of it then, certainly.
21 MR. OTT: We've agreed that -- no, I'm not
22 going to get out of it. I'll be on the steering
23 committee, but at least I won't be the one who has to
24 organize all the meetings and telecons and write the
25 summaries, etcetera, etcetera and so forth. And maybe

1 next year we'll get the then current chairman Gary
2 Foley to come by and do the same thing and tell you
3 what the MOU has done over the last year.
4 DR. WYMER: Thanks very much. You have
5 our best wishes and our prayers.
6 MR. LEVENSON: It's a needed effort.
7 DR. WYMER: I should say, are there any
8 other questions here? Thanks again.
9 Well, I guess the next thing on the agenda
10 is the committee goes to work on preparation of
11 reports so that's not too exciting for the audience.
12 And I don't think we need the reporter.
13 (Off the record.)
14 CHAIRMAN GARRICK: I'd like to call the
15 meeting to order, please. We're at the point in our
16 agenda where we're going to hear about the Sequoyah
17 Fuels activities from an NRC perspective. This is a
18 project of considerable interest to the Committee
19 because of its many facets and components. It's one
20 that I had some involvement with in the late 1980s and
21 early 1990s and given the fact that it handles quite
22 a variety of material and involves both temperature
23 processes and cold processes such as solvent
24 extraction processes and that they've had waste
25 problems, it occurred to me that this would be

1 something in terms of a status report that would be of
2 great interest to the Committee and we're delighted to
3 have the staff here to give us an update on it.
4 The Committee member that has been
5 designated as our lead on questioning is Ray Wymer.
6 I think the gentleman that's going to lead off the
7 presentation is Mr. Shepherd. Is that correct? So
8 you'll introduce yourself and your team and the floor
9 is yours.
10 MR. SHEPHERD: Thank you. Good morning.
11 I'm Jim Shepherd from the Decommissioning Branch of
12 the Division of Waste Management in NMSS and we're
13 here this morning to talk with you about Sequoyah
14 Fuels. With me is Gary Stirewatt, a certified
15 geologist working with the cradle computer system.
16 We're having a couple of technical difficulties we
17 hope to resolve in a few minutes so we can show you
18 some of the models.
19 There have been a number of questions I've
20 heard concerning modeling and what has been done to
21 date so I'll prefix the rest of the presentation by
22 saying that when Sequoyah Fuels in 1993 submitted what
23 is called the preliminary plan for decommissioning
24 they included a statement for on-site disposal and
25 we'll talk about that.

1 As part of that, the staff did a very
2 preliminary no action dose analysis using RESRAD,
3 assuming that everything in the site was available for
4 uptake and we got some very high results. We don't
5 really believe those. It was simply a scoping
6 analysis and I'm not going to talk about those
7 results.
8 The licensee also submitted a dose
9 analysis in their 1999 decommissioning plan and I'll
10 talk more about that in a few minutes.
11 More importantly, what we are going to
12 talk about is the three dimensional modeling that we
13 have done to identify potential groundwater pathway
14 flow and the results that could have on a dose
15 analysis. And hopefully our experts will have that up
16 by the time we get to that part of the presentation.
17 My background quickly, I've been in waste
18 management for about not quite 10 years. I've been
19 with Sequoyah Fuels since 1993. Prior to that I was
20 a consultant where I was both performing and teaching
21 probabilistic risk assessment and human performance
22 analysis to clients primarily in the Orient and before
23 that I worked at Idaho National Engineer Lab where I
24 did some of the risk analysis on the LOFT and other
25 reactors out there. I'll let Gary give you his

1 background when he gets started.

2 So our purpose here today is to give you

3 an overview of the Sequoyah Fuels site by way of a

4 brief history, description of the site. There are

5 some interesting current decommissioning issues and to

6 show you what we plan to do to address those issues.

7 (Slide change.)

8 MR. SHEPHERD: As you may know, Sequoyah

9 Fuels is a uranium conversion facility. The input is

10 basically yellowcake. The output is basically uranium

11 hexafluoride. They started operating in 1970 through

12 1993. In 1986, they had an event where they had

13 overfilled a uranium hexafluoride cask because of an

14 error in the way they set up their measurements.

15 They took it outside, put it in a steam

16 drum, heated it up. As you know, you have six

17 sublimes and once it volatilized it did indeed make

18 room. It ruptured the cask, looked like a big smile.

19 I could just about put my fist through the center of

20 the hole and basically blew 14 tons of uranium

21 hexafluoride into the air.

22 The result was one fatality, several

23 injuries and significant contamination in the area.

24 Uranium being heavy, it fell out so it didn't go very

25 far, but it did create quite a mess to clean up.

1 Following that in 1987, General Atomics from
2 California offered to buy the site and I'll talk more
3 of the details of this in a little bit. The NRC
4 approved it.
5 In 1990, they began excavating around
6 their solvent extraction tanks. They used normal
7 hexanes, so they buried the tanks. They began
8 excavating around those tanks. The NRC inspectors
9 were there and determined there were high
10 concentration in the water on the order of several
11 grams per liter. That resulted in a thing known as
12 the Facility Environmental Investigation, FEI, for
13 short.
14 Following some other details which I'll
15 talk about, they began operation in 1992. They had an
16 uncontrolled release of NOx from the site. This was
17 caused by a combination of a hardware failure, failure
18 to perform maintenance, plus another human error. As
19 you know the dissolution process of yellowcake and
20 nitric acid is exothermic. Generally, they will put
21 a batch of nitric acid in the tank. They will then
22 meter the powder into it in order to hold down the
23 temperature. In this case, they had inadvertently put
24 about a half a batch of powder in the tank that was
25 thought to be empty. They dumped a full load of acid

1 on top of it. At that point, there's nothing they can
2 do but run.
3 They announced two days later they were
4 shutting down or would not restart the main process
5 and that they would shut down complete operations by
6 July of 1993.
7 (Slide change.)
8 MR. SHEPHERD: A couple of administrative
9 things as a result of all of this. In August of 1993,
10 they signed what is known as an administrative order
11 on consent with EPA Region VI in Dallas in which they
12 agreed to perform what is called a facility
13 investigation, similar to what the NRC calls site
14 characterization and then they are to identify
15 corrective measures for that. This is similar to our
16 decommissioning plan. The major difference is that in
17 EPA space, the EPA decides what alternative they will
18 use. In NRC space, the licensee basically decides
19 what in turn will be done.
20 They agreed to remediate all materials
21 that are controlled by Resource Conservation Recovery
22 Act. And we have an interesting one, nitrates, which
23 I'll talk about in a little bit that are not covered
24 by their NRC or RCRA order.
25 MR. SHEPHERD: In March of 1999, they

1 submitted the current decommissioning plan and that
2 will then drive what they do for the Nuclear
3 Regulatory Commission and I'm going to talk now how we
4 got to that point.
5 (Slide change.)
6 MR. SHEPHERD: The license was last
7 renewed in August of 1985. It was given a 5-year
8 renewal. In July of 1990, they submitted a timely
9 renewal application. One of the things they stated in
10 there is that they would acquire financial assurance
11 at some time in the future before the revised license
12 was issued and there was no mention of any
13 contamination. They started the excavation around the
14 solvent tanks about 3 weeks after they submitted that
15 application and that's when the NRC became aware of
16 large amounts of contamination in the vicinity of the
17 solvent extraction building.
18 (Slide change.)
19 MR. SHEPHERD: As a result of
20 investigations by OI, IG, people that even talked to
21 the FBI, they were required to shut down, regroup and
22 they did a phased restart under 24-hour, 7 day a week
23 observation by NRC inspectors which is rather unusual
24 for a materials site.
25 Despite our oversight, they still had

1 problems. As I said, they did not perform maintenance
2 in a timely manner. That resulted in the NOx release
3 and their shutdown following that in December of 1992,
4 there was a Commission meeting followed by demand for
5 information that asked how they were going to
6 decommission the site and how they were going to pay
7 for that decommissioning effort. Since they were shut
8 down it wasn't clear that they had any revenue
9 available.
10 Their response six weeks later was a thing
11 known as a preliminary plan for completion of
12 decommissioning and what they said is we're going to
13 put everything in an on-site cell similar to a mill
14 tailings type cell and we're going to pay for it with
15 a thing called Converdyn.
16 (Slide change.)
17 MR. SHEPHERD: Shortly thereafter, when
18 they shut down what is known as the secondary process
19 in which they took depleted uranium from the DOE
20 facilities, converted it from DUF6 to DUF4, it was
21 then sent on to Aerojet who ultimately converted it to
22 the metal penetrators. We have places like Jefferson
23 Proving Ground, North Africa and so on. That was in
24 July of 1993. In August they withdrew their request
25 for license renewal that had been issued in 1990.

1 As a result of that, the NRC issued a
2 financial order to both Sequoyah Fuels and its third
3 tiered corporate parent, General Atomics to provide
4 financial assurance in accordance with the 1988
5 Financial Assurance Rule. We used the Sequoyah Fuels
6 estimate from the preliminary plan of $87 million.
7 (Slide change.)
8 MR. SHEPHERD: To give you an idea of how
9 this whole organization is structured and what the
10 effect of the restructuring is, it started out as a
11 subsidiary of Kerr-McGee. In 1987, General Atomics
12 formed a subsidiary, Sequoyah Holding and purchased
13 all of the stock in Sequoyah Fuels from Kerr-McGee.
14 They then divided that corporation in two parts,
15 Sequoyah International in which they put the assets,
16 the land, uncontaminated land and so on and Sequoyah
17 Fuels which held only the operating part of the
18 facility. So we end up with, as you can see, General
19 Atomics being a third-tiered parent and not a licensee
20 in this case.
21 Then they told us that they were going to
22 use a thing called Converdyn. Well, to get to
23 Converdyn, we have to go to General Atomics parents,
24 General Atomics Technology Corporation who formed a
25 subsidiary called Energy Systems. Allied Signal, who

1 is the parent corporation over the Metropolis Uranium
2 Conversation Facility also formed a subsidiary, Energy
3 Systems, and those two subsidiaries formed a
4 partnership known as Converdyn.
5 Now Converdyn is the source of money for
6 Sequoyah Fuels. The first flow of money came from the
7 existing contracts that Sequoyah had at the time of
8 shutdown which they transferred both the contract and
9 the material to Allied Signal and they got, I don't
10 know, a few cents on the dollar for having given up
11 those contracts.
12 Then Converdyn is a marketing company and
13 as they make profits, they basically sent some of that
14 money to Sequoyah Fuels to what is called a standby
15 fee. Somewhat cynically it's a fee for not competing.
16 Sequoyah Fuels is no longer operating all the uranium
17 conversation in this country and was then being done
18 in Metropolis and so Sequoyah Fuels got a little money
19 for, in essence, not competing.
20 And finally, there's a thing called the
21 added standby where they got a share of the profits
22 after taxes and everything else. So you can see we
23 have an interesting situation in terms of funding.
24 (Slide change.)
25 MR. SHEPHERD: When we go to settle the

1 financial assurance order, the 1988 rule said two
2 things. By two years from the date of this order you
3 will have a formula value for financial assurance
4 which they did. That formula value is $750,000.
5 The other thing it said was at the time of
6 your next license renewal, you will have full value
7 for decommissioning. As I said a few minutes ago,
8 Sequoyah Fuels withdrew their request for license
9 renewal.
10 Both of them requested a hearing as a
11 result of the order. Sequoyah said the order does not
12 apply to us because we have not renewed our license.
13 And we do have the $750,000. However, we don't have
14 anything else, so the staff decided that we couldn't
15 get any blood out of a turnip, if you pardon the
16 cliche, so we settled for what they said and what they
17 said was they promised to use their resources
18 judiciously.
19 We continued negotiating with General
20 Atomics. General Atomics said the NRC does not have
21 the authority to go to a third-tiered corporate parent
22 with what is tantamount to a financial penalty where
23 there's been no allegation of wrongdoing. The staff
24 tried to argue corporate similitude, a thing known as
25 "piercing the corporate veil" to show that the

1 corporation, Sequoyah Fuels, was so closely controlled
2 by General Atomics that a normal person would not be
3 able to distinguish between the two corporations.
4 It's pretty hard to do when one of them is in Oklahoma
5 and the other one is in San Diego.
6 We ended up settling. General Atomics
7 said we don't owe you anything, but we will give you
8 $9.5 million just to go away because you're
9 interfering with our ability to do business, with the
10 outstanding order. However, you get to pay the taxes.
11 And ultimately we ended up with a trust fund of $5.5
12 million to decommission the site.
13 (Slide change.)
14 MR. SHEPHERD: Cash flow in the meantime
15 is provided by Converdyn. Converdyn is actually a
16 proprietary arrangement so I can't discuss any of the
17 details with you, but through the three paths that I
18 showed you a few minutes ago, indeed, they have
19 provided the amount of money that they said they were
20 going to. They have plans to provide about another
21 $26 million which is in keeping with Sequoyah Fuels
22 cash projections in order to do decommissioning as
23 they've proposed.
24 But Converdyn is a business. It is not a
25 financial assurance mechanism. You're all, of course,

1 familiar with the fuel cycle. Converdyn sits here in
2 conversion. The money revenue business to Converdyn,
3 therefore, is dependent on what goes on downstream.
4 Ultimately, what is the demand. There's a question on
5 total demand. There's also a question on other
6 sources to meet that demand, such as downblending,
7 weapons grade material from the former Soviet Union.
8 DOE projections for total uranium demand
9 for reactors is less than favorable after 2005. Now
10 these are projections. We don't know exactly what's
11 going to happen. The energy crisis in California has
12 persuaded some politicians to advocate building up
13 nuclear power. As I'm sure you're aware recently in
14 Germany they passed legislation to shut down all of
15 their nuclear plants within 10 years. So we really
16 don't know what's going to happen, but it certainly
17 brings uncertainty to the money available to
18 decommission the Sequoyah Fuels site.
19 (Slide change.)
20 MR. SHEPHERD: A little detail on what
21 that might mean. What they have proposed is a
22 restricted release scenario in accordance with the new
23 license termination rule of subpart 10 CFR 20.
24 They're going to put all of the contamination at the
25 site, both nuclear and chemical in a cell that will be

1 above grade in order to protect groundwater, but it's
2 designed essentially to the mill tailings criteria in
3 appendix A to 10 CFR 40.
4 The plan that they submitted shows a 20
5 acre footprint by about 35 foot high cell. Some of
6 the numbers in the cell indicate that that would be
7 the maximum size. If they have less contamination,
8 the cell could be as small as a 10 acre footprint.
9 In addition, there will be a buffer around
10 that footprint that has a total area of about 100
11 acres.
12 Everything else in the current site which
13 is around 635 acres would then be what they call
14 released or unrestricted use. There is contamination
15 in the groundwater, both chemical and nuclear and
16 we'll talk in a minute, hopefully, Gary will be able
17 to show you the --
18 MR. STIREWALT: We shall, we shall be
19 able.
20 MR. SHEPHERD: Great. The several levels
21 of groundwater underlying the site. Sequoyah has
22 proposed some limited remediation in the uppermost
23 level that as they remediate the dirt down to a
24 residual concentration, if they encounter a
25 groundwater, they will remediate it. If they don't

1 encounter it, they will leave it in place.

2 For the balance, whatever is left in

3 place, they're proposing actually an EPA approach that

4 was developed for chemical contamination known as

5 monitored attenuation. And as we'll see, there are

6 some difficulties with this. One is that it's

7 difficult to show that heavy metals are -- heavy metal

8 concentrations are going down by anything other than

9 dilution and the other thing is how do you actually

10 monitor where the material is.

11 (Slide change.)

12 MR. SHEPHERD: To give you an idea of how

13 the contamination came to be where it is, this is a

14 process flow diagram and I'll show you a physical

15 diagram of the facility in a minute.

16 The first place we had problems was in

17 what is known as the digestion portion, where they

18 bring in the yellowcake, put it in a vat, dissolve it

19 in nitric acid. This is where the NOx release

20 occurred. It's in the main process building. There

21 were a number of spills in that area that went through

22 the floor.

23 They then took that material and piped it

24 literally across a driveway about 30 feet away to

25 another building known as the solvent extraction

1 building. They had a number of spills in the solvent
2 extraction building, the worst of which they lost
3 about 1500 kilograms of uranium. I'm not a process
4 person. I haven't done the engineering calculations
5 on how many gallons that would amount to, but it's a
6 lot. They ran a yellow river all the way to the
7 Arkansas as a result of that spill.
8 Another spill area was denitration. After
9 solvent extraction, they brought it back across the
10 building. Denitration took place in open top tanks,
11 basically heated it up until the nitric acid boils
12 off. They often boiled it over. State-of-the-art of
13 that facility for checking the level in the tank was
14 a dip stick which they didn't always use.
15 The bottoms from the solvent extraction
16 process known as raffinate was then sent out to the
17 ponds, settling ponds just to the west. It was
18 treated with barium and ammonium. They then called it
19 ammonium nitrate. They had some storage ponds to the
20 south that I'll show you in a minute. They then used
21 ammonium nitrate which you and I go to the hardware
22 store and buy as fertilizer to fertilize their land,
23 both immediately adjacent to the facility and some
24 actually in the next county over. They then either
25 leased that land for grazing of cattle or they grew

1 hay on it which they harvested and sold as fodder.

2 Then, of course, there was the accident

3 with the US_6 tank shown down in the lower right corner

4 of the screen.

5 (Slide change.)

6 MR. SHEPHERD: This is an aerial view of

7 the site looking roughly south along the western side,

8 the left side as you look at it is Highway Oklahoma

9 10. The Illinois and Arkansas River are off the

10 picture to the right side of the screen.

11 This is the main process building where

12 many of the spills occurred. This is the solvent

13 extraction building to the west of it where many other

14 spills occurred. The UF_6 explosion cask rupture took

15 place just at the north edge of the main process

16 building. That material was then washed northwest

17 into what's known as the north ditch and emergency

18 basin. These are unlined basins that now have the

19 residue from that accident.

20 These five ponds to the south are the

21 so-called fertilizer storage ponds where they have

22 some leakage and where they have a high concentration

23 of nitrates.

24 As a result of the overall operations,

25 this is roughly the area that has high uranium

1 contamination. In the soil it runs about 50 to maybe
2 a couple of hundred picocuries per gram, higher in the
3 sediments in the ponds. There's 20.304 burial area up
4 in the northern part of the site.
5 The settling ponds, the sludges there
6 contain most of the radium and thorium on the site.
7 Concentrations in the sludge there are on the order of
8 300 to 350 picocuries per gram. The sludges right now
9 are roughly 20 percent solids. So there's more water
10 in those ponds than there is sludge which for a no
11 action alternative is a potential problem from a
12 mobility point of view.
13 Nitrate contamination is moving generally
14 westerly and we'll show you the aquifers and why in a
15 moment, both out of the nitrate or ammonium nitrate
16 storage ponds and also out of what's known as Pond 2.
17 Pond 2 underwent a particle remediation about 1989.
18 The residual contamination in the clay liner in the
19 poind is about 2,000 picocuries per gram. But there's
20 a definite nitrate plume coming out of this poind in
21 several directions.
22 (Slide change.)
23 MR. SHEPHERD: This is a physical diagram
24 of the area. Here is the decorative pond just south
25 of the main process building. Here's the sanitary

1 lagoon in the upper left corner of the picture. We'll
2 use the lagoons as overlays on the GIS system to help
3 you stay oriented.
4 Wells of particular interest, 25, which is
5 just -- MW 25, we think is picking up material
6 probably from the solvent extraction building spills.
7 MW 14 is in a straight line with the wash down from
8 the cask rupture which took place about here. And the
9 material was then washed over into the north ditch.
10 MW 12, you'll notice there's a thing inside the
11 building known as the subfloor process monitor. They
12 spilled so much material out of the denitration tanks
13 on to the concrete floor and into the sand underlying
14 the building, they actually drilled a hole in the
15 floor, put a pump in it and pumped the liquid back
16 into the process because it had recoverable amounts of
17 uranium.
18 MW 13, you'll see is an interesting one.
19 There's a thing that the licensee calls a paleo
20 channel that runs down through this area that may be
21 a conduit for uranium moving generally south. MW 13
22 and MW 18 are approximately in that channel and I'll
23 let Jerry point out some of the differences that we
24 see. As you can see, east and west, they're very
25 close together.

1 MW 10 is about the bottom of the channel
2 and has one of the highest concentrations in the area.
3 The other wells to the west are at or near background,
4 typically less than 7 and many of them less than 5
5 picocuries per liter.
6 With that, I'll let Gary Stirewalt
7 introduce himself and --
8 MR. STIREWALT: This is a somewhat more
9 informal entrance than I had anticipated. I feel like
10 the Phoenix of Sequoyah has arisen from the ashes or
11 maybe the phantom of Sequoyah.
12 (Slide change.)
13 MR. STIREWALT: Actually, Jim had asked me
14 to sort of introduce myself and my background. Maybe
15 rising from what could consider the basement is
16 appropriate because I'm really a hard rock geologist.
17 So geologists know if you work in hard rock basement
18 or nice high grade metamorphic and that's lots of fun,
19 so instead of being a sedimentary guy, my background
20 is hard rock geology and I just spent half the morning
21 of your meeting lurking under the desk preparing for
22 this.
23 But I would like to thank Theron, Alan and
24 my assistant administrative guy, Kenny, for helping
25 boot stuff up and around. The problem was, I must

clarify and I apologize for what may have been mild mumblings and interruptions in the background, but it was necessary. We moved a very expensive piece of hardware, in fact, and crossed out fingers, well, okay, it turns out that it worked all right.

Okay, anyhow, Jim has done a very excellent introduction and lead in for what I'd like to talk about. I'll make sure I'm alive and up back here and I am. That looks mildly fuzzy to me, Theron. Is that -- is it -- could be my eyes. Is it sort of visible? We're going to be doing some flippings around with it, I think, actually.

I know modeling is kind of an important topic for a whole handful of reasons, but I'd like to start just by saying that really there's modeling and there's modeling.

Many of you, if you think about the concept of modeling, ah, we're going to probably see some nice, neat hydrologic flow and transport code work this morning that's going to talk about how uranium and nitrate might well have moved in a rather complex aquifer system at the site. Well, you aren't. We're going to step back even more basic and actually show you the framework model that those hydro folks are going to have to consider when they start setting

1 up their flow codes. The site is really rather
2 complex. It's a three aquifer system that we're going
3 to illustrate for you. There's an upper level
4 terrace, a lower shallow and an even lower and deeper
5 deep groundwater system aquifer as labeled qualified
6 name, investigated, studied by the people at Sequoyah.
7 So this is not our terminology, it's theirs, which
8 should clue you in that we are most certainly using
9 their database. That's very important.
10 We aren't going in and doing anything to
11 generate new data. We're taking the data that they've
12 been able to give us and actually speaking of data,
13 being a visual person, I can't resist. The models
14 that you're about to see, this is the hard copy data
15 base for these models, so there's a fair amount of
16 information to support and back up this.
17 This actually includes information for
18 both groundwater that I'm going to show you today and
19 some solid stuff that we're currently working on
20 modeling for the individual, some of whom I see are
21 here. We're doing some work on the EIS because they
22 need to see what sort of concentrations exist in the
23 soil. Those might be areas that they, in fact, must
24 dig up to remediate. But again, we're starting with
25 this kind of database.

1 Now thank goodness, it didn't just come to
2 us in hard copy. We actually got digital information,
3 certainly to the credit of the Sequoyah folks. The
4 database that exists for the groundwater, the MW
5 series wells, the designation that you see here, this
6 is how I know what I"m looking at. These are the
7 groundwater monitoring wells, but database for that
8 exists between 1991 and 2000. So we have again a
9 massive database to work with, which again is exciting
10 and well, there are some frustrations because you
11 don't reformat it into an ASCII file that this
12 particular software package will take. It's called
13 EarthVision. More about that in a moment.
14 In fact, I think in general, about 95
15 percent of your time is spent getting the data ready.
16 So once that's done and those of you who -- remember,
17 I'm only a geologist. I'm not a computer jock, but
18 still even computer jocks, they still spend that
19 amount of time getting the data ready. But that's
20 very crucial. It's very important, particularly when
21 we're analyzing data of the type that we have here.
22 We're looking at variations in uranium and
23 nitrate, specifically because that's what Jim has
24 requested. There may be other elements that were --
25 we will model later depending on what we might need

1 for EIS, but we're looking at those in a regulatory
2 arena. That data set is, in fact, three dimensional,
3 so you cannot properly illustrate it for either just
4 simply looking at it to show it to administrators,
5 committees or the lay public as well if you're just
6 using a 2-D like GIS which is very powerful,
7 geographic information system, but that's essentially
8 a 2.5-D.
9 You can do a series of maps, but what we
10 can do with this particular software product, again,
11 it's EarthVision. It was developed by a company
12 called Dynamic Graphics in Alameda, California. We
13 can actually represent solid, 3-D spatial block models
14 that we can cut, slice, analyze, pull apart, pick
15 apart to look at everything from data distribution and
16 that's what you're seeing on the screen right now and
17 again, I'm going to get back to that in a second. But
18 we can look at everything from the data distribution.
19 We can take those data sets, actually contour them in
20 three dimension so that we can really look, in fact,
21 in 3-D space, real position of X, Y, Z coordinates and
22 a measurement in 3-D space. We can visualize this.
23 Analyze the data, analyze the concentrates, so you can
24 actually visualize the zones or, in fact, volumes
25 because they are volumes. They're 3-D volumes of

1 concentration.

2 So what we're doing then with this
3 software package, in fact, I should add one thing.
4 This particular package was developed as I said by
5 Dynamic Graphics. It is well pedigreed. It was
6 developed initially for the oil industry about 15
7 years ago. It's been used a great deal there. It
8 really is a premiere software package for 3-D
9 geospatial modeling. There are others. But this one,
10 I should add which might be an important point has
11 been QA/QCd for the Yucca Mountain project. So the
12 models that were constructed using this same software,
13 in fact, same version that I'm illustrating, that has
14 passed QA muster at YMPO. And again, that's a pretty
15 important thing. So it certainly has a pedigree.
16 Enough about pedigree.

17 The reason that we're doing all this, you
18 think, gee, that's a nice pretty picture in back of
19 you. What can we do with it? It really, it obviously
20 provides the means, you know, to sort of cleverly
21 illustrate stuff. You can see that this really is a
22 data distribution in 3-D space. This, in fact, is the
23 entire data set that exists for the month of April
24 1996 from the MW series wells at the Sequoyah site
25 showing distribution of subsurface uranium in the

terrace aquifer, the shallow aquifer and the deep aquifer. This is the entire data base and again, you can certainly see that this is, in fact, a 3-D data package so you do want to consider it in 3-D.

The highest value in this case happened to have been in the -- and I know I'm looking at a terrace measurement. If there's no designation on the bore hole number, you see MW 014 and what I just flagged, that's a value, a sample taken in the terrace aquifer. In fact, that was the highest for this particular time frame.

So obviously, showing you again in this case, so okay, gee, we can go in and query these data points. Well, I know where I am. I've also taken the liberty of sort of plastering on the top of this the overlays for the basins that Jim illustrated to just kind of give you an idea of where you are at the site. I didn't want to put the buildings on there, because at this scale of the model, it's just simply too cluttered, so I've used the basins and hopefully that will help you sort of think about remember, understand where you were or where you are.

So again, we really are looking at data, three dimensional data and this suite of data, this data base, this data set really is related to the

1 geological and the hydrological characteristics and
2 these are factors that certainly are deemed important,
3 deemed critical for consideration and decommissioning,
4 including assessment of potential remediation options.
5 So there's some practical reason for being able to use
6 it, not just for an illustration, but actually to show
7 you the kinds of things that we can do with respect to
8 analysis.
9 So today's goal, obviously, is to show you
10 the software. Well, okay, you're getting a good view
11 of that one behind, but really to kind of involve you
12 to a mild degree, actually in the analysis process, so
13 you can see the kinds of things that Jim and I have
14 literally spent a fair amount of time, shoulder to
15 shoulder, discussing the property models that you're
16 about to see, that we've developed in the computerized
17 risk assessment and data analysis laboratory, CRADAL
18 for short is better for me to -- okay.
19 So that's kind of the logic for why we
20 think it important and I've also mentioned again the
21 connection with some additional modeling that we are,
22 in fact, doing even as we speak, getting the data set
23 up and formatting for the EIS, particularly
24 contamination in the soil horizon because that's
25 material that they might well have to excavate.

1 I've defined all the data that we've got,
2 so let's kind of go from this again sort of general
3 illustration that I show you, again, data distributed
4 in 3-D space. Let's -- what I'd like to do actually
5 is walk to the upper aquifer unit, the terrace deposit
6 strictly first. And, as I do that, I would also like
7 to post on the data set that we used to develop the
8 property models for the terrace. This is going to
9 give you again the sort of -- these are essentially
10 just ASCII files, pretty easy to set up, even for a
11 geologist.
12 And we're looking at uranium, not nitrate
13 in this case. Now this then is the data base that
14 we're dealing with, hanging up in 3-D space that we
15 utilized to develop the property model illustrating
16 subsurface contamination of uranium in the terraced
17 deposit. The terrace, by the way, includes real
18 terrace material as well as an upper unit of bedrock.
19 It contains real terrace stuff, unconsolidated and it
20 also contains unit 1 shale. So the terrace aquifer
21 actually contains terrace and bedrock, but don't be
22 confused by all those facts. It's not necessarily
23 crucial. The point is that what we're illustrating
24 here actually does reflect geology.
25 DR. WYMER: Does the nitrate sort of map

1 the uranium or does the uranium precipitate and the
2 nitrate moves independently?
3 MR. STIREWALT: Excellent question,
4 excellent question.
5 Actually, I'm glad you asked. I might
6 have preferred you asked in a few minutes, but when we
7 have a chance to look at the nitrate and we're going
8 to do that if Jim doesn't pull me off the stage with
9 his gaff hook, you will see, particularly in the
10 shallow aquifer in the area of the main process
11 building where it looks as if the flow transport
12 pathway for -- it's basically the same pathway as
13 reflected both for nitrate and uranium in that
14 location, which again gives you some good feeling
15 about oh gosh, we really must be tracing this out
16 pretty well and what it should tell the hydromodelers
17 that they're going to need to attempt, if they can
18 step down fine enough, to possibly capture those kinds
19 of flow path and transport, but yes, it's a very good
20 question and I'm happy to say one, in fact, does
21 reflect the other where both occur, particularly in
22 the area of main process building.
23 Right now, we're just showing uranium, but
24 that's a very, very pertinent question and you helped
25 me make a good point I wanted to make, so I appreciate

1 it.

2 Let's -- I talked about the fact that we
3 were stepping into the models and actually building 3-
4 D contours around the data points. Well, okay, let's
5 start to do that then. Let me do it just by clicking
6 a few magical buttons in the EarthVision and if you're
7 watching, you can now see that we have a volume
8 represented that represents everything between 15,000
9 and greater than 20,000 micrograms.

10 So these are concentrations, micrograms
11 per liter. And you can see where that sits. You can
12 see it in here and it ought to be clustered around our
13 high data point which is lurking in the middle of
14 that, at hole 14.

15 Now actually, I mentioned volumes, these
16 are volumes. One thing you can actually do with the
17 software, let me just quickly illustrate this idea.
18 You can really do on the fly volume calculations so
19 what the quick calculation that's show with the
20 software for this concentration, this is in cubic
21 feet, so you can actually do on the fly volume
22 calculation. You can refine that with some other
23 aspects of EarthVision if and when you need to and
24 sometimes you need to. We've used this in other
25 situations where that was -- those -- and actually in

1 simpler hydrologic situations where the on the fly
2 calculations was really quite literally all we needed,
3 but I'm not going to post that on a regular basis, but
4 the point is we can do that, so, for example, when we
5 do the soils modeling, we'll be able to actually give
6 you volume values, volume measurements that, in fact,
7 the Sequoyah folks are going to have to consider if
8 they're going to excavate that and put it in their
9 disposal cell. That's one of their remediation
10 options.
11 Let's walk through this a bit more, again,
12 just to show you the concept. Again, we would
13 certainly be expanding our volumes. Again, if you
14 look at the scale on the left side of the screen, you
15 will be seeing what we're representing relative to
16 concentration levels for uranium, for this time frame.
17 And it looks like it's honoring the data pretty well.
18 There's Hold 10 that Jim mentioned. I'm going to show
19 you that relative to that paleo channel in a 3-D
20 illustration in just a moment.
21 And Jim, I know that you needed 10 minutes
22 after I finished.
23 MR. SHEPHERD: I can cut it to 5.
24 MR. STIREWALT: Boy, that's a compliment.
25 But again, what we're beginning to see then is we're

1 beginning to see a rather definite pattern of where
2 the highs are. Now let me just, lest you think this
3 is a -- we call it a model because it is in the first
4 place, and lest you think, boy this sure looks good.
5 Looks like there are no glitches, no problems. Let me
6 just show you that there do happen to be some
7 extraneous extrapolations.
8 The more data you have, the better the
9 control is, needless to say. But this area out here,
10 that by our color code indicates ought to be somewhere
11 between 50 and 500 micrograms per liter of uranium.
12 Well, there's no data out there. The algorithm and if
13 anyone is interested I can give you the mathematical
14 basis for that and papers that are written on it
15 that's used in EarthVision minimum tension gridding.
16 Actually, it picks up the transit it sees
17 within the data points and extrapolates out to that
18 corner. Those could be cleaned up and that would need
19 to be done if we needed to do a good volume estimate
20 for that particular concentration range, but clearly,
21 there's some extraneous extrapolation in the area
22 between 50 and 500.
23 So again, lest you think -- remember, we
24 call it a model because it is and unless you think
25 it's flawless and perfect, it really does require some

1 geo knowledge of the site and some of the basic geo
2 principles, not just to use the software best, but to
3 really go in and carefully work with the data and in
4 fact, that's where we start with the raw data and
5 sometimes you detect, I mean these things were
6 assembled and written down and recorded by humans, so
7 you will often find little glitches in the data base.
8 And the Sequoyah folks to their credit have been
9 absolutely exemplary. Any quite literally errors we
10 found in their data base, because of transcription,
11 they have, generously, and in a very, very timely
12 manner, I think Jim would agree, corrected, without
13 any hesitation. So they've really been on top of
14 that.
15 DR. WYMER: Let me ask, since you're going
16 to run out of time before -- let me ask you a question
17 on the fly here.
18 MR. STIREWALT: yes.
19 DR. WYMER: Does the soil contain
20 limestone, dolomite or clay? What kind of a dirt have
21 you got?
22 MR. SHEPHERD: A lot of clay.
23 MR. STIREWALT: It's clay.
24 DR. WYMER: Not a lot of limestone or
25 anything like that?

1 MR. STIREWALT: No, not at the site. In
2 fact, there's no limestone on the site per se. The
3 interesting thing about the soil category, as the SFC
4 folks have defined it, their soil material includes
5 everything down to all but refusal when they were
6 doing sampling. That means in point of fact within
7 their sampling intervals that are quote soil, they
8 really have friable, weathered bedrock as well, but
9 basically no carbonate. There's carbonate in the
10 region, but not at the site and it's essentially clay
11 rich.
12 DR. WYMER: Okay, thanks.
13 MR. STIREWALT: Let me show you just
14 quickly the concept of paleochannel. That's the
15 direction that you're walking out. These highs are
16 sort of related to things we think we know we have
17 sources for. These are, in fact, it appears sitting
18 in the paleo channel.
19 Let me just show you that right quick
20 again with the 3-D model that we set up. What we did
21 was we took their data. This is a vertical
22 exaggeration of 5, but if I get it at the right angle,
23 you can see within this area that there really is in
24 the bedrock surface itself, there really a small
25 channel, a gully, not the Grand Canyon by any stretch

1 of the imagination, but even at a 1 to 1, another
2 vertical exaggeration you can still see this.
3 Okay, and what I have done is I have
4 flagged the bore holes that Jim mentioned. Let me
5 just pull those out for you. The highs that were
6 sitting back up in the terrace deposits are shown
7 thusly. Jim mentioned some of the holes that bracket
8 it, 7.3 and 19.57 and 2.8. The one at the quote
9 headwaters at 9.4. Let me squiggle those off. And
10 the two that are high, and 18, it's 8400 and 10, it's
11 4700.
12 Now this is information that the Sequoyah
13 folks and I think wisely so used. Think hey, gosh,
14 you know, we must have movement there down some
15 potential paleo channel. Lo and behold, they
16 collected information on that surface, literal
17 elevation of that surface. That's in their data base.
18 That's where these values came from and when it's
19 modeled, it turns out that those highs, I'm not
20 kidding you, fit right where they should in the bottom
21 of that paleo channel and it's darn narrow as Jim
22 implied just a moment ago. It's darn narrow.
23 Jim, there's a lot of things I could
24 continue to do. I'm now 5 minutes over. That gives
25 you your 5 minutes. We did not get a chance --

1 MR. SHEPHERD: We've got until 12:30.

2 MR. STIREWALT: Have we? You never give

3 a talker more time when he likes to talk anyway.

4 Okay, what I need to do though since there

5 was this version running, actually the software is

6 initially set up to run on UNIX, on an SGI box. This

7 is running on an NT. This is their first version.

8 They've got to keep up with the Joneses or the

9 Gateses, if you wish, but this is now set up to run,

10 just the EV viewer, not the calculation, on an NT and

11 there was some hardware glitches, things kept freezing

12 up quite literally.

13 When I tried to mount everything and have

14 -- what we had planned is we're going to have dual

15 views. We're going to have nitrate on the left,

16 uranium on the right and of course, we'd be glad to do

17 that on the high powered UNIX work station at some

18 stage, if anybody would like to wander up and see it,

19 but let me particularly since Dr. Wymer inquired, let

20 me just pull up very, very quickly, the values for

21 nitrate. Again, same year, same sampling time frame,

22 just to show you what this looks like. And it's at

23 least easy to pull it up.

24 Okay, what I want to do, in fact, just to

25 make the case for what appears to be some degree of

1 continuity, I want to jump immediately to the shallow
2 aquifer system. This is what we're looking at now.
3 Now remember, we're looking now at nitrate, same time
4 frame. Maybe to help you locate, I should quickly
5 post or I shouldn't -- I should say I will quickly
6 post those same location points.
7 Now again, I'm going to ask for your
8 imaginative recall for a second, but you certainly
9 remember -- well, hopefully, or perhaps, that we were
10 getting those uranium hives over in exactly the same
11 location as we're getting the trends that the model
12 illustrates for nitrate, again and Jim and I would
13 interpret this as a strong suggestion that these
14 things are moving along similar pathways. Now one
15 thing that, of course, the geochemist would jump in
16 here and say hey, wait a minute, hold it, hold it. It
17 looks like there's retardation on the uranium. It's
18 not moving quite as rapidly. I'd say that's probably
19 true. The area on Pond 2 is, boy, this is just
20 beautifully instructive. I got to take 30 more
21 seconds and post the data, Jim. I can't resist.
22 First you find it in the data set and you
23 get the right one. But it's really intriguing that
24 again, and Jim, I know you're going to pounce on me if
25 I say something that you don't feel is accurate or

1 appropriate which I do at times. But the interesting
2 thing is that we saw from the Pond 2 area migration
3 basically south, west and north, every direction but
4 east for the nitrate within the shallow aquifer
5 system. There's a curious hole in there though. See
6 that really low spot, 14A and remember I know I'm in
7 the shallow aquifer because it has the A designation.
8 That's strangely low when I realize it's surrounded by
9 points that point of fact you'll see what I'm flagging
10 are really considerably higher.
11 Jim might want to speculate on logic there
12 too, but at least I wanted to show you the nitrate,
13 particularly as a follow up to your excellent
14 question. In this area, there's a strong suggestion
15 that we're getting highs in nitrate, basically in the
16 same position.
17 CHAIRMAN GARRICK: What's the threat to
18 the lower aquifer? You mentioned earlier, I thought,
19 that there was -- you --
20 MR. STIREWALT: You mean the connection
21 between --
22 CHAIRMAN GARRICK: Yes.
23 MR. STIREWALT: Well, that's also an
24 extremely pertinent question. There's an indication
25 from the models and I think again Jim and I agree on

1 this, that there may well be a vertical connection
2 between the terrace and the shallow, not so much with
3 the deep values there, at least for this particular
4 time frame, even though they're somewhat above
5 background. They're still quite low. Less than 10
6 micrograms per liter for uranium, but now that
7 connection could be through the fractures in the
8 intervening areas that are not sampled which, in fact,
9 I didn't illustrate because I was so excited about the
10 other stuff, but the way that the sampling sequence is
11 done, the terrace system is sampled.
12 There's a nonsampled interval that, in
13 fact, corresponds to an aquiclude, Unit 1 sand,
14 between shallow, next sampled interval terrace so that
15 means that if that connectivity exists, and there's
16 some suggestions that it might, that it's actually
17 penetrating that aquiclude. It could be moving along
18 fractures. It's a pretty good sandstone. It could
19 also be moving along some of the borehole connections
20 which make beautiful pathways under many conditions.
21 But their indications, I think, from the data and Jim
22 concurs, that there may well be a connection between
23 the terrace across that aquiclude that's a sandstone
24 down into the shallow, but not across the next
25 aquiclude into the deep.

1 Good question. Good point.

2 MR. SHEPHERD: Let me say a couple of

3 things on that. Unlike what a lot of us learned in

4 Geology 101, at this site we have interlaced layers of

5 sandstone and shale. The sandstone is the aquiclude

6 and the shale is the water-bearing layer.

7 There are several sandstone layers in

8 what's called the shallow aquifer and it's not until

9 we get down to what's called Sandstone Unit 4 that we

10 have the aquiclude between what is called the shallow

11 and the deep. That is roughly 85 feet below grade.

12 And we don't believe that there's been any migration

13 of either nitrates or uranium below the 85 foot level.

14 There are a dozen holes in that aquifer

15 which if you look at the data there will be wells with

16 a B designation on them.

17 In addition to the MW series wells which

18 were installed during the Facility Environmental

19 Investigation in 1990 and 1991, there's a whole other

20 series of wells that Kerr-McGee began drilling back

21 before they constructed the site in 1969. Many of

22 those wells were actually plugged in 1994, 1995

23 because they were known not to give accurate data.

24 Some of the problems were they were screened across

25 multiple zones. In one case the sandpack went all the

1 way from the surface to the bottom of the hole. There
2 were no seals whatsoever.
3 So there are some wells that we know
4 provided some amount of conduit. There were about
5 four or five dozen geotech borings made during
6 construction of the site, although the exact location
7 of which was not documented, at least we've never
8 found it and the indications are they were never
9 plugged.
10 So there are probably halfways between
11 what is called the terrace, which is everything above
12 Sandstone unit 1, and the shallow which was from
13 Sandstone 1 down to the top of Sandstone 4 that may be
14 artificial rather than fractures in the layers
15 themselves.
16 There may also be just simple
17 discontinuities in the sandstone and the shale that
18 allow things to go back and forth.
19 CHAIRMAN GARRICK: So what is being done
20 about this?
21 MR. SHEPHERD: Well, this model has
22 provided us with some insights and every time we look
23 at it we get a few more. As I said, what Sequoyah
24 Fuels had proposed is called Monitored Natural
25 Attenuation. One of the requirements in the EPA

1 regulations says that you identify and monitor the
2 center of the plume. When you saw the nitrate coming
3 west out of Pond 2 and all of a sudden there's a zero
4 there with several thousand on either side of it, that
5 has some very interesting implications for how do you
6 know you're actually monitoring what's going on?
7 The answer is and I'll get to another
8 approach that the Sequoyah has proposed, but
9 physically, we have not agreed to what the residual
10 concentration in the soil is. Sequoyah Fuels has
11 verbally discussed with us alternatives for
12 remediation, one of which would be to consider
13 actually excavating down to Unit 1 shale, just taking
14 out what we really call the terrace aquifer, removing
15 all of the liquid, backfilling that with dry material
16 and building their cell on top of that.
17 This kind of information will be a factor
18 in their ultimate decision. To their credit, what
19 they have done is they have hired a consultant,
20 Shepherd-Miller from Colorado Springs.
21 MR. STIREWALT: Yes.
22 MR. SHEPHERD: To actually go in and do a
23 mod flow type model and an MD 3-D transport model.
24 This, in my opinion, is far better than doing things
25 like probabilistically varying Kd and RESRAD because

1 who cares what Kd is when we don't know where the
2 plume is.
3 So that kind of model, then once we have
4 the location and the concentrations identified, we can
5 put a RESRAD calculation at that point. It raises
6 some very interesting questions on dose calculations
7 of as you saw, there was a distribution. There's
8 uranium in certain places. There's thorium and radium
9 in certain places. There's nitrate in certain places.
10 How big an area does it really take? This is rural
11 Oklahoma. We believe the resident former scenario is,
12 in fact, appropriate. The nearest resident is a half
13 a mile away. There's one other that's about a mile
14 away to the south and the next one is about two miles.
15 CHAIRMAN GARRICK: Now where's the river,
16 how far are you from the river?
17 MR. SHEPHERD: The Illinois River runs
18 north and south about three quarters of a mile to the
19 west of the site. From the grade level of the main
20 process building, down to the pool level of the river
21 is about 100 feet vertically. I said pool level. At
22 that point the river is actually considered by the
23 Corps of Engineers as to be the top of the reservoir.
24 The Arkansas River, the waterway is a navigable
25 waterway maintained by the Corps of Engineers.

1 So the Corps owns well, sort of owns the
2 property from Sequoyah Fuels boundary to the river.
3 The other player is the Cherokee Nation. If we go
4 back to the treaty of 1865, the Nation has rights to
5 the river bottom, reaffirmed in 1965, but nobody has
6 yet defined exactly what the river bottom is and how
7 far it extended because certainly the river moved when
8 they built the reservoir. So I think the politically
9 correct definition is the land is maintained by the
10 United States for the benefit of the Nation
11 administered by the Corps of Engineers.
12 DR. WYMER: I'd sort of like to move into
13 the questions. We're about halfway into it, up to
14 this point.
15 MR. SHEPHERD: Please. I've got some
16 other pieces of presentation, but I can work those
17 into the questions as we go.
18 DR. WYMER: One observation, you talk
19 about part of this set being under restricted release
20 category. I think --
21 MR. SHEPHERD: If I could talk about -- as
22 soon as you finish your question, I'll talk about what
23 they're proposing for institutional controls and how
24 they're going to restrict the areas.
25 DR. WYMER: Okay, that would be good.

1 Restricted release where you have a cell still on site
2 is kind of a strange restricted release. I thought
3 you talked about putting a lot of dirt into a cell on
4 site and yet that's --
5 MR. SHEPHERD: That's right.
6 DR. WYMER: Subject to restricted release.
7 That can't really be true for that?
8 MR. SHEPHERD: Yes.
9 DR. WYMER: For the cell.
10 MR. SHEPHERD: 20.1403, 10 CFR 20.1403 is
11 a dose based rule. It says for restricted release
12 that areas outside the institutional control boundary
13 will have a calculated dose of no greater than 25
14 millirem.
15 DR. WYMER: Right.
16 MR. SHEPHERD: Inside the institutional
17 control boundary, they will have, assuming the
18 boundary scale, the calculated dose will be less than
19 100 millirem.
20 DR. WYMER: Right.
21 MR. SHEPHERD: What Sequoyah is proposing,
22 by their calculations will be less than 100 millirem
23 on failure of the institutional controls.
24 Now what we're dealing with here is
25 natural uranium. That's all there is at the site is

1 natural uranium and it's decay products.

2 DR. WYMER: Well, we usually think about

3 restricted release is the site that maybe some

4 industry could go into and do something on, under the

5 realization that it is restricted release and sort of

6 a brownfield.

7 MR. SHEPHERD: We can build that mental

8 image. The regulations are absolutely silent on the

9 uses of restricted release. The only thing they say

10 is there has to be an institutional control.

11 The other regulations are obscure on the

12 radon calculation. Now dealing with natural uranium

13 in the short term, 1,000 years, we don't have a radon

14 problem. However, as we all very well know, radon

15 will build in, but you're not going to get a peak dose

16 from radon to the 75,000 to a quarter of a million

17 year time frame.

18 What the statements of consideration for

19 the rules say is for outdoor areas, radon is not an

20 issue because it will be dispersed in the air. The

21 only time radon is an issue is in indoor areas and

22 therefore the restrictions would be, if you build

23 there, you have to comply with the EPA, building

24 regulations to preclude build up of radon within

25 enclosed areas. But we're talking about a situation

1 where we now have failed institutional controls. Why
2 would somebody fail institutional controls and then go
3 comply with EPA regulations?
4 It gets a little weird. But the cell
5 design that Sequoyah is using has a clay cap radon
6 barrier, similar to that used in the mill tailing site
7 that in fact will limit the calculated radon migration
8 through that cap to about less than 10 percent of the
9 part 40 limits.
10 DR. WYMER: One of the things that --
11 DR. HORNBERGER: And that cap will surely
12 still be functional at 75,000 years.
13 MR. SHEPHERD: Oh, absolutely. It's going
14 to be covered with rock. And the rock won't rust.
15 DR. WYMER: One of the things that we said
16 we were interested in, in the past, not necessarily
17 for you people here, was we wanted to see the
18 application of things like RESRAD and D and D to
19 complex sites. When you've got a complex site here
20 there's no question about that. It looks to me like
21 there's for a complex site there's a very strong
22 modeling component that sits right at the heart of
23 things before you even think about using RESRAD and D
24 and D.
25 MR. SHEPHERD: I believe that's true. My

1 personal opinion, not necessarily my boss's opinion,
2 my personal opinion is that D and D is not a value at
3 these sites. D and D was designed as a screening code
4 for sites that had minimum contamination. If they
5 passed the screen, they were done.
6 DR. WYMER: Right, that's true.
7 MR. SHEPHERD: If they could pass D and D,
8 I wouldn't be the project manager. They'd still be
9 over in fuel cycle.
10 RESRAD is basically a point release code.
11 It does not handle simultaneous ground, existing
12 groundwater and existing soil concentration at the
13 same time.
14 Now, if you're smart and you understand
15 the code, you can fool it and do multiple runs and
16 figure out how to add that together, but basically,
17 RESRAD says you tell me what the input concentration
18 and then I will calculate the dose for a variety of
19 land uses.
20 In this case, figuring out what the
21 concentration at the uptake point is, is much more
22 difficult than anything that RESRAD needs to calculate
23 after that.
24 DR. WYMER: Questions? John?
25 MR. SHEPHERD: One more thing. We had

1 another site, Nuclear Fuel Services in Erwin, Tennesee
2 that also has severe groundwater contamination and
3 soil contamination, primarily with highly enriched
4 uranium. They process naval fuel. They also have
5 some natural material, so they've got the whole gamut
6 and also some transuranics of plutonium, americium and
7 so on because they did some MOX fuel studies some
8 years ago.
9 DR. WYMER: That site is still open, isn't
10 it?
11 MR. SHEPHERD: That site is still
12 operating, but they are decommissioning portions under
13 the unused part of the site in the timeliness rule.
14 The area that's called the north site which used to be
15 a 20.302 burial area. They have exhumed and they are
16 now trying to remediate that for a restricted use.
17 They did two things. They persuaded the
18 staff that the groundwater, drinking water pathway was
19 not viable for the shallow aquifer. Because of the
20 poor qualify of that water and the ready availability
21 of high quality water from the city, from the adjacent
22 river, from the spring that used to be the city water
23 supply in the immediate vicinity, doing a RESRAD
24 analysis, putting in the proposed derived
25 concentration guideline limits, I calculated very,

very large numbers. So I took this to performance assessment.

They did an analysis and said basically RESRAD is wrong. The stuff that is in the ground and in the groundwater today has been there for roughly a quarter of a century and it's not going to get any worse than that because you can't add contamination. So when you take the numbers that they have and the calculations that they did and came up with doses of a few 10s of millirem per year, said if RESRAD calculates something different from that it's because RESRAD doesn't really have the ability to take into account, in this case, the simultaneous soil and existing groundwater contamination.

So RESRAD is a good code for what it does, but for complex sites it has some serious limitations. It wasn't designed as a transport code.

CHAIRMAN GARRICK: Considering the now absence of surface source and the dynamics of the plumes and the diminishing concentration. Have you projected this out in time?

MR. SHEPHERD: Not yet.

CHAIRMAN GARRICK: To see kind of what happens?

MR. STIREWALT: Could I say one thing

about that? What is planned with that, exactly that thought in mind, the flow codes that Jim mentioned, the consultant for Sequoyah is using, he'll be doing essentially 3-D flow transport and there are means by which you set those data files up and ASCII files. You put them back into EarthVision and actually do a 3-D model of that time period as predicted by your code.

If you have enough of those, we have an excellent data base from 1991 to 2000, put in whatever they do at 5010 and you can actually assemble those together in EarthVision and animate so that you can actually visualize to assist the analysis with that kind of thought. So the current thought is actually pull data from the forward modeling that will be done and analyze those in EarthVision.

CHAIRMAN GARRICK: I see, I see.

DR. WYMER: George.

DR. HORNBERGER: I'm curious about how the contaminated groundwater now interfaces with first of all the NRC regulations and second of all, how EPA gets involved here because monitored natural attenuation is an EPA concept. For uranium, it would be dilution and furthermore, if EPA is involved, how does therefore millirem per year groundwater standard

1 enter into this?

2 MR. SHEPHERD: EPA, at this site, is very

3 interesting. The biggest problem with EPA is the

4 nitrates which clearly are moving to the west toward

5 the site boundary and also to the south towards the

6 proposed institutional control boundary. However,

7 nitrates are not regulated under RCRA. They're under

8 Clean Water Act.

9 The order at the site is a RCRA order. We

10 have a site specific memorandum of understanding

11 between NMSS and EPA Region 6 to coordinate our

12 regulatory interaction. And I get along very well

13 with my counterpart in Region 6 and up to now we

14 haven't run into any insoluble problems. Because of

15 the difficulty or potential difficulty in finances

16 that I talked about briefly, Region 6 of EPA is

17 determined to treat this site as a potential CERCLA

18 site and they are doing a CERCLA type analysis.

19 And the kicker would be if Sequoyah Fuels

20 fails to comply with the RCRA order, they would then

21 go under CERCLA for a CERCLA review. Because of the

22 very low population density in the area, as you know,

23 there's two parts to the CERCLA hazard ranking, how

24 much stuff is there and who's going to be affected,

25 who's going to be affected is almost zero in the

1 ranking system.

2 We don't believe that it will likely make

3 the national priority list in which case federal EPA

4 would step out of the picture. It will go to the

5 State of Oklahoma because they're both CERCLA and RCRA

6 authorized.

7 I didn't answer your question about how

8 the four millirem interfaces. We don't know yet.

9 DR. HORNBERGER: So EPA hasn't turned the

10 RAD portion over to you?

11 MR. SHEPHERD: No, like I said, they're

12 doing right now a complete risk analysis for both

13 chemical and radiological. Interestingly enough at

14 NRS they issued a RCRA permit to remediate the shallow

15 groundwater which is another reason we agreed not to

16 regulate it under our part of the cleanup. But they

17 included the nuclides under the RCRA order.

18 DR. HORNBERGER: Just from looking at some

19 of the maps, it doesn't appear as if you have

20 migration toward the Illinois River, so what are the

21 discharge points for the three aquifers involved?

22 MR. SHEPHERD: Generally, they surface

23 within the site boundary. Certainly, the terrace

24 aquifer surfaces within the site boundary. They said

25 it was like 100 feet from the main process building

1 down to the Illinois.

2 The piezometric head of the terrace

3 aquifer is about two feet above the bottom of Pond 2,

4 the large one on the western border. The next

5 aquifer, the bottom of the next aquifer is, we

6 believe, somewhere on the hill. We've had some highly

7 qualified geologists standing there, scratching their

8 heads, wondering exactly which sandstone unit they

9 were standing on.

10 The consultant to Sequoyah is actually out

11 doing some of additional field work to try and make a

12 scientific determination of that.

13 We currently believe that unit 4 sandstone

14 goes under the river. So whatever would go in would

15 be above that.

16 DR. HORNBERGER: So given where you stand

17 now, what do you see as the biggest challenge for

18 decommissioning? Is it the groundwater or is the

19 soil?

20 MR. SHEPHERD: The biggest challenge I see

21 is the institutional control requirements. What the

22 decommissioning plan said is because of the long-lived

23 nuclides which you can interpret the statements of

24 consideration that even though it says 1,000 years, if

25 we have long-lived nuclides, we're leaning towards the

1 durable institutional controls. Sequoyah said we
2 would like a party like Department of Energy to do
3 this, to cover about 100 acres which would surround
4 the sale. The sale is proposed to be about the main
5 process building up to cover an area around the ponds.
6 Beyond that, they would have groundwater
7 restrictions for the amount of time it took the
8 nitrates to reach drinking water levels which they
9 estimated about 200 years, which is interesting
10 because we have indications that the uranium may well
11 follow the nitrates, so we're into how do you
12 demonstrate compliance and do we need to keep the
13 institutional controls and the license in place for
14 200 years. We don't have an answer to that question
15 yet. And they said if there are other things that are
16 needed.
17 The physical remediation is not difficult.
18 You get in with a backhoe and you scoop it up. If you
19 get in the water, you pump the water and you treat it
20 and you put the treated stuff in the cell and you let
21 the clean water go.
22 The real problem is the institutional
23 controls. When we asked the State, the State said we
24 don't know how to spell Sequoyah, we never heard of it
25 before. It's a federal problem, don't call us.

1 The Cherokee Nation said we have an
2 interest in this area because we believe in protecting
3 the land, this is part of the Cherokee Nation. I
4 won't bore you with the story with the "Trail of
5 Tears", but there's a 14-county nation in Oklahoma
6 where the Cherokee Nation has some authority and this
7 is within that boundary. It's near the southwest
8 corner. They said we do not have any interest of
9 becoming the owner of this land.
10 The Corps of Engineers, who owns the
11 adjacent property also wrote a letter said we don't
12 have anything within our rules that said we could take
13 over title to this property. That leaves us back to
14 Department of Energy.
15 Sequoyah came in in January and said well,
16 if you look at the words in Atomic Energy Act, Section
17 11(e)(2) it says ore is anything from which you
18 extract source material. We extracted uranium, the
19 yellowcake that we brought in the door was about 60 to
20 65 percent uranium, we ran a solvent extraction
21 process just like they do at the mill and our output
22 is 95 percent plus uranium. Therefore, we're
23 operating just like a mill. Milling is a function
24 that's not a location. We think you ought to call our
25 material 11(e)(2).

1 That question right now I'm writing a
2 Commission paper that we're going to go to the
3 Commission and basically ask for a policy. Ore is not
4 well defined. The people from uranium recovery said
5 we've always maintained a physical separation between
6 the mills essentially in the west and the rest of the
7 processing essentially in the east part of the
8 country, but that's certainly not a regulatory basis
9 for a decision.
10 So we're really going to go to the
11 Commission. One of the residual problems they say 80
12 percent of the waste certainly there's -- the
13 hexafluoride, both the depleted and the natural waste
14 that is clearly not 11(e)(2) in any case, if they
15 propose putting that material into the cell as well as
16 the RCRA material, there's a little bit of arsenic and
17 some copper residual from the solvent extraction
18 process.
19 DR. WYMER: They're talking about putting
20 it in containers of UF_6 into the cell?
21 MR. SHEPHERD: Not at this point in time.
22 There is UF_6 residual in some equipment. They believe
23 they flushed it out as well as they can. There are
24 process leaks over the time. If you walk through the
25 building you can see a little yellow shadow here and

1 there on the cable trays.

2 DR. WYMER: Of course, that's not UF_6.

3 MR. SHEPHERD: But there may well be UF_6

4 stuck in some of the piping, but again, once they cut

5 the piping open it will probably --

6 DR. WYMER: That's right. When you have

7 air and water, it's no longer UF_6.

8 MR. SHEPHERD: Although we've seen some

9 cases where it will actually skin enough to hold a

10 pocket under some conditions, but those would be

11 relatively small.

12 DR. WYMER: I would think.

13 MR. SHEPHERD: There is some depleted UF_4

14 in barrels that in the opinion of Sequoyah Fuels

15 belongs to the Army. They said we're a processor. We

16 don't own this stuff and the Army says well, we don't

17 want it. You guys can have it. No problem.

18 DR. WYMER: I guess we were right in

19 saying this was a complex site.

20 MR. SHEPHERD: It is.

21 DR. WYMER: Milt, you got any questions?

22 MR. SHEPHERD: The reason they proposed

23 11(e)(2) is that that would give them DOE ownership

24 under Mill Tailing Recovery Act title 2.

25 The other option is Nuclear Waste Policy

1 Act, Section 151(b) that authorizes, but in no way
2 compels Sequoyah Fuels, Department of Energy to take
3 sites like Sequoyah Fuels.
4 We are working on a Memorandum of
5 Understanding with Department of Energy to facilitate
6 transfers under Section 151(b). That MOU is not in
7 place. We're hopeful that it will be there soon.
8 Even if it is there soon, that doesn't guarantee any
9 specific site would be transferred under 151(b).
10 So we have a lot of uncertainty in both
11 paths and the biggest problem is how do we get
12 institutional controls.
13 DR. WYMER: The MOU is a broader thing
14 that just --
15 MR. SHEPHERD: Yes, the MOU will -- well,
16 I could let Robert answer that, but basically the MOU
17 is a vehicle by which sites could be transferred, not
18 a transfer of specific sites. Is that close enough?
19 DR. WYMER: Okay, all right, well, we
20 probably ought to saw this off. It's been, to me,
21 certainly very interesting. We did, as I said
22 earlier, we specifically requested this presentation
23 because we were interested, but our interest was
24 focused at that time of the request on the application
25 of the RESRAD code and DOD to a complex site and

1 you've certainly expanded our vision of what's
2 involved here.
3 So I think with --
4 MR. SHEPHERD: I thank you for your
5 attention and I hope I brought some ideas that will
6 give you something to think about.
7 DR. WYMER: Thank you very much.
8 MR. SHEPHERD: Any time you want to learn
9 more on Sequoyah or in particular on GIS, just let us
10 know. We'll be more than happy to --
11 CHAIRMAN GARRICK: All right, thank you
12 very much.
13 I think this ends the part of our briefing
14 that has to be on the record and so we can move to our
15 miscellaneous discussion. We may want to talk a few
16 moments before we think about lunch because we may
17 want to meet through lunch and adjourn later, such
18 that people have the choice of either eating or
19 leaving.
20 (Whereupon, the proceedings went off the
21 record.)
22
23
24
25

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: ACNW 127th Meeting

Docket Number: (Not Applicable)

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Rebecca Davis

Rebecca Davis
Official Reporter
Neal R. Gross & Co., Inc.

SEQUOYAH FUELS

HISTORY AND STATUS

1

PURPOSE

- TO PRESENT AN OVERVIEW OF SFC
  - HISTORY AND DESCRIPTION OF THE SITE
  - CURRENT DECOMMISSIONING ISSUES
- IDENTIFY PLANNED STAFF ACTIONS

2

SFC HISTORY

- URANIUM CONVERSION FACILITY '70-'93
- SIGNIFICANT OPERATIONAL EVENTS
  - 01/86 UF_6 CASK RUPTURE
  - 11/87 SALE TO GENERAL ATOMICS
  - 08/90 SX CONTAMINATION; FEI
  - 11/92 NOx RELEASE AND END MAIN PROCESS
  - 07/93 DU SHUTDOWN (END ALL OPERATION)

3

SFC HISTORY

- 08/93 SIGN EPA ADMINISTRATIVE ORDER
  - PERFORM FACILITY INVESTIGATION
  - IDENTIFY CORRECTIVE MEASURES
  - REMEDIATE RCRA MATERIALS
- 03/99 SUBMIT DECOMMISSIONING PLAN TO NRC

4

PRIOR OPERATIONS 1/3

LICENSE RENEWAL

- LICENSE LAST RENEWED 08/85
- RENEWAL APPLICATION IN 07/90
  - FINANCIAL ASSURANCE "TO BE ACQUIRED"
  - NO MENTION OF CONTAMINATION
- SX EXCAVATION 08/90
  - UNDERGROUND SOLVENT TANK AREA
  - U CONCENTRATION IN SEEP ~7 g/l

5

PRIOR OPERATIONS 2/3

SUBSEQUENT EVENTS

- 1991 STOP AND PHASED RESTART
- 11/92 NOx RELEASE AND SHUTDOWN
- 12/92 D F I
  - HOW TO DECOMMISSION SITE
  - HOW TO PAY FOR IT
- 02/93 P P C D
  - ON-SITE CELL
  - CONVERDYN

6

PRIOR OPERATIONS 3/3

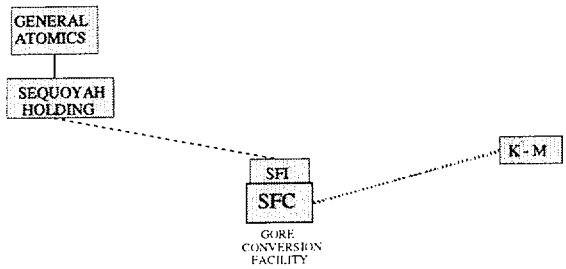
SUBSEQUENT EVENTS 2/2

- 07/93 10 CFR 40.42 NOTIFICATION
- 08/93 WITHDRAW RENEWAL REQUEST
- 10/93 FINANCIAL ASSURANCE ORDER
  - TO SFC AND PARENT, GENERAL ATOMICS
  - PROVIDE $87 M PER FA RULE OF '88

7

CORPORATE STRUCTURE 1/3

THE PRINCIPALS



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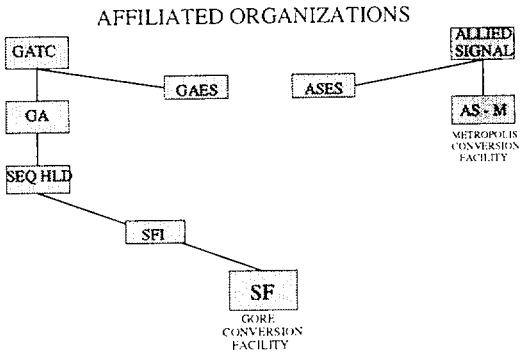
CORPORATE STRUCTURE 2/3

AFFILIATED ORGANIZATIONS



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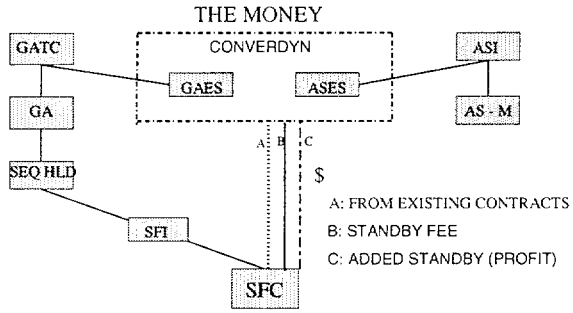
CORPORATE STRUCTURE 3/3



SFC DECOMMISSIONING 1/4

FUNDING 1/2

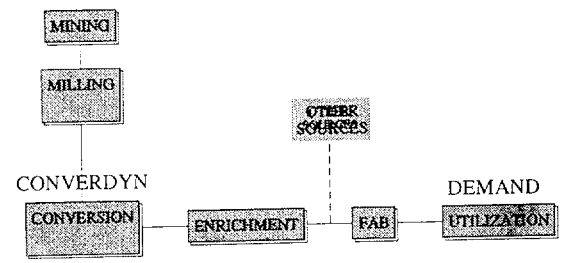
- SETTLEMENT OF 1993 NRC ORDER REQUIRING FULL FINANCIAL ASSURANCE
  - SFC HAS $750K LOC AND PROMISES PRUDENT RESOURCE USE
    - LIMITED ACTIVITIES AND REDUCED STAFF
    - CURRENT SFC CASH ASSETS ARE ABOUT $9 MILLION
  - GA PROVIDES $5.4 MILLION TO TRUST FUND

SFC DECOMMISSIONING 2/4

FUNDING 2/2

- **CONVERDYN**
  - HAS PERFORMED AS PLANNED (~ $45 M)
  - PLANS TO PROVIDE ABOUT $26 MILLION MORE THRU 2005

FUEL CYCLE



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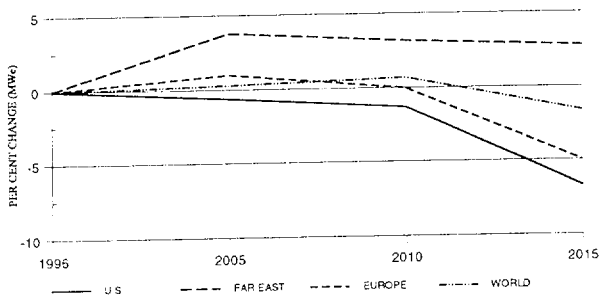
U DEMAND

DOE PROJECTIONS - 1997



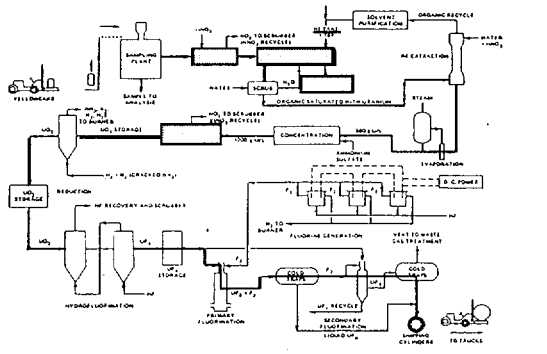
14

SFC DECOMMISSIONING PLAN

- RESTRICTED RELEASE PER 10 CFR 20.1403
  - ALL CONTAMINATION IN ABOVE-GRADE CELL
    - 10 CFR 40 APP. A (MILL SITE) TYPE DESIGN
    - 10-20 ACRE FOOTPRINT + BUFFER
  - BALANCE OF SITE *UNRESTRICTED*
- GROUNDWATER REMEDIATION
  - LIMITED TERRACE LEVEL REMEDIATION
  - REST MONITORED NATURAL ATTENUATION

15

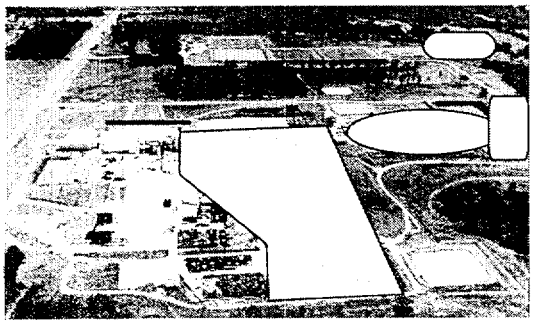
SFC PROCESS



16

DESCRIPTION OF SITE

AND CONTAMINATION



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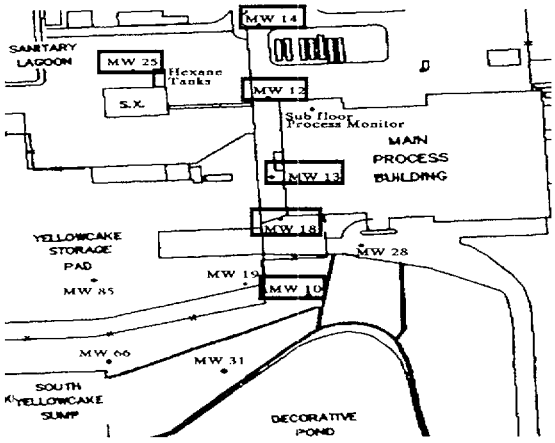

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19

SFC DECOMMISSIONING PLAN 2/2

- INSTITUTIONAL CONTROLS
  - IC PARTY "LIKE DOE"
  - INSTITUTIONAL BOUNDARIES (~100 ac -- 40 ha)
  - BALANCE OF SITE WITH WATER RESTRICTIONS
    - ~ 200 YR RESTRICTIONS IN NITRATE AREAS
    - OTHER IF NEEDED

20

AEA 11(e)(2)

- SFC PROPOSES ~80% OF WASTE IS 11(e)(2)
  - MILLING IS A FUNCTION, NOT A LOCATION
  - SFC FRONT END PROCESS IS SAME AS AT MILL
- NON-11(e)(2) DISPOSAL NEEDED
- APPROVAL WOULD MANDATE DOE OWNERSHIP UNDER TITLE II OF UMTRCA

21

SFC DECOMMISSIONING 3/4

COST

- NRC EIS: APPROXIMATELY $950K
- SFC DIRECT DECOMMISSIONING COSTS
  - EIS BUDGET $1.2 MILLION
  - REMEDIATION $22 MILLION
  - POST-CLOSURE $2.2 MILLION
- SFC INDIRECT COSTS: ~ $65 MILLION

22

SFC DECOMMISSIONING 4/4

SCHEDULE

- SFC DECOMMISSIONING SCHEDULE
  - SFC PLAN
    - REMEDIATION 2000-2003
    - POST-CLOSURE MONITORING 2004-2005
  - CURRENT NRC PLAN
    - PUBLISH FEIS (08/03)
    - ISSUE LICENSE AMENDMENT (04/04)
    - TERMINATE LICENSE (12/08)

23

NRC STAFF ACTIONS

- TECHNICAL REVIEW OF DECOMMISSIONING PLAN
- EIS TO EVALUATE ENVIRONMENTAL IMPACTS
- REVIEW 11(e)(2) QUESTION
- APPROVE D-PLAN
- PARTICIPATE IN HEARINGS, AS NECESSARY

24

MAJOR MILESTONES

- PUBLISH DEIS 8/02
- COMPLETE SER 11/02
- HEARING TBD
- PUBLISH FEIS 8/03
- ISSUE AMENDMENT 4/04
- TERMINATE LICENSE 12/08

25

ISSUES

- NO INSTITUTIONAL CONTROL PARTY
- LIMITED AVAILABLE MONEY
- GROUND WATER REMEDIATION
  - RESIDUAL CONTAMINATION LEVEL
  - LONG TERM MIGRATION -- POTENTIAL DOSES
- COORDINATION WITH EPA

26

THE END

27

Interagency MOU on Research and Development of Multimedia Environmental Models

William R. Ott, Assistant Chief, RPERWMB
Office of Research, US NRC
June 21, 2001

Telephone: 301-415-6210 E-mail: WRO1@NRC.GOV FAX: 301-415-5385

Background

- For the past six years, discussions on coordinating activities between DOE, NRC, EPA, and later DoD have occurred.

- In March, 2000, a workshop was hosted by NRC on "Environmental Software Systems Compatibility and Linkage."

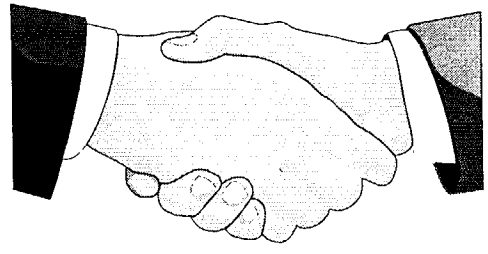
- A recommendation was "The relationship between the Federal agencies involved [in the workshop] should be formalized." Also, "No one agency or group should be 'in charge' of this collaborative effort towards a unified system." The effort needs to be a collaboration of equals.

- An MOU on Research & Development of Multimedia Environmental Models has been developed by an ad hoc organizing committee with representatives of six Federal organizations. Five have signed and the sixth signature is expected on June 25, 2001.

- First Steering Committee meeting was held June 18-19, 2001, at NRC headquarters in Rockville, MD.

- Other organizations have expressed interest
  - Natural Resources Conservation Service
  - National Oceanic and Atmospheric Administration
  - Cooperative State Research Ed. And Ext. Service
  - Bureau of Reclamation

US Army Corps
of Engineers®



Interagency Steering Committee Members

U.S. Environmental Protection Agency - Gary Foley, NERL

U.S. Army Corps of Enginers - Mark Dortch, ERDC

U.S. Geological Survey - George Leavesley, WRD

U.S. Department of Energy - Teresa Fryberger, ORD/EM

Agricultural Research Service - Dale Bucks, ARS

U.S. Nuclear Regulatory Commission - William Ott, RES

Highlights of MOU

PURPOSE: To establish a framework for facilitating cooperation and coordination among the "participants" in

- **research and development (R&D) of multimedia environmental models,**
- **software and related data bases,**

including

- development
- enhancements
- applications and assessments of site-specific, generic, and process-oriented multimedia environmental models

as they pertain to

- human and environmental risk assessment.

<u>THIS MOU IS INTENDED TO PROVIDE</u> a mechanism for the cooperating Federal Agencies to pursue a common technology in multimedia environmental modeling with a shared technical basis.

<u>The cooperating agencies:</u>

- **seek mutual benefit from their R&D programs,**
- **seek to ensure effective exchange of information between staff and contractors.**

"The R&D programs referred to include development and field applications of a wide variety of software modules, data processing tools, and uncertainty assessment approaches for understanding and predicting contaminant transport processes including the impact of chemical and non-chemical stressors on human and ecological health."

DESIGNATED POINTS OF CONTACT WILL:

- Promote technical coordination.
- Identify joint R&D programs of mutual interest (e.g. working groups) and funding.
- Assist in arranging for supplementary interagency agreements for R&D.
- Facilitate the coordination and exchange of R&D data and technical information.
- Serve as members of a Steering Committee.

PURPOSE OF STEERING COMMITTEE:

Coordinate joint research efforts under the MOU.

Summary of Steering Committee Meeting

- Discussed highlights of MOU.
- Presentations by each participant on their program objectives and plans. (Focused on modular framework activities.) (USGS Modular Modeling System; ARS-NNRCS-USGS Object Modeling System; Army Risk Assessment Modeling System and Land Management System; EPA 3MRA-HWIR and MIMS; interagency cooperation on FRAMES.)
- Discussed proceedings of March 2000 workshop.

- Discussed two working group proposals
  - Software System Design and Implementation for Environmental Modeling - Gerry Laniak, EPA/NERL, Athens & Ralph Cady, NRC/RES
  - Uncertainty and Risk Analysis - George Leavesley, USGS & Tom Nicholson, NRC/RES
- Discussed EPA concerns on peer review and QA/QC.
- Discussed and resolved administrative issues (organization of committee, frequency of meetings, how to deal with additional requests to join, etc.).

Actions of Steering Committee

- Approved rotating chair in order of signing. Period of service one year centered on annual meeting to be hosted by organization of chair. (NRC-EPA-COE-USGS-DOE-ARS)

- Steering Committee will meet at least semiannually by telecon (in addition to annual meeting) or more frequently as needed but will meet quarterly for the first year.

- The Steering Committee will seek authority from the original signers to accept additional members without going back to the original signers.

- An ad hoc group will be formed to develop a position for the steering group to cover the peer review and QA/QC concerns raised by EPA. Gary Foley, EPA, will draft instructions for the ad hoc group and circulate to the Steering Committee for review. Each participant will provide a representative to the ad hoc group.

- The working group proposal for "Software System Design and Implementation for Environmental Modeling" was approved with the reservation that the Phase II proposal should be focused on discrete lines of investigation and prioritized.

- The working group proposal for "Uncertainty and Risk Analysis" was approved with the reservation that risk should be addressed as the context for which uncertainty must be addressed but that regulatory policy on agency approaches to the definition of risk should not be debated. Re-titling the Phase II proposal may be appropriate.

Phase I Working Group Proposal:

Software System Design and Implementation for Environmental Modeling

Scope of proposed activities:

Design and specification of extensible schema for the exchange of data and results between multi-media, multi-pathway modeling components - thus supporting component or framework interoperability and sharing of components and frameworks.

Areas in system software design that could be included:

- GIS linkage
- conceptual modeling tools
- visualization tools
- flexible database connectivity
- component software testing and QA
- framework testing and QA
- uncertainty analysis tools
- analysis reporting tools

Phase I Working Group Proposal:

Uncertainty and Risk Analysis

Scope of proposed activities:

Develop a common understanding of various ways to address uncertainty by: identifying, evaluating and comparing sets of existing tools for assessing uncertainty and risk within MMEM applications; evaluate newly developed techniques such as the UUCODE developed by Dr. Mary Hill and others, MOCOM developed by Drs. Hoshin Gupta and Louis Bastidas, and the GLUE code developed by Drs. Keith Beven and Jim FREER for parameter estimation and uncertainty analysis. Develop

parameter estimation methodologies for use with available digital databases. Establish degree of applicability to all MMEMS and propose steps for enhancing general applicability.

CONCLUDING REMARKS

OPPORTUNITY

COOPERATION

COORDINATION

EXCITING POSSIBILITIES!!!