

RFCA Stakeholder Focus Group

February 14, 2001

Meeting Minutes

INTRODUCTION AND ADMINISTRATIVE

A participants list for the February 14, 2001 Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group meeting is included in this report as Appendix A.

Reed Hodgkin of AlphaTRAC, Inc., meeting facilitator, reviewed the purpose of the RFCA Focus Group. Introductions were made.

Reed asked the Focus Group if there were any changes or additions / corrections to the January 31, 2001 meeting minutes. One correction was noted:

- The Summary of Actions did not include the addition of exposure of children to the land use scenarios being modeled for Radioactive Soil Action Level (RSAL) evaluation.

Reed reviewed the meeting agenda, which included:

- Regulatory Analysis Report, Revision 2 – Discussion
- RSAL Peer Review Update and Discussion
- Review of RESRAD 6.0 approach to air pathway
- Report-back from Workshop Design Group

Tom Marshall raised a process issue, addressed in an email forwarded to the group on the day of the meeting. He indicated that there appeared to be a disconnect between the community and the RFCA agencies concerning the collaborative effort of the Focus Group. He suggested that the Focus Group hold a discussion about its goal and its process for meeting that goal. The purpose of the discussion would be to make sure that the Focus Group would be successful at the end of its process.

A significant number of the attendees agreed that the discussion would be beneficial. Reed asked the group to schedule the discussion at agenda setting time.

ADMIN RECORD

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1/15
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REGULATORY ANALYSIS REPORT, REVISION 2, DISCUSSION

Tim Rehder, U.S. Environmental Protection Agency (EPA), briefed the Focus Group on the key differences between the first draft and the second draft of the Regulatory Analysis Report (Appendix B). His key points were:

Important Points in 2nd Draft

- NRC Rule is a Relevant and Appropriate Requirement
 - So 25 mRem/yr dose requirement must be met
 - ALARA Analysis will be required for each project
 - There is a preference for unrestricted use.
- If 25 mRem/yr is not within the risk range, the RSAL will be based on a value within the Range

Draft 2 RSAL/Cleanup Level Proposal (surface soil)

- RSAL will be based on the anticipated future user (wildlife refuge worker)
- When an action is triggered (contam. > RSAL) ALARA analysis will be performed to determine if cleanup can be achieved that will support unrestricted use.

Tim emphasized that the report states that the RSAL will be based on a future anticipated user. The RFCA Agencies believe that the most anticipated user is a wildlife refuge worker. When the RSAL is triggered for a specific cleanup, a project specific ALARA analysis will be conducted to see if it's possible to get to a level of unrestricted use. Tim noted that the draft report proposes a "suburban resident" land user as the unrestricted use scenario. The Agencies have decided, since publication of the report, to use a "rural resident" land user to represent unrestricted use. The primary reason for the change is that the suburban resident scenario takes credit for blue grass ground cover, while the rural resident scenario does not. The rural resident would also have a larger lot that could potentially support some animals. The agencies plan to proceed using the RESRAD computer model to calculate soil concentration numbers for four different scenarios:

- the open space user

- the refuge worker
- the office worker
- the rural resident.

A group discussion followed.

The members of the Focus Group discussed the role of the 25 mrem dose criterion in setting the RSAL. Specific questions and answers from this discussion follow.

Q: If 25 is within the risk range, then you may go past it (more restrictive) not at the RSAL level, but at the ALARA level. Is that correct?

A: We could pick an RSAL that is lower (more restrictive) than the value calculated from the 25 mrem dose criterion even if the 25 mrem number falls in the risk range.

Q: What would be the basis of going beyond 25 mrem (more restrictive)?

A: We'll have to develop a basis for it. At this point, we're going to generate the candidate RSAL numbers and then we're going to talk about them.

Q: Are you talking about something that is technically based or a policy negotiation?

A: Probably a little of both.

A: If 25 mrem falls within the CERCLA risk range, we would have a regulatory basis for using that calculation to set the RSAL. But, what we're saying is, we haven't yet made that decision.

A member of the Focus Group asked for clarification on the use of the anticipated future user scenario to set the RSAL. The member indicated that it had appeared that the agencies would definitely use the anticipated future user as the basis for the RSAL, but that now there was a possibility that some other value might be chosen. In a broader context, the question went to which decisions are open for discussion and which are now made.

The U.S. Department of Energy (DOE) answered that the draft Regulatory Analysis report presents current agency thinking and recommendations as they exist at the staff level. The policy issues are still being worked (including the collaboration with the Focus Group) and have not been submitted as recommendations to the RFCA Principals yet.

The member reiterated that the agencies might still choose a more restrictive RSAL than that associated with the anticipated future user.

The Colorado Department of Public Health and Environment (CDPHE) clarified that the idea that the RSAL will be based on an anticipated land use is a recommendation made by the RFCA Project Coordinators. The expectation is that the RSAL will be based on the risk range for the anticipated future user, then the rural resident values will be used to drive further cleanup under As Low As Reasonably Achievable (ALARA). The approach has not been formally sanctioned. The approach and results will not be approved as final for some time. It is conceivable that the approach could change.

A member of the Focus Group raised the statement by EPA that the 25 mrem dose criterion would not fall within the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) risk range.

EPA responded that the risk associated with the 25 mrem dose value would be radionuclide-specific, and that the risk could very well fall within the CERCLA range for a substance like Plutonium. He referred the Focus Group to Attachment 1 of the Regulatory Analysis report for further discussion.

The Focus Group member indicated that basing the RSAL exclusively on risk and not dealing with a dose criteria as well would be less confusing and more meaningful to most people.

"My final comment on this particular piece of it would be having to do with the relation between the RSAL and the cleanup level. It would make a lot of sense to the RSAL to get as close as possible to the cleanup level so that work doesn't have to be done twice,

which I can imagine happening if you had a different kind cleanup level than you had an RSAL.”

A member of the Focus Group asked if an RSAL could result which is higher (less restrictive) than the final cleanup level.

DOE answered that a cleanup level more restrictive than the RSAL could result, and provided several examples:

- An isolated dirty spot in an otherwise clean area,
- Protection of water quality,
- Long-term stewardship strategy.

CDPHE and EPA noted that the RSAL, not just the cleanup level, must fall within the CERCLA risk range. DOE disagreed, stating that its interpretation was that only the cleanup value was required to fall within the risk range, but further stated that using an RSAL within the CERCLA risk range would help to ensure that the integrated risk met the CERCLA requirement.

A member of the Focus Group noted that the selection of the value within the risk range for use as an RSAL is a policy-level decision which the community could influence.

A member of the Focus Group expressed concern that contaminated areas that did not trigger the RSAL (based on the anticipated future user) would not be considered for cleanup at all. He suggested that a more conservative RSAL (based on unrestricted use) would trigger more extensive evaluations and actions – that some action would be required, but the exact nature of the action could be site-specific.

Kaiser-Hill responded that the approach using the anticipated future user was driven by Congress’s expectations for cleanup and funding.

The member indicated that the assumption of an anticipated future user was in reality an institutional control and that a more restrictive RSAL would reflect the reasonable expectation that the institutional control would eventually fail.

DOE indicated that a key issue was now on the table for discussion. The law defines the minimum acceptable result of cleanup in terms of remaining dose or risk. The law does not limit the extent of cleanup beyond that minimum. DOE stated that it believes the community "wants to get as much cleanup as it can possibly get." DOE further stated that the Agencies were balancing this need against constraints such as the amount of funding available to do cleanup and the limits of technology to perform cleanup.

A member of the Focus Group asked if the Agencies would be performing the calculations to bound the possibilities and address the constraints. DOE answered that the table being developed would bound the possibilities and provide the information needed for discussion and decisions.

A member of the Focus Group reminded the group that protection of surface water quality could dominate the decisions in places and drive the cleanup much lower than the RSALs would.

A member of the Focus Group noted that the dose and risk limits to maximally exposed and reasonably exposed individuals would be key policy decisions, as well as the definition of the reasonably maximally exposed individual.

CDPHE noted that the application of ALARA will be another key activity, yet to be fully defined. It was noted that the ALARA discussion with the community should begin quickly.

A member of the Focus Group noted that the Nuclear Regulatory Commission (NRC) definition of ALARA, based on a cost-benefit analysis, appears to conflict with the RFCA's goal of "cleanup to the maximum extent feasible." EPA concurred that the RFCA statement comes from the RFCA vision and is not legally enforceable, and further stated that the NRC definition of ALARA should not be adopted at Rocky Flats Environmental Technology Site (RFETS).

A member of the Focus Group asked if ALARA would be applied to contaminated areas that did not trigger an action through the RSAL. DOE responded that the agencies are actively discussing that issue. A two-tiered RSAL is being examined as a possible solution.

A member of the Focus Group asked what would be the anticipated future user scenario if the Wildlife Refuge bill does not pass. CDPHE responded that passage of the bill would happen outside the timeframe of the RSAL review, and thus the RSAL process will use the wildlife refuge worker as the presumed anticipated future user.

A member of the Focus Group asked if there would be a separate public process for setting the cleanup level for the 903 Pad, in addition to the RSAL setting process. CDPHE responded that such a public process is required. It is expected that the RFCA Stakeholder Focus Group will be a player in that public process.

A member of the Focus Group suggested that a two-tier RSAL might be an effective way to capture situations that almost trigger the RSAL but not quite. DOE responded that that could be a good way to force a close look at such situations.

A member of the Focus Group expressed concern that the work load for the RSAL Working Group is greater than the resources available. The Agencies responded that more resources are being added and efforts are being made to focus the activities and discussions of the Working Group.

A member of the Focus Group asked if the Agencies had the latitude to use a definition of ALARA other than the one specified in the NRC rule. The State Attorney General's Office answered that there was sufficient flexibility to allow our own definition.

A member of the Focus Group expressed concern about a cleanup that caused more harm than it saved. DOE responded that the RSAL would trigger an action. The design of the action (which could be controls rather than cleanup) would consider mitigating effects such as worker safety and habitat damage.

A member of the Focus Group reminded the group that the setting of RSALs is only a step in the overall process of planning the cleanup of Rocky Flats. He suggested that the Focus Group needs to look at the big picture and decide where to spend its effort. He suggested that the group focus on getting to cleanup levels, instead of a tight focus on RSALs.

REVIEW OF RESRAD 6.0 APPROACH TO AIR PATHWAY

Bob Nininger of Kaiser-Hill introduced Martha Hyder.

Martha made a presentation on her comparison of RESRAD air calculations (see Appendix C). Her review examined how air calculations are performed in three versions of the RESRAD model:

- Version 5.70 and earlier ("old" RESRAD),
- Version 5.75 and later ("new" RESRAD), and
- RESRAD as modified by RAC (RAC RESRAD).

In her review, she compared results of air calculations for the three versions and qualitatively compared the effect of different air calculations and other factors in determining an RSAL.

A group discussion followed Martha's presentation.

A member of the Focus Group asked if there was another alternative to the three RESRAD approaches that would be better for RFETS. Martha responded that the RESRAD code can meet Rocky Flats needs if used properly and that she doesn't know of a better approach.

A member of the Focus Group asked why the mass loading of Plutonium seemed to go down as wind speed increased. Martha responded that this resulted from increased amounts of non-contaminated dust resuspended by higher winds.

The member asked if amount of Plutonium in the air would go up for high wind events. Martha answered that in general this would occur, but noted that annual average wind speed is used in RESRAD – individual events are not treated.

A member of the Focus Group asked how the wind erosion threshold plays into RESRAD calculations. Martha replied that it doesn't apply directly, because RESRAD is an annual average model, but that it is incorporated in the calculations indirectly through the mass loading number that is input to the model.

A member of the Focus Group asked if Martha had access to the source code for Old RESRAD as part of her review. Martha responded that she did not.

The discussion next addressed the finding that Old RESRAD was more conservative than New RESRAD. Martha pointed out that the findings were restricted to the performance of the air pathway portions of the models, and did not reflect the overall conservatism of the codes. Also, the inclusion of the fire scenario in RAC's analysis was a determining factor in the conservatism of that analysis.

A member of the Focus Group asked if RARC RESRAD was very sensitive to the specific location chosen to represent the maximum exposed individual, because the soil contamination level at that location would dominate the RSAL number. Martha responded that the 903 pad calculation she had performed was representative of that effect.

A member of the Focus Group noted that Martha's report showed a particulate air concentration of 7,000 micrograms per cubic meter for the fire scenario. Martha responded that this was an appropriate air concentration within a plume from a forest fire. The member noted that the RAC RESRAD analysis assumed as a worst case that this concentration would last 24 hours per day for a year.

A member of the Focus Group expressed concern that Kaiser Hill's role in contracting for the review of the RESRAD air pathway treatment represented a conflict of interest. He indicated that a financial stake by Kaiser-Hill in the outcome of the review was the basis for the concern and that even the appearance of such a conflict could be damaging to the process. The member stated that the review should have been conducted independently of Kaiser-Hill and that the community should have been involved in selecting the contractor. The member submitted a letter to DOE expressing his concern.

DOE and Kaiser-Hill responded that Kaiser-Hill, by the nature of its contract, has no financial stake in the outcome of the review and that Kaiser-Hill had commissioned the study at the request of the RSAL working group. DOE noted that the nature of the study, the contractor to perform the work, and the method of contracting the work had been discussed with the Focus Group at previous meetings in December and January.

DOE stated that Kaiser-Hill was responsible for providing technical support and conducting studies in support of the RSAL review as a commitment under its operating contract for Rocky Flats. CDPHE noted that it also contracts for technical support as part of the RSAL review.

The City of Westminster stated that it believes Kaiser-Hill's role in contracting for the study represented a conflict of interest, because it would have been a conflict of interest for the City of Westminster if it had been in a similar situation.

The focus group member stated that the wording on the cover sheet of the report, stating that the work had been done for Kaiser-Hill, indicated that the work was commissioned primarily by Kaiser-Hill rather than the agencies. This was part of the concern.

REPORT-BACK FROM WORKSHOP DESIGN GROUP

Ken Korkia presented the report-back from the workshop design group (Appendix D). He indicated that the workshop would be two days long, held on a Friday and Saturday, and would focus on computer models and parameter selection. The sessions would be led by a panel of experts. Representatives of DOE and the regulators would also present and discuss their current views and parameters.

A group discussion followed.

DOE stated that it would support the workshop as designed, and would want to add some additional experts of its choosing to the panel.

DOE asked if this workshop had been designed to meet the needs of the Rocky Flats Citizens Advisory Board (RFCAB) as well as the Focus Group. The group answered "Yes."

A member of the Focus Group noted that there was strong interest in the community for a workshop on health effects as well.

Ken indicated that March 30 – 31, 2001 are the target dates for the Workshop. He also stated that Laura Till had been selected to facilitate the workshop. He indicated that the workshop would probably cost \$15,000 - \$20,000.

Reed asked the Focus Group if everyone was comfortable with the revised workshop design. The Focus Group members indicated that they were in agreement with the approach and agreed to move ahead. The RFCAB will take the lead in implementing the workshop and will form subcommittees of Focus Group members to move ahead.

A member of the Focus Group emphasized the need for a community discussion on health effects. She indicated that a special evening session might be appropriate in order to broaden the discussion beyond the Focus Group to the community as a whole. She suggested that the session might require a full day or evening and could be sponsored by the community rather than the agencies.

AGENDA

The Focus Group agreed on the following topics for the February 28, 2001 meeting:

- ALARA discussion
- RFCA Focus Group meeting process discussion

ADJOURNMENT

Christine reminded the Focus Group that the February 28, 2001 RFCA Focus Group will be held at the Arvada City Hall, 3:30 to 6:30 p.m.

The RFCA Stakeholder Focus Group meeting was adjourned at 6:30 p.m.

2/14/01 Agenda Items

Review of RESRAD 6.0 approach to air pathway

Regulatory Analysis Report, Revision 2 - Discussion

Report-back from Workshop Design Group

ADMIN RECORD



**RFCA Stakeholder Focus Group
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**Appendix A
Participants List**

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Appendix B

**Tim Rehder: Regulatory Analysis Report, Revision 2 –
Discussion RSAL Peer Review Update and Discussion**

**RFCA Stakeholder Focus Group
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**Appendix C
Martha Hyder: Review of RESRAD 6.0 Approach to Air
Pathway**

**RFCA Stakeholder Focus Group
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**Appendix D
Ken Korkia: Report-back from Workshop Design Group**

**RFCA Stakeholder Focus Group
Attachment A**

Title: Agenda for February 14, 2001 Focus Group Meeting

Date: February 8, 2001

Author: C. Reed Hodgins
AlphaTRAC, Inc.

Phone Number: (303) 428-5670

Email Address: cbennett@alphatrac.com

**RFCA Stakeholder Focus Group
February 14, 2001
Participants List**

NAME		ORGANIZATION / COMPANY
David	Abelson	RFCLOG
Lorraine	Anderson	City of Arvada
Christine	Bennett	AlphaTRAC, Inc.
Ray	Betts	
Kent	Brakken	DOE, RFFO
Laura	Brooks	Kaiser-Hill Company, LLC
Kimberly	Chleboun	RFCLOG
John	Ciolek	AlphaTRAC, Inc.
Gerald	DePoorter	RFCAB
Sam	Dixion	City of Westminster
Shirley	Garcia	City of Broomfield
Steve	Gunderson	CDPHE
Mary	Harlow	City of Westminster
Jerry	Henderson	RFCAB
Reed	Hodgin	AlphaTRAC, Inc.
Martha	Hyder	Wind River Environmental Group
Ken	Korkia	RFCAB
Joe	Legare	DOE
Ann	Lockhart	CDPHE
Carol	Lyons	City of Arvada
John	Marler	RFCLOG
Tom	Marshall	Rocky Mountain Peace and Justice Center
Anna	Martinez	US DOE
Dan	Miller	Natural Resources and Environment Section Colorado Department of Law
LeRoy	Moore	RMPJC
Diane	Niedzwiecki	CDPHE
Bob	Nininger	Kaiser-Hill Company, LLC
Steve	Paris	RMRS
Tim	Rehder	US EPA
Mark	Sattelberg	US Fish and Wildlife Service
Dave	Shelton	Kaiser-Hill Company, LLC

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**RFCA Stakeholder Focus Group
Participants List**

**Broomfield City Hall
January 31, 3:30-6:30 p.m.**

Carl
Noelle

Spreng
Stenger

CDPHE
RFCAB

Regulatory Analysis - 1st Draft

- Proposed that RSAL would be based on either 25 mRem/yr to anticipated future user or a risk range value (ie 10^{-4} , 10^{-5} or 10^{-6}).
- An ALARA analysis would be performed on every project to determine if cleanup below the RSAL was reasonable.

Important Points in 2nd Draft

- NRC Rule is a Relevant and Appropriate Requirement
 - So 25 mRem/yr dose requirement must be met
 - ALARA Analysis will be required for each project
 - There is a preference for unrestricted use.
- If 25 mRem/yr is not within the risk range, the RSAL will be based on a value within the Range

Draft 2 RSAL/Cleanup Level Proposal (surface soil)

- RSAL will be based on the anticipated future user (wildlife refuge worker)
- When an action is triggered (contam. > RSAL) ALARA analysis will be performed to determine if cleanup can be achieved that will support unrestricted use.

RSAL/Cleanup Level Table

Land Use	25 mRem	10-4	10-5	10-6
Restricted				
Open Space User	?/? (child/adult)	?	?	?
Refuge Worker	?	?	?	?
Unrestricted				
Rural Resident	?/? (child/adult)	?	?	?
Resident Rancher	?/? (child/adult)	?	?	?

RESRAD Air Calculation Comparison

February 2001

ADMIN RECORD

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Scope of Review

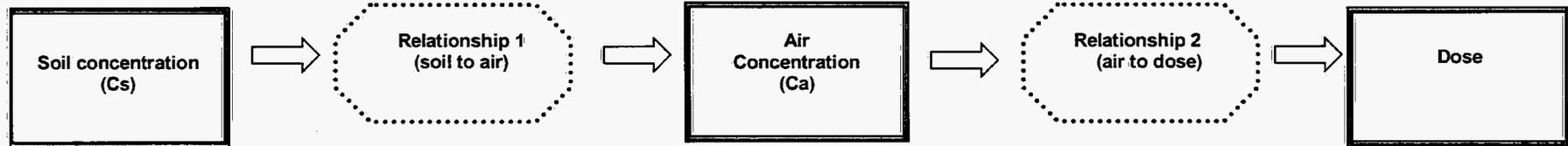
- Determine how air calculations are performed in 3 versions of RESRAD:
 - Version 5.70 and earlier ("old" RESRAD)
 - Version 5.75 and later ("new" RESRAD)
 - RESRAD as modified/used by Risk Assessment Corporation (RAC) in independent derivation of RSALs (RAC RESRAD)

Scope of Review, con't

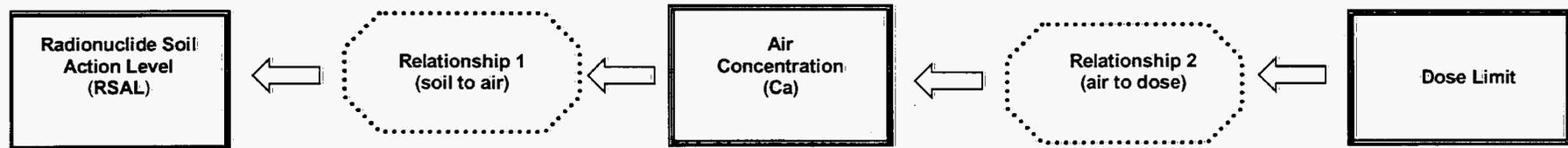
- Compare results of air calculations for the 3 versions
- Qualitatively compare effect of different air calculations and other factors in RSAL determination

RESRAD Overview

Step 1



Step 2



RESRAD Air Calculation

$$Ca = Cs \times ML \times AF$$

where:

Ca is the concentration of radioactivity in air
(pCi/m³)

Cs is the concentration of radioactivity in soil
(pCi/g)

ML is the mass loading of dust in the air (g/m³)

AF is the area factor (dimensionless)

RESRAD Air Calculation, con't

- Area factor (AF) adjusts the mass loading in air to account for the fraction that originates from the contaminated area
- Relationship $1 = Ca/Cs = ML \times AF$

Old RESRAD (5.70 and before)

- $Ca = Cs \times ML \times AF$ (basic equation)
- Area factor (AF) based on **size of contaminated area**
- Cs, ML, and size of contaminated area are input by user (or defaults used)
- Ca is calculated for the air immediately above the contaminated area (i.e., Ca is maximized)
- Area factor based on box model

Old RESRAD, con't

$$AF = A^{1/2} / (A^{1/2} + DL)$$

where:

AF is area factor (fraction of dust in air that originates from contaminated area)

A is size of contaminated area (m²)

A^{1/2} is length of side of contaminated area

DL is a dilution length, set to 3 m (default)

New RESRAD (5.75 and later)

- $Ca = Cs \times ML \times AF$ (basic equation)
- Only difference from old RESRAD is that formula for area factor is different:

$$AF = a / (1 + b(A^{1/2})^c)$$

where:

a, b, and c are coefficients for curve fitted to simulation modeling results; they vary with wind speed

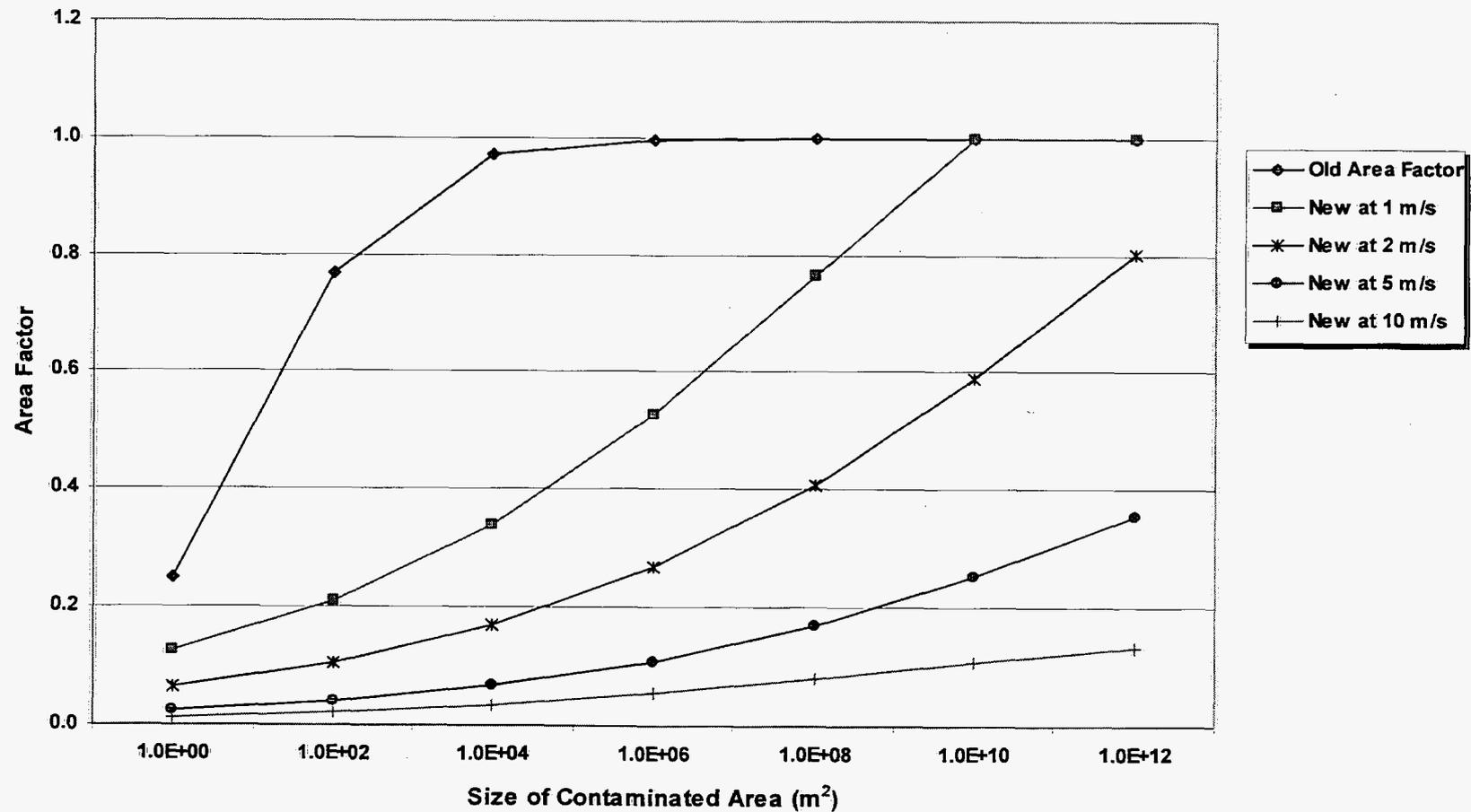
New RESRAD, con't

- AF based on **size of contaminated area** and **wind speed** (old RESRAD based on size alone)
- Cs, ML, size of contaminated area, and wind speed input by user (or defaults used)
- Ca is calculated for the “downwind” boundary of the contaminated area (i.e., Ca is maximized)

New RESRAD, con't

- To derive area factor formula, Gaussian plume simulations compared air concentrations of pollutants from various size areas, under various wind speeds, to concentrations from an infinitely large area
- Results fitted to curves and coefficients that define the curves are built into RESRAD

OLD vs. New RESRAD Area Factors



RAC RESRAD

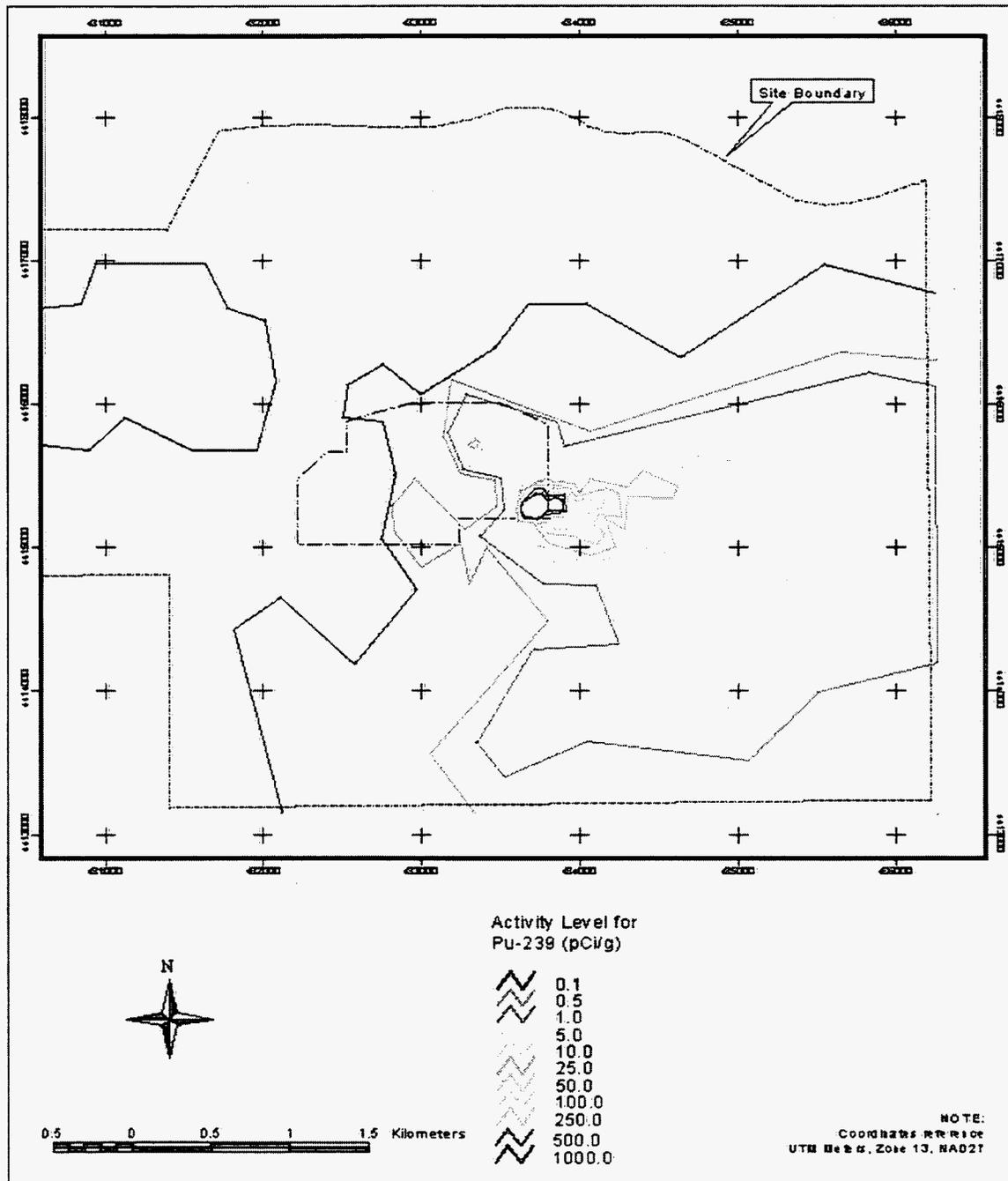
- RAC performed air calculation outside of RESRAD, then used new RESRAD to compute intakes and doses
- Ca and Cs were computed outside of RESRAD using:
 - Existing soil and air radionuclide concentration data
 - Combination of resuspension model and dispersion model to relate soil concentrations to air concentrations

RAC RESRAD, con't

- Resuspension/dispersion model:
Coefficients for resuspension portion unknown; coefficients were adjusted to fit model results to measured air concentrations
- Manipulated RESRAD into duplicating the externally calculated Ca by substituting different quantity for user-input ML value

RAC Use of Air Calculation

- RAC's model allowed calculation of Ca at many locations
 - However, to derive RSALs, input **maximum** Ca/Cs pair (i.e., maximized Ca/Cs instead of Ca)
 - Maximum Ca/Cs ratio represents eastern fenceline, where air concentrations result from upwind contamination (903 Pad area) but actual soil concentrations of radioactivity are low



Activity Level for
Pu-239 (pCi/g)

- 0.1
- 0.5
- 1.0
- 5.0
- 10.0
- 25.0
- 50.0
- 100.0
- 250.0
- 500.0
- 1000.0



0.5 0 0.5 1 1.5 Kilometers

NOTE:
Coordinates refer to
UTM Zone 13, NAD27

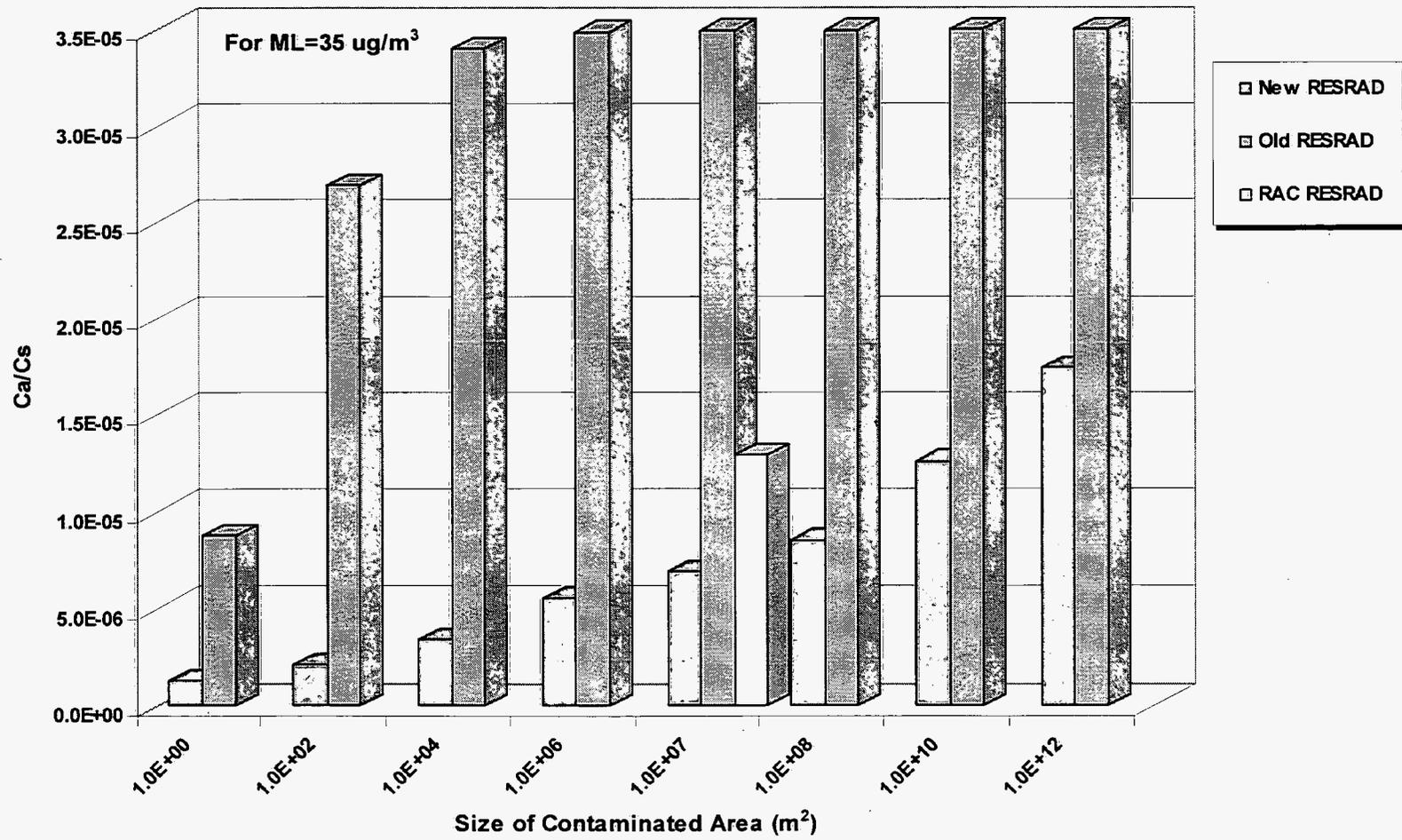
RAC Use of Air Calculation, con't

- RSALs based on series of Monte Carlo simulations vs. deterministic RSALs calculated by RESRAD
 - RSAL represents a point on a probability curve rather than the soil concentration that would result in the limiting dose

RAC Use of Air Calculation, con't

- Fire included probabilistically and assumed to increase annual resuspension (and therefore dose) by up to 200 times
 - RSALs set based on 10% probability of exceeding dose limit; at that level, fire simulations drive RSAL calculation

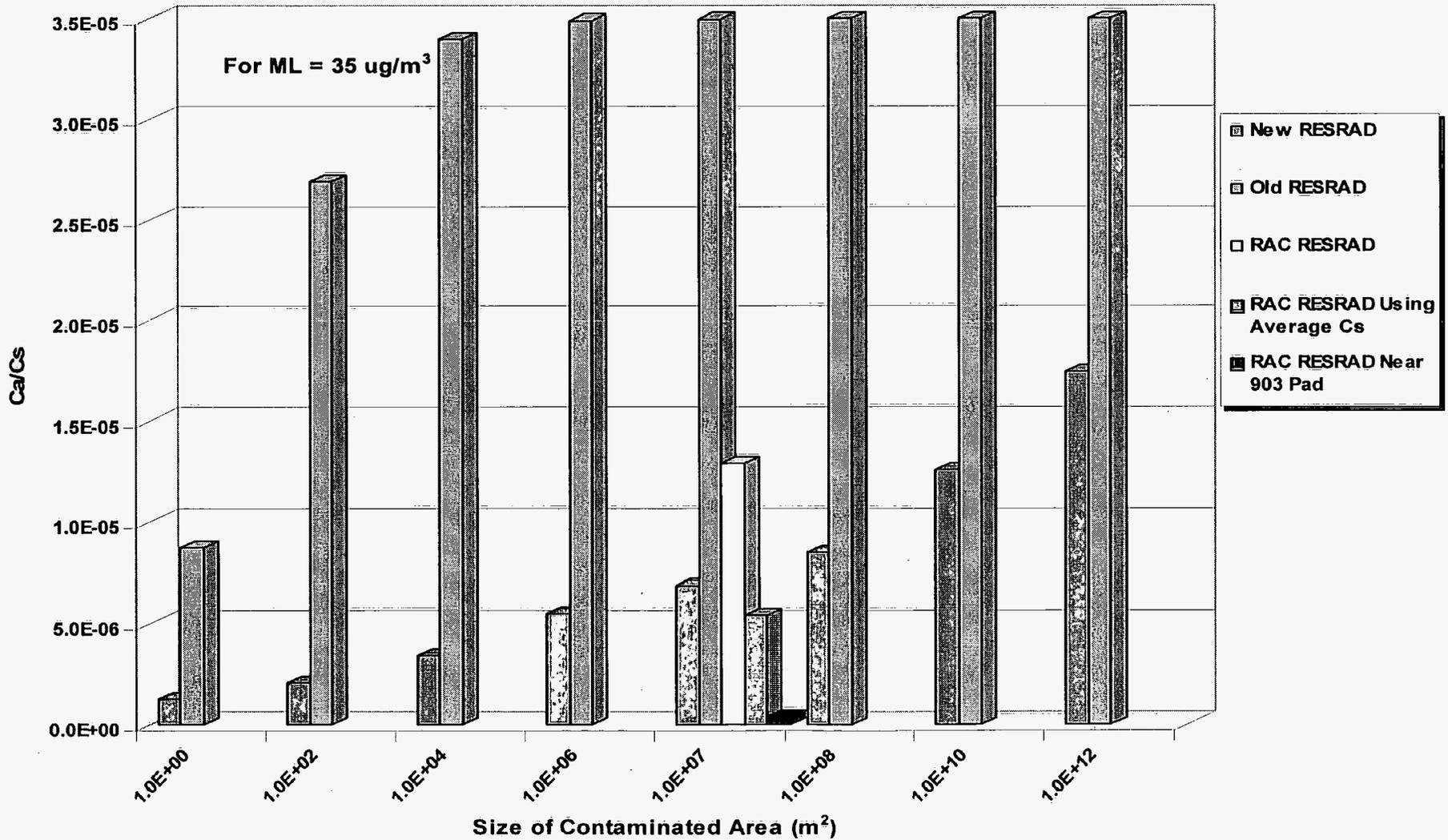
Comparison of Air Calculations



Comparison of Air Calculations, con't

- Ca/Cs ratio (Relationship 1) compared
- Old RESRAD predicts highest air concentration for a given amount of soil contamination; resulting RSAL would be **lowest (most restrictive)**
- RAC Ca/Cs ratio in between; therefore, RSAL would be in between old and new RESRAD

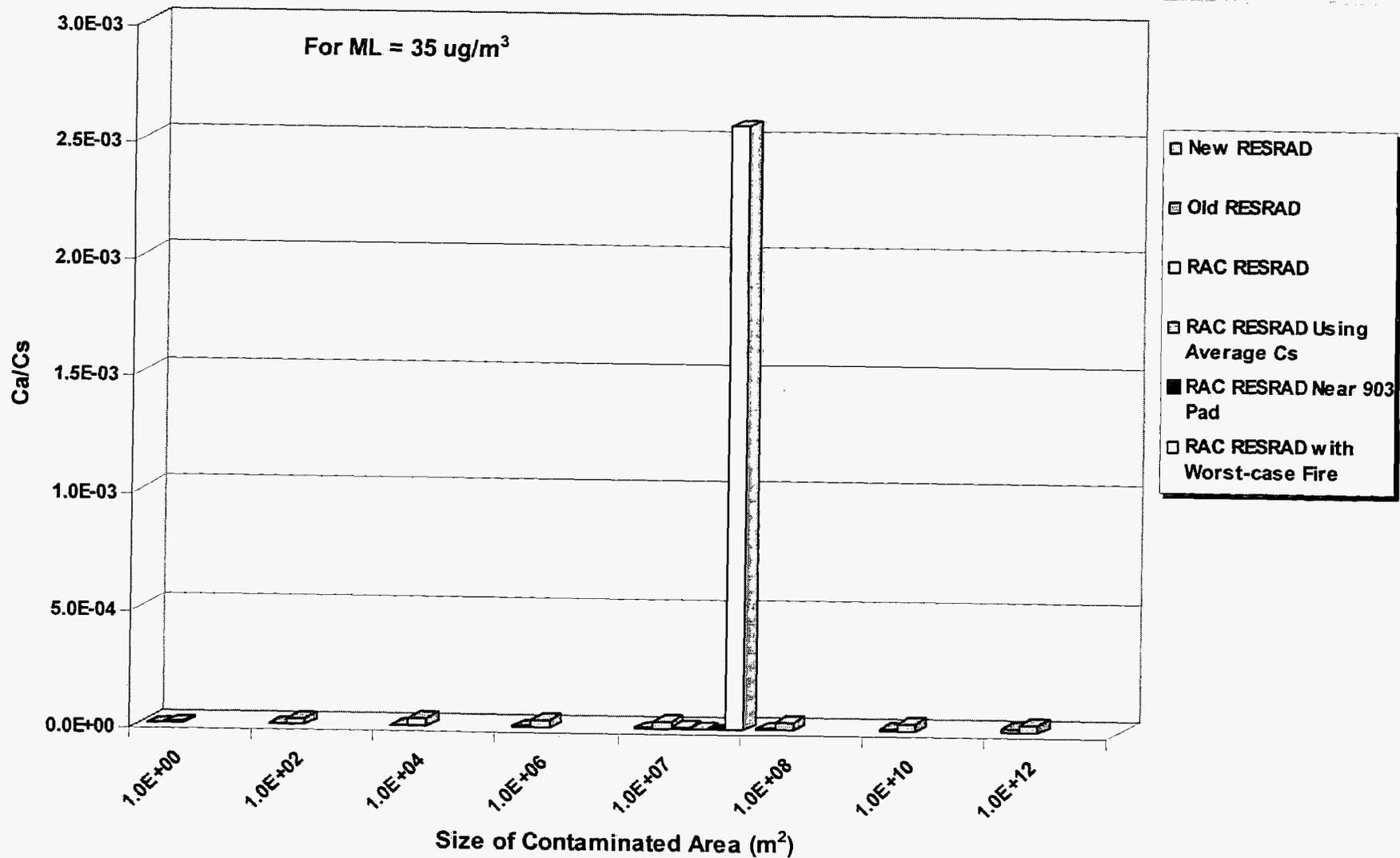
Comparison of Air Calculations, con't



Comparison of Air Calculations, con't

- RAC Ca/Cs ratio recalculated:
 - 1) Based on upwind average Cs
 - 2) For point near 903 Pad (Ca maximized, instead of Ca/Cs ratio)
- Both revisions show reduced Ca/Cs (lower air concentration for a given amount of soil contamination); therefore, RSALs would be **higher (less restrictive)** than either old or new RESRAD

Comparison of Air Calculations, con't



Comparison of Air Calculations, con't

- If a worst case fire is included, Ca/Cs ratio is greatly **increased**
- Resulting RSAL (calculated deterministically) would be greatly **decreased (more restrictive)**

Conclusions

- All other things being equal, old RESRAD (5.70 and before) would result in more restrictive RSALs than either new RESRAD (5.75 and later) or RAC RESRAD
- RAC RESRAD produces air pathway calculations in range of new RESRAD; however, RSALs derived by RAC are highly sensitive to location, contaminated area size, and fire

Addendum: RAC RESRAD Calculation

Note: ***Bold, italic*** notation is used for quantities calculated by RAC outside of RESRAD

- $Ca = Cs \times ML \times AF$ (basic RESRAD air calculation)
- Therefore, $Ca/Cs = ML \times AF$
- RAC calculated ***Ca*** and ***Cs*** outside of RESRAD using different model

Addendum: RAC RESRAD Calculation, con't

- RAC also calculated AFr = area factor that would be calculated by RESRAD for given area and wind speed
- $ML \times AF / AFr$ was input to RESRAD in place of ML (where $ML \times AF = Ca / Cs$ calculated externally)

Addendum: RAC RESRAD Calculation, con't

RESRAD calculates:

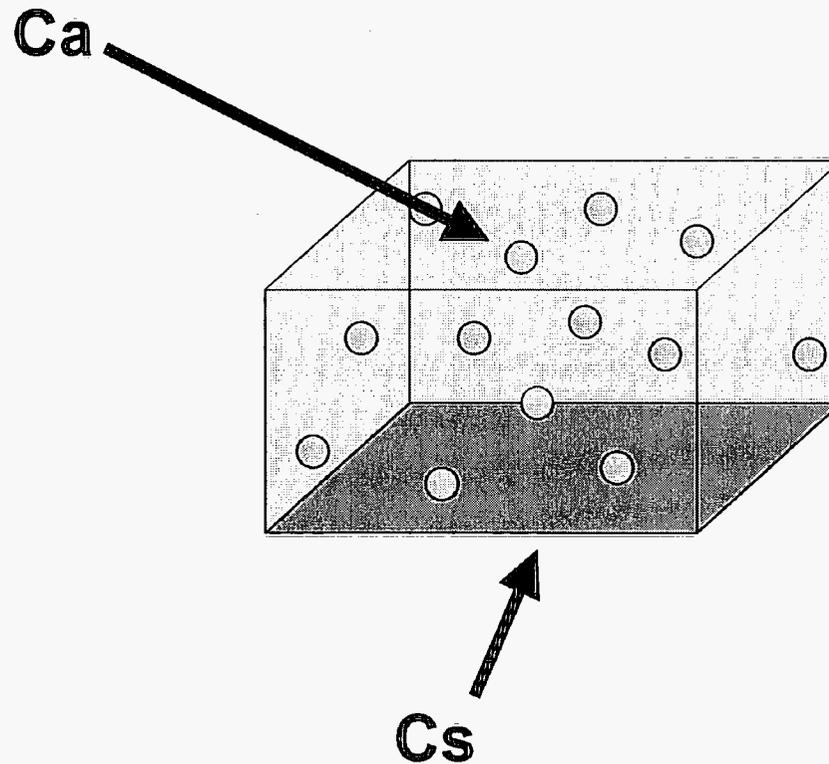
■ $Ca = Cs \times (ML \times AF / A_{Fr}) \times AF$ where
 $A_{Fr} = AF$

■ $Ca = Cs \times (ML \times AF)$ (AF, A_{Fr} cancel)

■ $Ca = Cs \times (Ca / Cs)$

■ $Ca = Ca$ for the Cs shown above

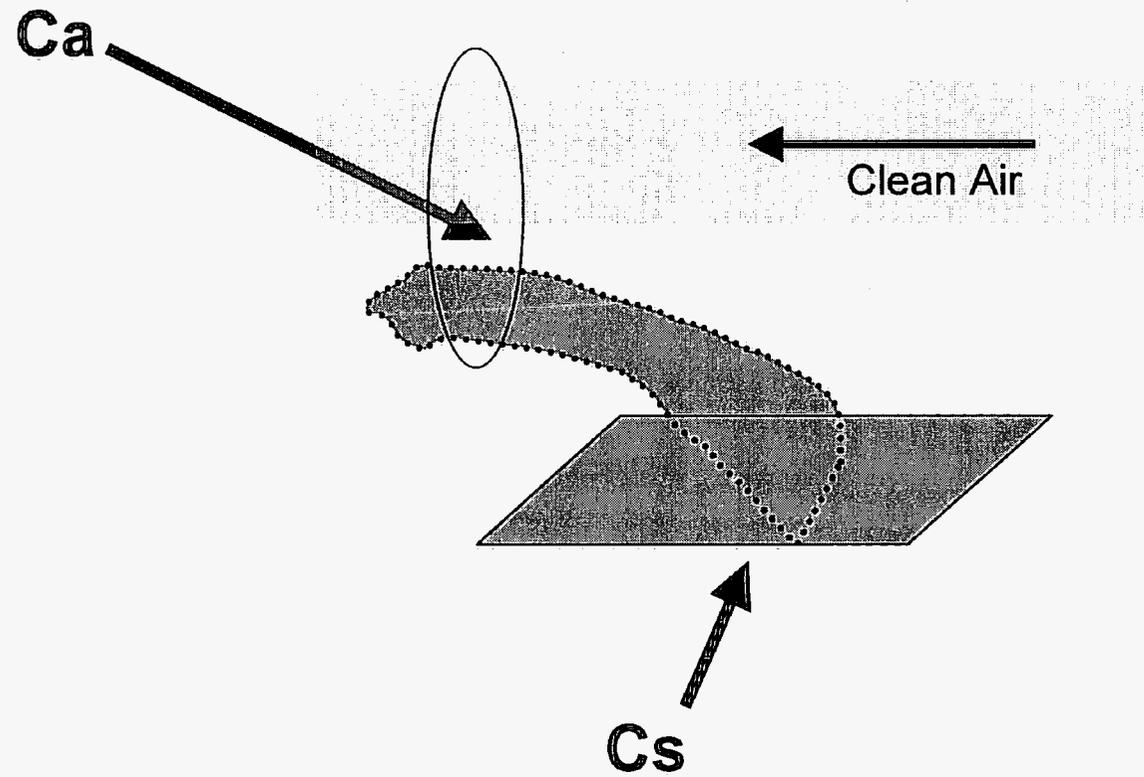
“Old” RESRAD



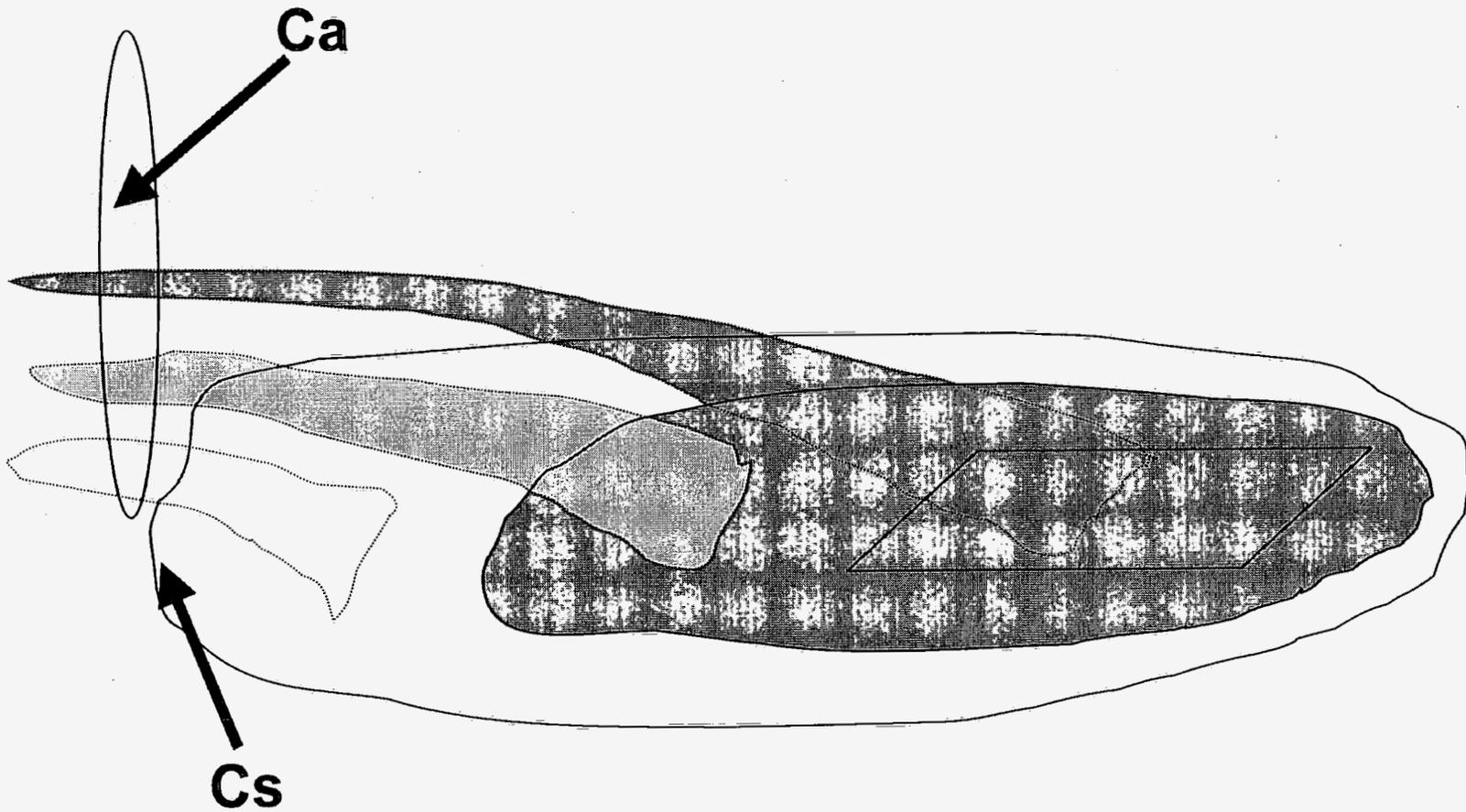
ADMIN RECORD



“New” RESRAD



“RAC” RESRAD



RFCA Focus Group Workshop Proposal

- **General Structure of the Workshop**

- 2 days long (Friday and Saturday)
- Focusing on Computer Models and Key Parameter Selection
- Invited Panel of Experts will present and discuss key topic areas
- DOE and the regulators will also present and discuss current assumptions and views
- Attendees will have opportunity to interact with DOE, regulators and the panel of experts
- All discussions will be facilitated

RFCA Focus Group Workshop Proposal

- **There are four major parts to the workshop**
 - Foundations for understanding computer modeling as it relates to soil action levels
 - Application of models at Rocky Flats
 - Specific parameters of concern
 - Next steps

RFCA Focus Group Workshop Proposal

- **Suggested panel of experts include:**
 - John Till (RAC)
 - Art Rood (RAC)
 - Kathy Higley (Oregon State)
 - Argonne Representative

RFCA Focus Group Workshop Proposal

- **Day 1: Part 1**
 - Foundations of computer modeling
 - Basic functioning and components of models
 - History of model development
 - Key assumptions
 - RESRAD and its development

RFCA Focus Group Workshop Proposal

- **Day 1: Part 2**

- Application of modeling at Rocky Flats
 - Specific environmental conditions and exposure pathways at Rocky Flats
 - Challenges in applying models at Rocky Flats to meet specific conditions and exposure pathways
 - Application of RESRAD 6.0 at Rocky Flats
 - Key parameters of concern with respect to circumstances at Rocky Flats

RFCA Focus Group Workshop Proposal

- **Day 2: Part 3**
 - Parameters of Concern at Rocky Flats
 - DOE and regulators' assumptions and decisions regarding these parameters
 - Panel members react
 - Open dialogue with audience

RFCA Focus Group Workshop Proposal

- **Day 2: Part 4**
 - Where do we go from here?
 - General dialogue (a chance for the workshop attendees to engage the panel of experts and representatives from DOE and the regulators in general discussion related to computer models and parameter selection)
 - Identification of next steps: What do we do with the information learned during the workshop?

RFCA Focus Group Workshop Proposal

- **General Logistics**
 - CAB will head up logistical planning with support from Focus Group members, DOE and the regulators; funds will be made available through CAB's existing grant mechanism with DOE
 - Will form 2 committees:
 - Agenda planning committee – will identify and assign topics for presentation and work with panel experts
 - Logistical planning committee – will work on general workshop planning and logistics

RFCA Focus Group Workshop Proposal

- **Proposed dates:**
 - March 30 and 31
 - April 20 and 21
 - April 27 and 28

**RFCA Stakeholder Focus Group
Attachment B**

Title: Meeting Minutes for February 14, 2001 Focus
Group Meeting

Date: February 22, 2001

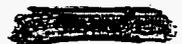
Author: C. Reed Hodgkin
AlphaTRAC, Inc.

Phone Number: (303) 428-5670

Email Address: cbennett@alphatrac.com

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**RFCA Stakeholder Focus Group
Attachment C**

Title: Specific Areas, Issues, and Questions of Interest

Date: February 8, 2001

Author: C. Reed Hodgkin
AlphaTRAC, Inc.

Phone Number: (303) 428-5670

Email Address: cbennett@alphatrac.com

PEER REVIEW OF
"RADIONUCLIDE SOIL ACTION LEVEL REGULATORY ANALYSIS"

**Specific Areas, Issues, and Questions of Interest to the
RFCA Stakeholder Focus Group**

Revision 0: February 1, 2001

OVERALL EVALUATION

The Peer Reviewers should conduct an overall evaluation of the draft report. This overall evaluation should address the questions:

- Is the regulatory approach described in the report appropriate for developing Radioactive Soil Action Levels for the Rocky Flats Environmental Technology Site?
- If the approach is inadequate in any way, why is it inadequate and what approaches would be appropriate?

SPECIFIC AREAS, ISSUES, AND QUESTIONS

The Rocky Flats Cleanup Agreement (RFCA) Stakeholders Focus Group has developed a list of questions which individual members feel are important to address in the Peer Review of this document.

Given that your primary focus is the overall evaluation described above, please answer any of the following questions that you feel qualified to address and for which you have sufficient effort available within the scope of your peer review commitment.

1. Is the regulatory approach used for setting RSALs at RFETS (as described in the draft document) consistent with that used elsewhere (best industry practice)?

Questions for Peer Review of
"RADIONUCLIDE SOIL ACTION LEVEL REGULATORY ANALYSIS"

2. What is the relevance of U. S. Environmental Protection Agency (EPA) CERCLA guidance to the specific cleanup at RFETS?
3. Is the Nuclear Regulatory Commission (NRC) rule actually an ARAR for this application - does the 25 mrem dose level under NRC rule meet the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk requirement?
4. Is the NRC rule appropriate for the specific conditions at RFETS (a cleanup action rather than a nuclear reactor or active production facility)?
5. Which method of health impact evaluation– dose assessment or risk assessment – will be most protective of human health?
6. Is the dose level chosen for the analysis appropriate and adequately protective?
7. Is the risk range chosen for the analysis appropriate and adequately protective – is a specific value in the risk range considered most appropriate?
8. Is there a regulatory requirement to maintain institutional controls in the future if such controls are used to meet CERCLA requirements?
9. Is the As Low As Reasonably Achievable (ALARA) principle being applied properly in this cleanup approach?
10. Does the document adequately address the role of community acceptance in setting RSALs?
11. Does the wildlife worker scenario described in the document meet the CERCLA criterion for protection of the reasonably maximally exposed individual, especially with regard to the long-term stewardship period?

February 7, 2001

Dear Stakeholder:

The Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group will meet at the Broomfield City Hall, Bal Swan and Zang's Spur Rooms, on Wednesday, February 14, 2001 from 3:30 to 6:30 p.m.

The agenda for the February 14, 2001 meeting is enclosed (Attachment A). We will discuss the following topics:

- Regulatory Analysis Report, Revision 2 - Discussion
- Review of RESRAD 6.0 approach to air pathway
- Report-back from Workshop Design Group

The meeting minutes for the January 31, 2001 meeting are enclosed as Attachment B.

Also enclosed (Attachment C) are the specific questions developed by the Focus Group as guidance for the peer reviewers evaluating Draft 2 of the Regulatory Analysis Report (Task 1 report).

If you need additional information to prepare you for the Focus Group discussion on February 14, 2001, please contact Christine Bennett of AlphaTRAC, Inc. at 303 428-5670 (cbennett@alphatrac.com). Christine will help to find the appropriate resource for you.

You may call either Christine or me if you have any questions, comments, or suggestions concerning the RFCA Stakeholder Focus Group or the upcoming meeting.

Sincerely,

C. Reed Hodgkin, CCM
Facilitator / Process Manager

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February 7, 2001

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Sincerely,

C. Reed Hodgin, CCM
Facilitator / Process Manager

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Actions Items from 1/31/01 RFCA Focus Group meeting

If and how pregnant females are considered in RSAL risk / dose calculations - all land use scenarios (CDPHE – Gunderson)

Revised / detailed design for RSAL Workshops (Workshop Design Group)

Revised RSAL schedule (DOE)

Schedule an agenda item in 4-6 weeks: discussion on ALARA (AlphaTRAC)

2/14/01 Agenda Items

Review of RESRAD 6.0 approach to air pathway

Regulatory Analysis Report, Revision 2 - Discussion

Report-back from Workshop Design Group

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8
999 18TH STREET - SUITE 500
DENVER, CO 80202-2466
<http://www.epa.gov/region08>

Ref: 8EPR-F

MEMORANDUM

TO: Whom it may concern

FROM: Tim Rehder, Rocky Flats Team Leader

SUBJECT: Radiation Risk and Radiation Dose, How Do They Relate?

During the long public debate that has surrounded the radiological soil action levels (RSALs) for Rocky Flats, questions have routinely come up on the issues of radiation dose and radiation; questions like what is a safe dose, what risk level does that dose equate to? Unfortunately, the answers to these questions are not always straight forward. The EPA Guidance Document "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," August 1997, says that a 15 mRem dose/yr is approximately equal to a risk of 3×10^{-4} . This over simplification has lead to much of the confusion stakeholders, public officials and regulators have experienced on this issue. In fact, the level of risk associated with a given dose depends on a number of factors such as: 1) the method used to convert dose to risk, 2) the radionuclide of interest and 3) the route(s) of exposure.

Let's talk first about the methods used to calculate the risk posed by exposure to radioactive materials. There are basically two methods for doing so; 1) calculating the Effective Dose Equivalent (EDE) and then converting that dose into a risk number, or 2) calculating a risk using cancer Slope Factors.

The Dose Conversion Method

The oversight panel is familiar with the concept of dose assessment. It is an assessment performed to answer the question "how much dose will an individual receive when exposed to a specified amount of radioactive materials?" When we talk about dose we are generally referring to the effective dose equivalent (EDE), which is a unit of measure developed by the International Commission on Radiologic Protection (ICRP) to normalize radiation doses by considering the adverse effects on a total body basis for the purpose of regulation of occupational exposure. In theory, if the EDE is calculated correctly, the risk associated with receiving, for example, a 1,000 mRem dose from Plutonium is equal to the risk associated with receiving 1,000 mRem from Radium, Cesium or any other radionuclide. EDE is derived by multiplying a dose conversion factor (DCF) for a given radionuclide by the unit intake of exposure to that radionuclide (i.e. ingestion, inhalation or external exposure). The following factors are considered in the

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development of dose conversion factors for the various radionuclides:

- ◆ type of radiation
- ◆ relative strength (or energy) of the radiation
- ◆ different radionuclides will target different organs or tissues
- ◆ different organs or tissues will exhibit different cancer induction rates.

A simple example that illustrates how dose is calculated is a man who breathes 20 m³ per day and lives year round at a location where the concentration in air of Plutonium is 0.1 pCi/m³. In this scenario the man is neither drinking contaminated water, eating contaminated foodstuffs, nor ingesting contaminated dirt. Assuming all the airborne Plutonium is respirable, and for this example using a DCF for inhalation of Pu of 0.308 mRem/pCi, the equation would look like:

example 1

$$(365 \text{ days/year})(20 \text{ m}^3/\text{day})(0.1 \text{ pCi/m}^3)(0.308 \text{ mRem/pCi})(30\text{years}) = \mathbf{6750 \text{ mRem}}$$

Since different radionuclides have different DCFs, if we changed the radionuclide in the equation above, the resulting dose would be different. Similarly, different routes of exposure have different DCFs. If we considered ingestion rather than inhalation in the equation above, the resulting dose would be different.

Most health physicists don't calculate the risk that is associated with a given dose. They simply compare the dose to accepted national standards : e.g. 100 mRem/yr for public exposure or 5,000 mRem/yr for occupational exposure. However, risks can be calculated using a two-step method. The first step being the dose calculation as demonstrated in example 1 above. The next step is to convert the dose to a risk value using a **probability coefficient**. ICRP has developed probability coefficients that allow dose to be expressed in terms of risk. The 1990 Recommendations of the ICRP says the probability coefficient from fatal cancers, non-fatal cancers and severe hereditary effects is 7.3×10^{-2} /sievert (1 sievert = 100,000 mRem). This risk coefficient is based on low LET (Gamma) radiation and considers all cancers. Using that coefficient, the next step in calculating risk is:

example 1 -step 2

$$(6750 \text{ mRem})(7.3 \times 10^{-2}/\text{sievert}) = 5 \times 10^{-3}.$$

Slope Factor Method

A slope factor is similar to a dose conversion factor, but instead of assigning a unit dose for every unit of exposure (i.e. mRem/pCi) a unit of **RISK** is assigned for every unit of exposure (i.e. probability of adverse effect/pCi). Using an inhalation slope factor for Plutonium of 3.33×10^{-8} /pCi we can go back to the above example and calculate a risk:

example 2

$$(365 \text{ days/year})(20 \text{ m}^3/\text{day})(0.1 \text{ pCi/m}^3)(3.33 \times 10^{-8}/\text{pCi})(30 \text{ years}) = 7.2 \times 10^{-4}$$

Note that this result is lower than the risk calculated in example 1 using the Dose Conversion Method. EPA believes that for internal exposures to alpha and beta emitters, the Slope Factor Method produces a more reliable estimate of risk.

EPA has calculated slope factors for most of the radionuclides and just as different radionuclides have different DCFs, different radionuclides generally have different slope factors. The slope factors also vary depending on route of exposure. Therefore, risk associated with inhaling 1,000 pCi of Uranium is different from that of inhaling 1,000 pCi of Cesium. Also the risk associated with inhaling 1,000 pCi of Radium is different from that of ingesting 1,000 pCi of Radium via drinking water.

Summary

There are two methods for calculating the risk associated with radiation exposure:

- 1) The Dose Conversion Method where a dose is calculated by multiplying a dose conversion factor (expressed in terms of unit dose/unit intake) for a given radionuclide by the total intake of exposure to that radionuclide (i.e. ingestion, inhalation or external exposure). The dose is multiplied by a probability coefficient to arrive at a risk value.
- 2) The Slope Factor Method where risk is calculated directly by assigning a unit of **RISK** for every unit of exposure (i.e. probability of adverse effect/pCi), and multiplying that by the total exposure. This method is basically the same method that EPA uses to calculate the risks associated with non-radioactive carcinogens.

EPA believes that the Dose Conversion Method is fine for calculating the risks of exposure to low LET radiation (i.e. gamma radiation), but does not work well for internal exposure to alpha and beta emitting radionuclides. In the case of internal exposure, the Dose Conversion Method tends to overestimate the risk as seen in the two example calculations above.

The risk associated with 15 mRem/year, as stated in recent EPA guidance documents is based on the ICRP risk value of .073/Sv for external low LET radiation. All external low LET radiation can use this value. (A new EPA calculated value is closer to .08/Sv) The calculation for deriving the 3×10^{-4} number is as follows:

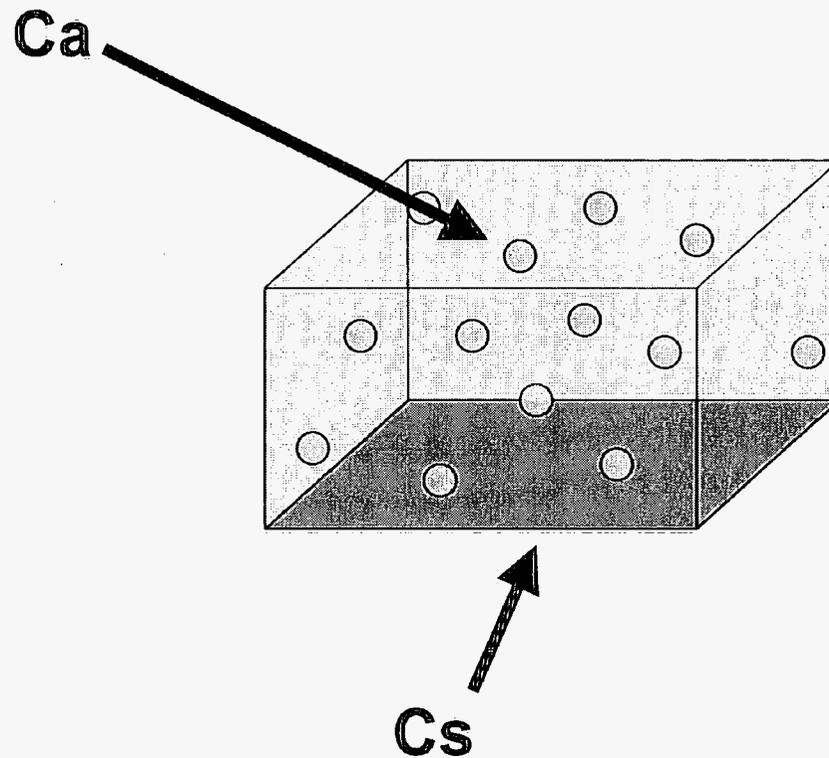
$$(15 \text{ mRem/yr})(30 \text{ yrs})(7.3 \times 10^{-2}/\text{sievert}) = 3 \times 10^{-4}$$

Again, EPA believes that this estimate of the risk associated with a 15 mRem/yr dose is only reliable for external low LET radiation (gamma radiation).

NOTE ON COMPARING CALCULATED RISK NUMBERS TO THE ACCEPTABLE RISK RANGE

When making this comparison, EPA generally rounds the number up or down. For example, EPA has gone on record saying 3×10^{-4} (3 in 10,000) is essentially equal to 1×10^{-4} (1 in 10,000). In another case, EPA made the call that 5.7×10^{-4} is **not** equal to 10^{-4} .

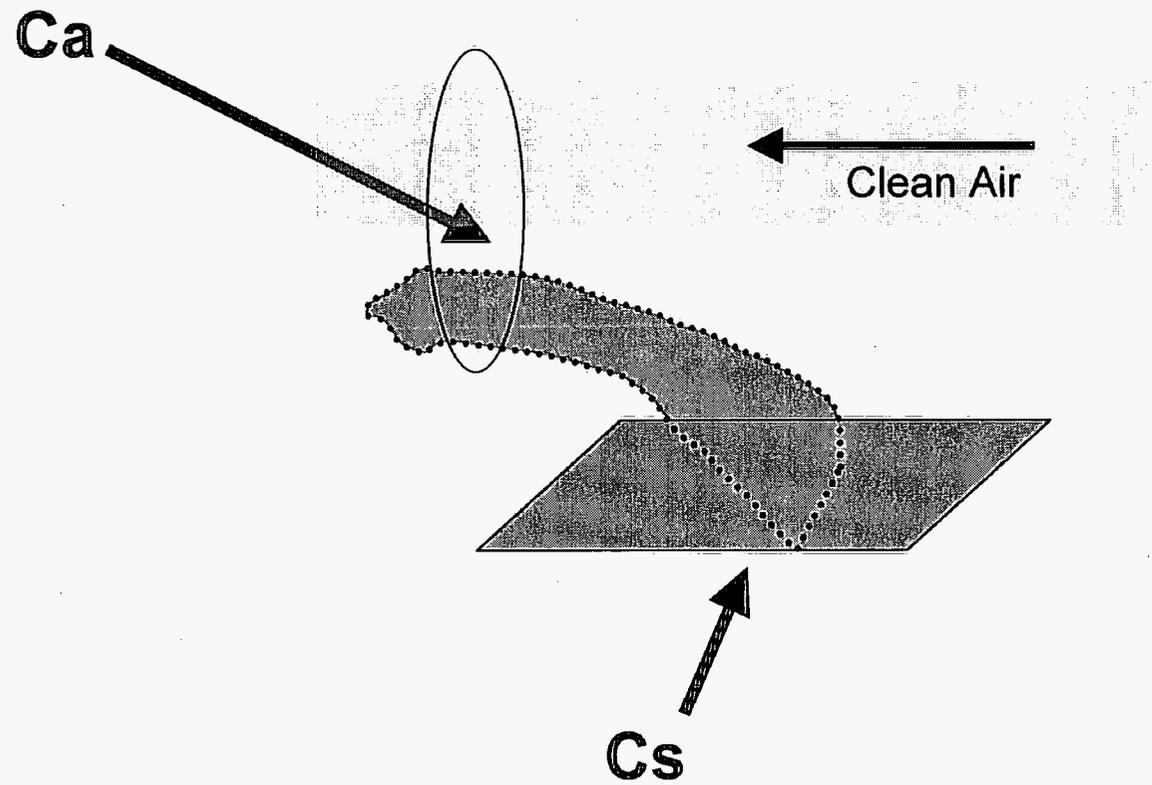
"Old" RESRAD



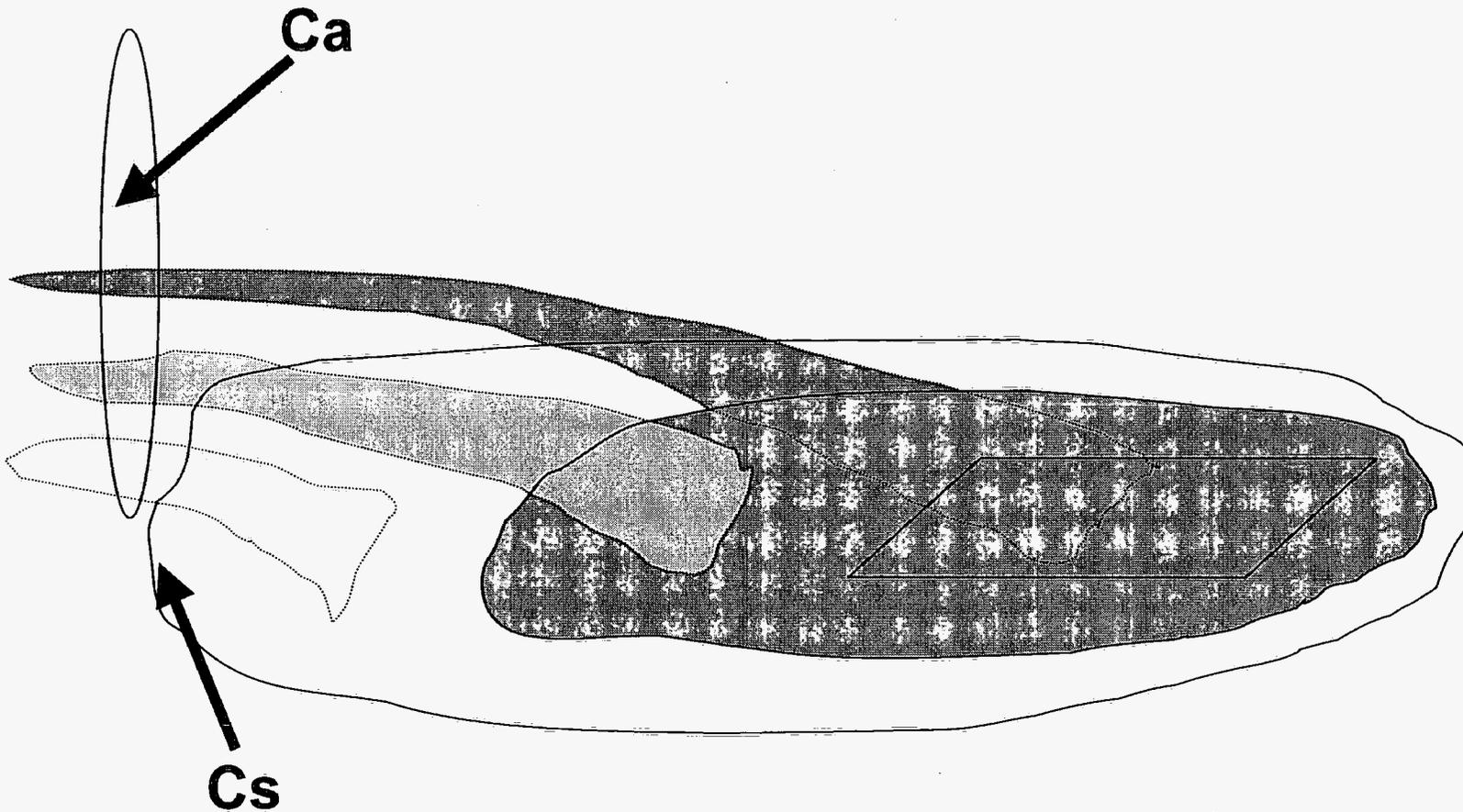
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“New” RESRAD



“RAC” RESRAD



12/13/00

It was noted that an independent review of the air resuspension module in RESRAD would be conducted and included in the next revision of the Model Evaluation Report

A member of the focus group emphasized the importance of understanding the sensitivity of the RESRAD model to inputs and pathways, especially as related to air resuspension. It was suggested that the RAC analysis of this area be carefully examined.

A member of the Focus Group asked if the Agencies were proceeding with the RESRAD 6.0 model. DOE responded that work had begun using RESRAD 6.0, and that this was the model of choice pending the results of the air resuspension review.

A member of the Focus Group emphasized the need to verify that the dose conversion factors used in the model were appropriate. A full discussion of whether to use ICRP 30 or ICRP 72 factors was requested.

Reed asked the members of Focus Group if there were other comments concerning the Agencies' choice of RESRAD 6.0 for the modeling analysis. There were no additional comments.

1/3

It was noted that differences between RESRAD versions were discussed in the RAC report. The focus group asked for a reference to the location of that discussion in the RAC report. Victor Holm agreed to provide the indicated reference.

A member of the focus group indicated that knowing the sensitivity of the modeling results to differences between RESRAD versions could be as or more important than knowing the differences themselves. It was suggested that RAC's experts be brought in to discuss this topic with the focus group. The agencies replied that the sensitivity of model results to model differences would be included in the RSAL review documentation.

SUMMARY OF ACTIONS AND COMMITMENTS

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- The focus group asked for the source code for RESRAD 6.0. DOE agreed to obtain and provide the source code.
- Location in RAC report where RESRAD code differences are addressed

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Air Resuspension Model

Radian Corporation has been contracted to review and report on the differences in the air resuspension approaches in the three versions of the RESRAD model – Version 5.8, the Risk Assessment Corporation (RAC) version and Version 6.0.

**Radionuclide Soil Action Levels Focus Group
Draft Workshop Proposal**

February 6, 2001

- 1) Proposal: A two-day workshop focusing on computer modeling and parameter selection for determining radionuclide soil action levels for Rocky Flats.

- 2) Suggested Dates:
 - 1st Choice: Friday and Saturday, March 30 and 31
 - 2nd Choice: Friday and Saturday, April 20 and 21
 - 3rd Choice: Friday and Saturday, April 27 and 28

- 3) Overall structure of workshop is to invite a panel of experts, representing various perspectives and expertise related to computer modeling and parameter selection, to provide presentations, discuss topics, and engage the workshop attendees in a dialogue related to soil action level setting issues. The workshop will employ a facilitator to make sure that the workshop goes according to schedule and conversations remain on the topics of concern.

- 4) Suggested experts include:
 - John Till – Risk Assessment Corporation
 - Art Rood – Risk Assessment Corporation
 - Kathy Higley – Oregon State University
 - A representative from the Argonne National Laboratory

- 5) Proposed Agenda Structure: The workshop will have 4 main parts spread over two days.

Day 1:

- ***Part 1: Foundations for development and use of computer models to determine soil cleanup at radioactively contaminated sites***

Purpose: The goal of this part of the workshop is to develop a fundamental understanding of computer models, the assumptions they make, and their application in determining soil action levels. The first part of the discussion will focus on models in general and then turn more specifically toward the different models that are available.

Suggested Components of this Discussion: After the presentation on each component, there will be time for reaction from the other panel members.



Following the panel discussion on the component, the audience will be invited to ask questions and engage in discussion with the panel members.

- i. What do computer models attempt to do? What are the basic components of models? How do they function? (Presenter: John Till)
- ii. History of development of models related to cleanup of radioactively contaminated sites: What models have been developed? How have models changed over the years? What are the strengths and weaknesses of the different models? (Presenter: Kathy Higley)
- iii. What are some of the key assumptions found in models? How are the assumptions of the ICRP and other organizations incorporated into the models? (Presenter: John Till)
- iv. The RESRAD model and its development: What distinguishes the RESRAD model from other models? How has the RESRAD model evolved over time? What are the differences between early versions, the RAC-modified version, and the current RESRAD 6.0 model? (Presenters: Argonne representative, Art Rood)

- ***Part 2: Application of Models for Use at Rocky Flats***

Purpose: The goal of this part of the workshop will be to use the information obtained in the first part of the workshop and begin to apply it toward the specific circumstances found at Rocky Flats. The first part of the discussion will identify the specific environmental conditions and exposure pathways at Rocky Flats. The discussion will then turn toward the application of models to take into account these site-specific conditions, first in a general sense and then more specifically with respect to the RESRAD 6.0 code. The first day of the workshop will close with the identification of and a discussion about the key model parameters of concern related to the specific conditions at Rocky Flats. The real-time use of computers will be encouraged during these discussions, especially the final component to allow the audience to better understand the sensitivities of the key parameters in determining a soil action level.

Suggested Components of this discussion: The format will be the same for this part of the workshop as described above, with initial presentations by a panel member, followed by reaction from the other panel members, and then an opportunity for questions and dialogue with the audience.

- i. What are the specific environmental conditions and exposure pathways at Rocky Flats that must be considered in developing a radionuclide soil action level? (Presenter: John Till)
- ii. What are the challenges in applying computer models in general to account for the specific environmental conditions and exposure pathways at Rocky Flats? (Presenters: John Till, Art Rood)
- iii. How well does the RESRAD 6.0 code model the specific conditions and exposure pathways at Rocky Flats? (Presenter: Argonne representative)
- iv. What are the key model parameters of concern related to Rocky Flats? (Presenter: John Till)

Day Two:

- *Part 3: Modeling Parameters of Concern at Rocky Flats*

Purpose: The goal of this part of the workshop is first to hear from DOE and the regulators with respect to the key modeling parameters of concern. They will present the parameter evaluations they have chosen or are considering for use at Rocky Flats. The remaining part of the discussion will then involve a dialogue among DOE and the regulators, the panel members, and the audience with respect to these key parameters.

Suggested components for this discussion:

- i. Presentation by DOE and the regulators on values either chosen or being considered for the key parameters of concern. (Presenters: representatives from DOE, CDPHE and EPA)
- ii. General discussion among the panel members (i.e. visiting experts) on the key parameter values.
- iii. Open dialogue with the audience.

- *Part 4: Where do we go from here?*

Purpose: This final part of the workshop will allow audience members to discuss what they have learned during the workshop and engage the panel members in additional dialogue. The goal of the discussion will be to

determine a path forward for the community with respect to ideas or issues that might arise based on this final conversation. The workshop facilitator will lead these discussions.

Suggested components for this discussion:

- i. General dialogue concerning computer models and parameter selection based on information obtained during the workshop
- ii. Identification of a path forward

4/19 8/83