

Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator and User Guide

External Peer Review Record
October 30, 2014-January 15, 2015

CONTENTS:

Peer Review Charge Questions

Matrix of Peer Review Comments

Thomas A. Schneider (Ohio Environmental Protection Agency)

[Review](#)

[Curriculum Vitae](#)

[Conflict of Interest Form](#)

U.S. Nuclear Regulatory Commission (Joint Review)

[Review](#)

Christopher A. McKenney

[Curriculum Vitae](#)

[Conflict of Interest Form](#)

Leah S. Parks

[Curriculum Vitae](#)

[Conflict of Interest Form](#)

Adam L. Schwartzman

[Curriculum Vitae](#)

[Conflict of Interest Form](#)

Leo van Velzen (Nuclear Research and Consultancy Group)

[Review](#)

[Curriculum Vitae](#)

[Conflict of Interest Form](#)

Peer Review Charge for:

U.S. Environmental Protection Agency (EPA), “Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator.”

Background:

EMS, under contract EP-W-13-016 with EPA’s Office of Solid Waste and Emergency Response, has been requested to obtain external, independent reviews of the “Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator.” The purpose of this peer review is to identify any technical problems, omissions, or inconsistencies in the PRG calculator, and to obtain expert opinion as to the calculator’s usefulness and appropriateness for its intended function. Your comments and recommendations will be used to revise the calculator so that the final version will reflect sound technical information and guidance.

EPA developed the electronic calculator to help risk assessors, remedial project managers, and others involved with risk assessment and decision making at sites with radioactively contaminated soil, water, and air. The electronic calculator provides guidance for establishing risk-based preliminary remediation goals (PRGs) for radioactively contaminated Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial sites.

Initially applied at the scoping phase of a project using readily available information, risk-based PRGs generally are modified based on site-specific data gathered during the Remedial Investigation and Feasibility Study (RI/FS). PRG development and use in screening should assist staff in streamlining the consideration of remedial alternatives. Radionuclide-specific PRGs usually are derived from two general sources: (1) concentrations based on potential applicable or relevant and appropriate requirements (ARARs); and (2) concentrations based on risk assessment. ARARs often include concentration limits set by other environmental regulations, such as Safe Drinking Water Act maximum contaminant levels (MCLs). The second source for PRGs, and the focus of this database tool, is risk-based calculations that set concentration limits using toxicity values under specific exposure conditions.

EPA issued guidance entitled “Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination” (OSWER No. 9200.4-18, August 22, 1997). This 1997 guidance clarified how to establish protective cleanup levels for radioactive contamination at CERCLA sites. The guidance reiterated that cleanup levels of radionuclides generally should be within the risk range for carcinogens established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) when ARARs are not available or are not sufficiently protective. Thus, cleanups generally should achieve a level of risk within the 10^{-4} to 10^{-6} carcinogenic risk range based on the reasonable maximum exposure for an individual. As addressed in the 1997 guidance, regions should include exposures from all potential pathways and through all media (e.g., soil, ground water, surface water, sediment, air, structures, etc.), when calculating cleanup levels. The guidance also provides a listing of radiation standards that are likely to be used as ARARs to establish cleanup levels or to conduct remedial actions.

Peer Review Charge:

Review the web site (instructions for accessing the site can be found on p. 3) to become familiar with its structure, organization, subpages, and links. The PRG calculator, for purposes of this peer review, includes:

- PRG Calculator Home page, with introduction and links to subpages
- PRG Calculator User's Guide, which include instructions, explanations, equations, default data, assumptions, and sources
- PRG Calculator
- Frequently Asked Questions (FAQs)
- What's New, which includes information on previous revisions to the calculator that change the results of modeling runs
- Equations
- Download Tables

We request that you review the overall web site, user's guides, and the calculator, and answer the charge questions below. You should focus your review on the user's guides, which provide a complete overview, explanation, and instructions, together with supporting data, models, equations, and references and citations. Please note any inconsistencies between the user's guide and calculator.

Charge Questions:

A. Overall Web Site

1. Is the web site clearly organized, described, easy to navigate, and generally "user friendly?" If not, what do you recommend?
2. Have the objectives of the PRG calculator, as stated in the documentation, been realized? If not, what do you recommend?
3. Does the documentation (user's guides) match the online PRG calculator tools and vice-versa? If not, what do you recommend?
4. Do you have any other recommendations to improve the usability of the web site?

B. User's Guides

1. Are the tool and web site clearly explained?
 - a. Are the assumptions clear and reasonable? If not, what do you recommend?
 - b. Does it adequately describe the calculator's limitations? If not, what do you recommend?
 - c. Is it well written and clearly organized? If not, what do you recommend?
 - d. Is the technical support documentation complete, well organized, and easy to follow? If not, what do you recommend?
2. Are the sources and citations appropriate, and do they represent the current state of knowledge? If not, what do you recommend?
3. Are the models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?
 - Resident
 - Farmer
 - Soil to Groundwater
 - Indoor Worker
 - Outdoor Worker
 - Composite Worker
 - Recreator

- Construction Worker – Unpaved Road Traffic (Site-specific only)
 - Construction Worker – Wind Erosion and Other Construction Activities (Site-specific only)
4. Are the equations for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations or derivations? Are the equation variables adequately explained in terms of relative sensitivities? Are the equation constants adequately explained and sourced? If not, what do you recommend?
 - a. Area (surface) contamination?
 - b. Volumetric contamination?
 5. Are the source material and photonic energy data used for the volume calculator comprehensive, appropriate, and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? Are they appropriate for residential and worker exposures? If not, what do you recommend?
 6. Are the choice of detectors and detector heights appropriate and based on supportable reasoning? If not, what do you recommend?
 7. Are the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend?
 8. Are the standard recommended default factors adequately explained, sourced, and reasonable?
 9. Is there anything else you recommend for the user's guides to improve them for their stated purpose?

C. Calculator

1. Are the results clearly explained and presented? If not, what do you recommend?
2. Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?
3. Do the results provide defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?
4. Are there aspects of other Superfund guidance that should have been used or incorporated into the calculator?
5. Are the radionuclides appropriate, and do the results adequately explain the variability among radionuclides? If not, what do you recommend?
6. Is there anything else you recommend for the calculator to improve it for its stated purpose?

D. Anything Else?

Is there anything else you would recommend to improve the PRG's utility, accuracy, completeness, or supportability?

When your review is complete, e-mail your comments to EMS's Project Manager (Keith Arnold, keith.arnold@emsus.com, 301-589-5318, ext. 28) on or before **January 15, 2015**. For specific comments or text edits on the user's guide, you may copy and paste text into Microsoft Word and indicate edits or comments using track changes or the comments feature. You also may detail edits by listing the section number and paragraph/sentence number (e.g., User's Guide, Section 2.3.2, paragraph 1, sentence 3:[comment]). *Please do not hand write your comments.*

How to Use the Calculator:

The PRG calculator is available for review at <http://epa-prgs.ornl.gov/radionuclides/>.

In step 1 you to select an exposure scenario. The PRG calculator has nine exposure scenarios:

1. Resident
2. Farmer
3. Soil to Groundwater
4. Indoor Worker
5. Outdoor Worker
6. Composite Worker
7. Recreator
8. Construction Worker – Unpaved Road
9. Construction Worker – Wind Erosion and Other Construction Activities.

Some of these exposure scenarios have multiple media choices; other scenarios will only involve one media so a choice will not appear.

In step 2 you may select either “Generic” in which case the runs use a pre-determined set of default input parameters, or “Site-Specific” where the user can change some of the input parameters.

In step 3 you may select if you want to get estimates of the cancer risk posed by radionuclides at your site, in addition to the target risk-based concentrations that will be provided as PRGs.

In step 4 you are also given a choice of having your results in either pico curies per gram, which are the units usually used in the United States, or in becquerels per gram which most of the rest of the world uses.

In step 5 you must select one or more radionuclides that you want to develop PRGs for.

You see here that some of the radionuclides and radioactive decay chain products are designated with the suffix "+D" to indicate that cancer risk estimates for these radionuclides include the contributions from their short-lived decay products, assuming secular equilibrium.

The decay chain for +D radionuclide ends in 100 years.

MATRIX OF PEER REVIEW COMMENTS: Charge questions for U.S. EPA 's Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator					
Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
Schneider	A.1.			The web site includes a lot of text which will be helpful to the more advanced risk assessor. It may be overwhelming to the more casual user or risk manager. It might be useful to have some pathway to a more concise direction to the default tables with a disclaimer of their conservative nature.	
Schneider	A.2.			I think so.	
Schneider	A.3.			There are some inconsistencies and/or improvements that could help the documentation. These are noted in the comments [in the	
Schneider	A.4.			See comments [in review] for usability improvement suggestions.	
Schneider	B.1.a.			Some comments [in review] for specific suggestions on clarifying assumptions.	
Schneider	B.1.b.			Yes.	
Schneider	B.1.c.			See comments [in review] for specific improvements to text.	
Schneider	B.1.d.			See comments [in review] for specific improvements to text.	
Schneider	B.2.			I'm not familiar with all the recent literature so will defer to others on this.	
Schneider	B.3.			One scenario or exposure path that comes to mind for me but doesn't appear addressed would be an on-site worker that conducts controlled burns for vegetation management. A number of former DOE sites are now maintained in a natural state that either might use burning as a management technique or might experience burning as a natural/vandalism event. It would be helpful in addressing public and worker concerns to have a scenario that provides PRGs to support this exposure pathway.	
Schneider	B.4.			I did find some discrepancies in the descriptions of the area contamination within the user's guide. See specific comments [in review].	
Schneider	B.5.			No response.	No response required.
Schneider	B.6.			It was not clear from my review where the detectors and detector heights were discussed.	
Schneider	B.7.			They appeared to be to me.	
Schneider	B.8.			In general yes, some questions presented in the specific comments [in review].	
Schneider	B.9.			Specific recommendations for improvements to the user guide are provided [in the review].	
Schneider	C.1.			I like the PDF export feature. Provides all the information in one package. The time stamp on it will be helpful for determining differences if changes to the calculator are made.	
Schneider	C.2.			I defer to those more experienced with the algorithms and calculators than I am to provide comment on this.	
Schneider	C.3.			No response.	No response required.
Schneider	C.4.			Not that I'm aware of.	
Schneider	C.5.			The list of radionuclides seems appropriately comprehensive to me.	
Schneider	C.6.			No response.	No response required.
Schneider	D.			See specific comments [in review].	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/resairimage.html	
Schneider		General		4. Technical Support Documentation under the Preliminary Remediation Goals for Radionuclides page. Would be good if the page would allow you to go back to expanded view of this subsection when clicking the back button after viewing one of the scenarios presented.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/res2Dsoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/res2Dsoilimage.html , the area considered is provided as a range of 1-1,000,000 square meters. In all subsequent pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/comworkairimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/comworkairimage.html it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the composite scenario.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/comwork2Dsoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/comworksoilimage.html it states the composite worker only differs from the outdoor worker in that it uses the more protective 250 day per year exposure. Page http://epa-prgs.ornl.gov/radionuclides/outworksoilimage.html it states the outdoor worker is the“most highly exposed receptor in the outdoor environment”. Not clear to the reviewer how the outdoor worker exposure exceeds that of the composite worker. Additional clarification of the two scenarios is needed.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/outworkairimage.html	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/outworkairimage.html it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the scenario.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/outwork2Dsoilimage.html	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/inworkairimage.html	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/inwork2Dsoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/inwork2Dsoilimage.html gamma shielding is misspelled “gamma shilding” and account is misspelled “accound.”	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/con1worksoilimage.html	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html the page title says “Construction Worker (Other than Standard Vehicle Traffic)” while the lead to the paragraph says “Construction Worker (Standard Vehicle Traffic)”. The latter needs to be corrected.	
Schneider		General		From the descriptions provided on pages http://epa-prgs.ornl.gov/radionuclides/con1worksoilimage.html and http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html it is unclear what the difference in exposure is. The descriptions should at least describe the parameters that are changed between the two scenarios.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/conworkairimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/conworkairimage.html it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the scenario.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/conwork2Dsoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/conwork2Dsoilimage.html the area considered is provided as a range of 1-1,000,000 square meters. In most prior pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/recsoilimage.html	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/recairimage.html	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/recairimage.html recreational is misspelled “reacreational”	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/recairimage.html , this scenario should include the description from the previous scenario, “This receptor spends time outside involved in recreational activities.	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/recairimage.html it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the assumed outdoor activity of the scenario.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/recwaterimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/recwaterimage.html the header reads “Tapwater Graphic and Supporting Text” and the paragraph lead reads “Recreator Surface Water.” Recreator Surface Water is the correct text	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/rec2Dsoilimage.html	
Schneider		General		On page http://epa-prgs.ornl.gov/radionuclides/rec2Dsoilimage.html this scenario should include the description from the previous recreational scenario, “This receptor spends time outside involved in recreational activities.” Also the area considered is provided as a range of 1-1,000,000 square meters. In most prior pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/recgameimage.html	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/restapwaterimage.html the title reads “ResidnetTapwater Graphic”. It should be corrected to read “Resident...”	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/agtapwaterimage.html	
Schneider		General		Graphic missing on the following page: http://epa-prgs.ornl.gov/radionuclides/fishimage.html	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/summary_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/summary_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/resair_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/resair_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/restap_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/restap_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/res2D_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/res2D_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/resfish_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/resfish_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil2gw_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil2gw_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download.html all remaining PDF tables with frozen header the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download.html for all PDFs where the header is not frozen it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.	
Schneider		General		On page: http://epa-prgs.ornl.gov/radionuclides/download.html for all Excel files it would be more user friendly if the header was fixed so they heading scrolled with the data, otherwise the very lengthy tables are hard to utilize.	
NRC	A.1.			Generally, yes. However, with the use of some browsers, the choices under the Preliminary Remediation Goals for Radionuclides (PRG) Calculator for Select PRG Types overlap the options for Select Media. The website should be viewed on various versions of commonly used browsers (Microsoft Internet Explorer [32- and 64-bit], Firefox, etc.) to ensure that formatting is maintained.	
NRC	A.2.			Yes.	
NRC	A.3.			No. The following recommendations are provided concerning the User's Guide:	
NRC	A.3.		User's Guide	Recommend including an option for viewing the User's Guide in pdf format for easier printing and/or storing notes.	
NRC	A.3.	2.1.	User's Guide	Section 2.1: this section has a list of the "most common land uses and exposure assumptions" with links to the equations in the sections below. For better transparency a comment should be added stating that this list is not inclusive and that equations for other scenarios (e.g., Recreator) are all included. In addition, the list refers to "Agricultural" as a common land use while the sections below refer to the individual under the heading of "Farmer." The calculator also refers to this scenario as "Farmer." For better consistency a single term should be used to describe this scenario.	
NRC	A.3.	2.3.2	User's Guide	Section 2.3.2: Include a description of how the hierarchy of parameters is used in addition to listing the priority in the user's guide.	
NRC	A.3.	3.0	User's Guide	Section 3.0: Include a link to the Download Area in the user's guide and rename "Download Area" to "Download Parameter Tables"	
NRC	A.3.	3.1	User's Guide	Section 3.1: Suggest being able to click on the image provided below this phrase and have a larger version pop up in a new window.	
NRC	A.3.	3.1	User's Guide	Section 3.1: Include a hyperlink to "Part 2 and Attachment A of the Soil Screening Guidance for Radionuclides: Users Guide (EPA 2000a) contains the steps for developing a CSM"	
NRC	A.3.	3.2	User's Guide	Section 3.2: Suggest renaming from "Radionuclide Background" to "Background Radiation"	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
NRC	A.3.	4.0	User's Guide	Section 4.0: See comment in Section B.	
NRC	A.3.	4.1.-4.25	User's Guide	Section 4.1 to 4.25: Suggest listing these scenarios in alphabetical order. Suggest including the definitions (e.g., SF, TR, IFS, IRS, ED, EF, etc.) for the parameters given in the equations when they appear. It is noted that they also appear in Table 1 but it is cumbersome to go back and forth between the equation and the Table. Alternatively, a hyperlink should be inserted which directs the user to the appropriate parameter definition in the table.	
NRC	A.3.	4.25	User's Guide	Section 4.25: Suggest defining SSL upon first instance.	
NRC	A.3.	4.26.7	User's Guide	Section 4.26.7: Suggest defining (TR) in the first paragraph as an acronym after “target risk”. Also suggest expanding this discussion to include more than one specific example and rationale of why it may be more practical to remediate one medium vs. another.	
NRC	A.4.			Are the “Introduction” text on the “PRG Home” webpage and the “PRG User’s Guide” webpage text supposed to match? If so, there are some discrepancies that need to be addressed. For example, the first sentence of the second to last paragraph of the “PRG Home” webpage states: “This website combines current EPA, SF with "standard" exposure factors to estimate ...” The “PRG User’s Guide” webpage replaces EPA with a link to the Center for Radiation Protection Knowledge.	
NRC	A.4.			To provide all stakeholders with a better understanding all acronyms should be spelled out. This could be done the first time the term is used in the text or listed on a separate webpage. Examples of acronyms that are not spelled out when they first appear (and their presumed meaning) include: <ul style="list-style-type: none"> • DCC – Dose Compliance Concentrations for Radionuclides • OSWER – Office of Solid Waste and Emergency Response • CERCLA -- Comprehensive Environmental Response, Compensation, and Liability Act • RAGs – Risk Assessment Guidance • RI/FS study -- Remedial Investigation (RI) Report or Feasibility Study (this is actually spelled out further down in the text, beyond its initial use) • RPM – Remedial Project Manager • SSL – Soil Screening Level • TR – Target Risk 	
NRC	A.4.			For better transparency and better understanding by various stakeholders it might be better to use Recreationalist instead of Recreator when describing that scenario. Recreationalist is the term typically used when describing this scenario in other regulatory documents.	
NRC	A.4.			The term landuses, which occurs throughout the webpage and documentation, is two words (land uses). This comment applies to its use throughout the website.	
NRC	A.4.		Frequently Asked Questions about Radionuclide PRGs	The first sentence in the response to Question 1 on the “Frequently Asked Questions about Radionuclide PRGs” webpage needs to be modified to read better. It currently reads: <ul style="list-style-type: none"> • “PRGs (Preliminary Remediation Goals), presented on this site, are for the Superfund/RCRA programs are risk-based concentrations, derived from standardized equations combining exposure information assumptions with EPA toxicity data.” One possible revision, provided below, breaks this sentence into two sentences: <ul style="list-style-type: none"> • PRGs (Preliminary Remediation Goals), presented on this site are for Superfund/RCRA programs. These PRGs are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. 	
NRC	A.4.		Frequently Asked Questions about Radionuclide PRGs	The first sentence in the response to Question 7 on the “Frequently Asked Questions about Radionuclide PRGs” webpage is difficult to read. It would read better if the commas are removed.	
NRC	B.1.a.			With the exception of the derivation of the equations, which is noted in Question 4 below, the assumptions are clear and seem reasonable.	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
NRC	B.1.b.	4.0		The web site does not highlight the limitations of the tool. Recommend including a separate section of the User's Guide that discusses the limitations. Section 4.26 on Supporting Equations and Parameter Discussion hints at some of the limitations, but they are not clearly described as such.	
NRC	B.1.c.	4.0		There were two issues that were encountered when reviewing the graphical representation and brief descriptions of the various exposure routes listed under the Section 4.0, Technical Support Documentation heading. In most cases the graphic did not appear (a small box with an "X" was shown where the graphic should be). Also, when selecting the Microsoft Internet Explorer back arrow to return to the previous page the website is returned to the subsections for the individual pathways related to the scenario and not the list provided under the Technical Support Documentation heading (the origination point). The Technical Support Documentation heading is also no longer expanded when returning to that section. These issues may be the result of browser version issues or could be an issue with the website programming and should be evaluated.	
NRC	B.1.c.	4.0		For easier understanding and better organization combine the graphical representation, brief description, and equations into individual subsections under the section heading of Technical Support Documentation. Also, suggest listing all scenarios in alphabetical order and using consistent titles for each scenario in graphics and equations. For example, the subheading in Section 4, Technical Support Documentation, is "Ingestion of Fish." The corresponding Section 4.18 uses the heading "Consumption of Fish." For consistency these two headings should be the same. Also, there should be a description associate with each set of equations, which does not appear to be the case currently.	
NRC	B.1.c.	4.0		In Section 4.0, in the description of "Residnet Tapwater Graphic and Supporting Text", "resident" is misspelled.	
NRC	B.1.d.			Recommend providing a more adequate description or citation for the derivation of the current equations. Also recommend defining the equation parameters along with the equations. Also, text should indicate that Table 1 is located at the bottom of the webpage.	
NRC	B.2.			Yes for those included. (See next comment.)	
NRC	B.2.			References used to justify some of the equations and parameter values are not included in the Reference section of the User's Guide. For example, the Residential Soil section mentions studies in Calabrese et al. 1989, Davis et al. 1990, and Van Wijnen et al. 1990. These three documents are not included in the Reference section. Table 1 also includes references that are not listed in the References section (e.g., Miller, 1980 and Hinton, 1992).	
NRC	B.2.			Document #7 listed in the Sources section (2.3.1) is the 3-volume "Understanding Variation in Partition Coefficient, Kd, Values" document. The link is labeled "EPAKD." The label should be modified to "EPA Kd" or something similar that is consistent with the other documents listed in this section.	
NRC	B.2.			Documents included as links in the text should also be included in the References section. For example, the report "Simulating Radionuclide Fate and Transport in the Unsaturated Zone: Evaluation and Sensitivity Analyses of Select Computer Models" should be included in the References section.	
NRC	B.3.			This list of scenarios includes a wide range of likely scenarios that range from conservative (e.g., farmer) to those likely to be associated with site-specific scenarios. However, it is difficult to distinguish between some scenarios (e.g., Resident Tapwater vs. Farmer Tapwater) given the descriptions available. Also, there is a Soil to Groundwater scenario that will allow the user to calculate the groundwater concentrations, but there does not seem to be a groundwater pathway for the resident or the farmer who encounters contaminated soil. Suggest including a groundwater pathway for these scenarios.	
NRC	B.3.			Please see the comment above regarding the use of Recreationalist in place of Recreator.	
NRC	B.3.			Please see the comment above regarding documentation of citations in the References section of the User's Manual. Recommend including the appropriate citation for each particular scenario in the description of the scenario that follows the scenario graphic. Also, the scenarios, as they are defined in the User's Guide, do not seem to exactly match those described in the Soil Screening Guidance for Radionuclides or in RAGS Part B. Suggest explaining the reason for any derivation from these previous guidance documents on scenario definitions and equations.	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
NRC	B.3.			Suggest matching the names of the scenarios in the User's Guide to those in the PRG Calculator. The order in which they appear in the User's Guide and the PRG Calculator should also be consistent. Some examples are provided for Resident and Farmer scenarios, but the comment applies to all scenarios. For example Resident Air, Resident Soil, and Resident Tapwater names match the options in the PRG Calculator, but the Resident Soil Alternate External Exposure Analysis is called "2-D External Exposure" in the PRG Calculator. Also, in the User's Guide there is a scenario called "Farmer Direct Consumption of Agricultural Products", which may correspond to "Farmer – Biota Direct" in the PRG Calculator. Similarly, "Farmer Direct Exposure and Consumption of Agricultural Products – Back Calculated to Soil" might describe "Combined Soil and Biota" in the PRG Calculator. The matching of these names is not obvious and it should be clearer.	
NRC	B.3.	2.3.2		In Section 2.3.2, Hierarchy by Parameter, "half-life" should be changed to half-life.	
NRC	B.3.			Are the updates included in OSWER Directive 9200.1-120, "Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors," dated February 6, 2014, included? If not, will they be?	
	B.4.a.			The equations appear comprehensive but they do not seem to be adequately supported by citations or derivations. The way in which the equations are presented in Section 4 separately from Table 1 makes reviewing the equations difficult. It is also difficult to determine the primary guidance source for the equations. It appears that they are based on the following three guidance documents: "Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)", "Soil Screening Guidance for Radionuclides: User's Guide", and "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (Peer Review Draft)". However, the equations in these documents do not exactly match the equations in the User's Guide. The primary source for this equation does not seem to be listed, and a description of how the information is used in these three documents to derive the equations presented is not apparent. The reviewer recommends clearly pointing to the document that describes how the equations were derived. If no such document exists, recommend including the derivation description in this User's Guide.	
NRC	B.4.b.			In terms of volumetric contamination, it is not clear where the user inputs the thickness of the contaminated zone. There is an option to "Select cover layer thickness for GSFO (gamma shielding factor – outdoor), but this seems to represent the thickness of a clean cover over the contaminated zone and not the contaminated zone itself. Suggest more clearly describing the options for surface only contamination versus volumetric contamination.	
NRC	B.5.			Yes, the area correction factors (ACFs) for volumetric contamination of less than infinite area (for various depths) were developed by ORNL (ORNL/TM-2013/00), published September 2014. This document lists all the photon energy data for parent and progeny radionuclides. However, refer to Comment above on the lack of clarity regarding inputs for volumetric contamination.	
NRC	B.6.			The reviewer was unable to find a description of the assumptions regarding detectors and detector heights in the User Guide to answer this question.	
NRC	B.7.			Yes, the majority of the decay chains and slope coefficients are adequately described in ORNL/TM-2013/00, published in July 2014. ORNL/TM-2013/00 does not contain the slope factors for the following three +D chains which are listed as options in the calculator: Ag-103 +D, As-69+D, and Ra-227+D. Reviewer recommends the citation be provided for these "radionuclide +D" options.	
NRC	B.8.			Minimal information is provided. Additional information should be added to assist the user.	
NRC	B.9.			See comment regarding the sources used to derive the pathway-specific equations in Sections 4.1 – 4.26. It would be beneficial to the user to include the reference with the equation to allow the user to easily find additional information.	
NRC	C.1.			When scrolling from left to right to view the PRG results, it would be helpful if the first column remained frozen so that you can view the radionuclide corresponding to the result. Or, consider transposing this table for easier viewing.	
NRC	C.2.			See comment regarding documenting sources for the derivation of equations.	
NRC	C.3.			See comment regarding documenting sources for the derivation of equations.	
NRC	C.4.			As questioned above, are the updates included in OSWER Directive 9200.1-120, "Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors," dated February 6, 2014, included in the calculator?	
NRC	C.5.			Suggest including graphical representation options for viewing the relative risk associated with each radionuclide.	
NRC	C.6.			"Site specific" listed under the heading "Select PRG type" should be changed to "Site-specific" (with dash).	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
NRC	C.6.			Provide the user with the ability to go back to the PRG calculator after selecting “Retrieve” to get the results. In situations when the user is evaluating various scenarios with the calculator this feature would enable the user to avoid having to reenter the radionuclides and exposure pathways. This could be completed by programming a ‘return’ button at the bottom of the results page or allowing the website to retain the inputs when using the web browser’s back arrow.	
NRC	C.6.			Links should be added to the headings in the results to direct the user to the definitions or descriptions of each result, providing a better understanding. For example, provide a link to the “Food Ingestion Slope Factor (risk/pCi)” that directs the user back to the explanation of what this slope factor discusses.	
NRC	D.			No response.	No response required.
van Velzen	A.1.			Agreed the web site is good organized, easy to navigate and generally “user friendly”. No comments;	
van Velzen	A.1.			The “symbol” for the PRG-Equations is not equal to applied “symbol” at the fact sheet for the general public. This might give confusions to some persons of the public (e.g. laypersons);	
van Velzen	A.1.			Web page: “Fact sheet”: i. Opening the fact sheet. The fact sheet for the public does not automatically scale to the size of the monitor; ii. At the fact sheet the model/option “Recreation” is missing, instead a “Fish Ingestion Exposure” is presented. Recommendations: Present at both web pages the same model/options	
van Velzen	A.1.			Web page “What’s new”: No comments.	No response required.
van Velzen	A.1.			Web page “FAQ”: No comments.	No response required.
van Velzen	A.1.			Web page “Equations”: All the equations are presented, however you cannot find at this web page the meaning of the applied symbols in the those equations. Recommendation: Present at this web page also the table or a link to section 4.26.7 from the "User's Guide".	
van Velzen	A.2.			No response.	No response required.
van Velzen	A.3.	2.2.2		Web page “User’s Guide”: i. Section 2.2.2 “Associated Decay Chains for “+D” PRGs” in combinations with the web-page “PRG Calculator” part Select Individual Isotopes. In Section 2.2.2 guidance is provided when to apply “+D”. In the list of Isotopes you can select Bi-214+D, but not Pb-214+D. Measuring NORM the nuclides Pb-214 and Bi-214 are mostly in equilibrium. This is also valid for the other Pb-Bi parent-daughter relations in the other U-decay and Th-232 decay chain. Recommendation: Update the list with Pb+D and investigate how the parent nuclides of Pb can be taken into account in a sufficient way. These parent nuclides may be alpha emitting nuclides.	
van Velzen	A.4.	2.4		Web page “Home”, section block “Contents” bullet point “Download”. From the applied Instruction the bullet point is called “Download Tables”. The part “Tables” is not visible. Further in Section 2.4 of the User's Guide is a link to tables in the "Download Area". This term gives the expectation that in this area are links to all documents that can be downloaded not only tables. Recommendation: Change “Download” into “Download Tables” (see figure below) and apply this term consistently.	
van Velzen	B.1.a.			The assumptions are clear and reasonable. However, some are mentioned/explained at the web page “FAQ”. Recommendation: Direct or advise the reader/user at the web page “User Guide” to look first at the web page “FAQ” to understand and become acquainted with the aim, applied assumptions and limitations of the PRG at a high level before going into more detail.	
van Velzen	B.1.b.	3.3		Limitations. Recommendation: Clear statements about the misapplication (limitation) of the PRG-calculator can be found in Section 3.3 "Potential Problems" of the User's Guide. I didn't expect to find the information about limitations here. Recommendation: Change title of Section 3.3 in "Potential Problems & Limitations."	
van Velzen	B.1.c.			<ul style="list-style-type: none"> • Well written: No comments. • Clearly organized: Minor Remarks. As example: In Section 4 of the "User's Guide" links to web pages are provide to "Residential Soil, etc.". Clicking on these links gives no problems, however going back to the former web page works not well. Some web pages are still under development like "Residential Soil 2D" and others. If this development and others are limiting the PRG calculator as tool it should be mentioned (e.g. in Section 3.3) and clear for users. In the fact sheet for the public a "Fish Ingestion Exposure" model is mentioned. Question is the model "Ingestion of Fish" in Section 4 this exposure model? Yes, makes titles consistent. If no, take care that titles are mentioning really different models. 	
van Velzen	B.1.d.			See above point "B.1.c. second bullet".	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
van Velzen	B.2.			<ul style="list-style-type: none"> Citations are appropriate. No comments. See also above point "B.1.c" second bullet. 	
van Velzen	B.3.		Resident	"Resident Soil": Two citations are mentioned both from 1990. Recommendation: Include if possible a newer one.	
van Velzen	B.3.	4.1.1	Resident	Section 4.1.1: Above the applied formulas is written the text e.g. "Direct external exposure to contamination at 1 cm". Below the formulas is written ".....the SF used is the 1 cm soil volume for external exposure". The in-consistency here is, that the text above the formula give the impression that the activity is present is a very thin layer at a depth of 1 cm from the soil surface, while the applied model is for the case the activity is homogeneous distributed in the top 1 cm. Recommendation: make the text consistence. Check this consistency also for other models.	
van Velzen	B.3.	4.2	Resident	User's Guide Section 4.2: No comments.	
van Velzen	B.3.	4.3	Resident	User's Guide Section 4.3: Here a special limitation is mentioned that the inhalation exposure is only calculated for C-14,.... Recommendation: Make a note in e.g. Section 3.3, like: that special limitations of models are mentioned at the models	
van Velzen	B.3.	4.19	Farmer	User's Guide Section 4.19: No comments.	
van Velzen	B.3.	4.20	Farmer	User's Guide Section 4.20: Formula "Consumption of eggs. Table 13-40.", the applied variable Qp-po is not mentioned in the Table 1.1. Other variables are: Qp-sw, Qs-sw, fp-sw, fs-sw,Recommendation: General check all formulas if the applies variables are explained in Table 1.	
van Velzen	B.3.	4.21	Farmer	User's Guide Section 4.21: variable SFwater, .. not explained in Table 1.	
van Velzen	B.3.	4.22	Farmer	User's Guide Section 4.22: No comments. Have not checked variables.	
van Velzen	B.3.	4.23	Farmer	User's Guide Section 4.23: No comments. Have not checked variables.	
van Velzen	B.3.	4.24	Farmer	User's Guide Section 4.24: See comments above at User's Guide Section 4.3"	
van Velzen	B.3.	4.25	Soil to Groundwater	User's Guide Section 4.25: Check if the abbreviation SSL has been explained earlier in the text. Recommendation: If SSL is not explained earlier, explain the abbreviation now.	
van Velzen	B.3.	4.8	Indoor Worker	User's Guide Section 4.8: No comments.	No response required.
van Velzen	B.3.	4.8.1	Indoor Worker	User's Guide Section 4.8.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".	
van Velzen	B.3.	4.6	Outdoor Worker	User's Guide Section 4.6: No comments.	No response required.
van Velzen	B.3.	4.6.1	Outdoor Worker	User's Guide Section 4.6.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".	
van Velzen	B.3.	4.7	Outdoor Worker	User's Guide Section 4.7: No comments.	No response required.
van Velzen	B.3.	4.4	Composite Worker	User's Guide Section 4.4: No comments.	No response required.
van Velzen	B.3.	4.4.1	Composite Worker	User's Guide Section 4.4.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".	
van Velzen	B.3.	4.5	Composite Worker	User's Guide Section 4.5: No comments.	No response required.
van Velzen	B.3.	4.14	Recreator	User's Guide Section 4.14: No comments.	No response required.
van Velzen	B.3.	4.14.1	Recreator	User's Guide Section 4.14.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".	
van Velzen	B.3.	4.15	Recreator	User's Guide Section 4.15: Variables IRA_{recsc} , ET_{recsa} , have not been explained in Table 1.	
van Velzen	B.3.	4.16	Recreator	User's Guide Section 4.16: No comments.	No response required.
van Velzen	B.3.	4.17	Recreator	User's Guide Section 4.17: Variable $DFA_{rec-adj}$ have not been explained in Table 1.	
van Velzen	B.3.	4.10	Construction Worker - Unpaved Road Traffic	User's Guide Section 4.10: No comments.	No response required.

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
van Velzen	B.3.	4.10.1	Construction Worker - Unpaved Road Traffic	User's Guide Section 4.10.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".	
van Velzen	B.3.	4.12	Construction Worker - Wind Erosion and Other Construction Activities	User's Guide Section 4.12: No comments.	No response required.
van Velzen	B.3.	General		General Recommendation: Check all formulas if the applied variables are explained in Table 1.	
van Velzen	B.3.	Table 1		Recommendation Table 1: Place the symbols in alphabetical order; it will be easier to find the symbol. Further, apply a consistent layout.	
van Velzen	B.4.			Agree with the equations.	
van Velzen	B.4.			Sufficient supported by citations.	
van Velzen	B.4.			As these equations are the same as in the User's Guide the comments made at point B.3 are also applicable here.	
van Velzen	B.4.			General Recommendation: Check all formulas if the applied variables/symbols are explained in Table 1	
van Velzen	B.5.			Agree with the source material and photonic energy data.	
van Velzen	B.5.			See comments made at point A.3.a.i (see above). Recommendation: Check if the nuclides with a "+D" are correct. Especially if the parent as well as the daughter has (very) short decay times. In such cases it can be important to change the parent nuclide. As example the decay chain of Ra-226. Bi-214 cannot be present without Pb-214, and Pb-214 cannot be present without the presence of Rn-222, so in fact Ra-226. There are similar chains of nuclides in the Th-232 decay chain and U-235 decay chain. The correct treatment in the PRG-calculator of these three NORM decay chains are quite important as large area's are contaminated with NORM (e.g. uranium mining and milling sites, phosphate production sites, mineral sand production, etc.)	
van Velzen	B.6.			I think that this question is not applicable for this peer review. I have not read at the PRG-calculator web site any information about detectors or measuring techniques. If I am wrong, please send me the info were to look and I will review those sections.	
van Velzen	B.7.			See comments made at point A.3.a.i and at point B.5 (see above).	
van Velzen	B.7.			See references: --Calculation of Slope Factors and Dose Coefficients; September 2014; ORNL/TM-2013/00 --Exposure Factors Handbook: 2011 Edition; EPA/600/R-090/052F.	
van Velzen	B.8.			Yes, No comments.	No response required.
van Velzen	B.9.	Table 1		Layout of Table 1: Symbols in a logical (e.g. alphabetical order).	
van Velzen	B.9.	Table 1		Layout of Table 1: Rows same layout (e.g. all centered or outlined left).	
van Velzen	B.9.	3.1		User's Guide line Section 3.1: Check the terms used in overview of the CSM and make them consistent e.g. applied in CSM "pork" versus applied in equations "swine". In the CSM is indicated that the model "Recreator-Exposure Route Biota-Game/animal" is present. However, I have looked at the User's Guide Sections for Recreator. Section 4.16 is called "Recreator consumption of game" and herein a model for a fowl has been given. I agree a fowl is an animal; however writing in the "CSM game/animal" the expectation is created that different animals are be able to taken into account. So, one unique animal a fowl is a limitation. This has to be mentioned. Recommendation: Make a note as limitation and change the text appropriately in the CSM overview. Note: In the PRG-calculator it is possible to select the Media: Game and Fowl!!!!	
van Velzen	C.1.a.			Yes and No. Yes the results are clear. No, in my opinion there is some inconsistency in the presentation of the results and in the order the results are presented.	
van Velzen	C.1.b.i.			Recommendations: i. Most of the results are presented like "Total PRG [Bq/g]" this is correct. Some of the results are presented like "Lambda" with no dimension mentioned/added. As physicist I agree and understand the notation, however a layperson perhaps not. Therefore, I would advise to present results like "Lambda" as "Lambda []" equally like "Total PRG [Bq/g]".	

Commenter	Charge Question	Document Section	Details	Comment	EPA Resolution
van Velzen	C.1.b.ii.			ii. Describing the "Default variables" equally as the results e.g. "t _r (time - resident) yr" as "t _r (time - resident) [yr]".	
van Velzen	C.1.b.iii.			iii. When I read the results I was asking myself, which parameters I had selected in the PRG-calculator and where are they mentioned in the results. This information is not easy to extract out of data. Therefore I would like to recommend adding a third page in which the user selected input and manual added values are reported.	
van Velzen	C.1.b.iv.			iv. Reading the results report you have to go the last cells of the last column to find the most important result "Total PRG [Bq/g]" for unique isotopes. It is evident that all other reported results and values of variables are important to understand how they have derived. However, this information is needed in the case that the reported value of the "Total PRG [Bq/g]" is unexpected. Therefore I recommend a different layout of presenting the results. See attachments: Appendix A is an example of the actual PRG-report and Appendix B is the recommended version including remarks made at point C.2.i.	
van Velzen	C.2.a			Yes and No. Yes the results are appropriately described and qualified. No, to the extent that may be relied upon and defended. This list of parameters and results can be created in different ways not necessarily by the PRG-calculator e.g. by typing or by other software, etc.	
van Velzen	C.2.b			Recommendations: i. Print at every output ".pdf" page the (release) version of the PRG-calculator.	
van Velzen	C.2.b			ii. Take care that the ".xls" outputs are "read only" and also contains information with which PRG-calculator version the ".xls" has been created.	
van Velzen	C.3.			See point C.2.b.	
van Velzen	C.4.			Not able to answer, as I am not familiar with "Superfund Guidance".	No response required.
van Velzen	C.5.			See also earlier comments under point B.	
van Velzen	C.5.			Yes, see point C.1.b.iv.	
van Velzen	D.			To create the possibility to select in some models a sensitivity analysis for one or more parameters.	
van Velzen		General	Appendix A	An example of the result report of PRG-calculator [included with submission].	
van Velzen		General	Appendix B	An example of the result report of PRG-calculator according to the proposed recommendations [included with submission].	

Review by

Thomas A Schneider

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Charge Questions:

My comments/responses are in bold below. It should be noted that I am not a risk assessor by training or practice but rather fall into the risk manager category so my review of the algorithms and scenario details come from that background.

Overall Web Site

1. Is the web site clearly organized, described, easy to navigate, and generally “user friendly?” If not, what do you recommend?
 - a. **The web site includes a lot of text which will be helpful to the more advanced risk assessor. It may be overwhelming to the more casual user or risk manager. It might be useful to have some pathway to a more concise direction to the default tables with a disclaimer of their conservative nature.**
2. Have the objectives of the PRG calculator, as stated in the documentation, been realized? If not, what do you recommend?
 - a. **I think so.**
3. Does the documentation (user’s guides) match the online PRG calculator tools and vice-versa? If not, what do you recommend?
 - a. **There are some inconsistencies and/or improvements that could help the documentation. These are noted in the comments below.**
4. Do you have any other recommendations to improve the usability of the web site?
 - a. **See comments below for usability improvement suggestions.**

A. User’s Guides

1. Are the tool and web site clearly explained?
 - a. Are the assumptions clear and reasonable? If not, what do you recommend?
 - i. **Some comments below for specific suggestions on clarifying assumptions.**

b. Does it adequately describe the calculator's limitations? If not, what do you recommend?

i. **Yes**

c. Is it well written and clearly organized? If not, what do you recommend?

i. **See comments below for specific improvements to text.**

d. Is the technical support documentation complete, well organized, and easy to follow? If not, what do you recommend?

i. **See comments below for specific improvements to text.**

2. Are the sources and citations appropriate, and do they represent the current state of knowledge? If not, what do you recommend?

a. **I'm not familiar with all the recent literature so will defer to others on this.**

3. Are the models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?

- Resident
- Farmer
- Soil to Groundwater
- Indoor Worker
- Outdoor Worker
- Composite Worker
- Recreator
- Construction Worker – Unpaved Road Traffic (Site-specific only)
- Construction Worker – Wind Erosion and Other Construction Activities (Site-specific only)

One scenario or exposure path that comes to mind for me but doesn't appear addressed would be an on-site worker that conducts controlled burns for vegetation management. A number of former DOE sites are now maintained in a natural state that either might use burning as a management technique or might experience burning as a natural/vandalism event. It would be helpful in addressing public and worker concerns to have a scenario that provides PRGs to support this exposure pathway.

4. Are the equations for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations or derivations? Are the equation variables adequately explained in terms of relative sensitivities? Are the equation constants adequately explained and sourced? If not, what do you recommend?

- a. Area (surface) contamination?
- b. Volumetric contamination?

I did find some discrepancies in the descriptions of the area contamination within the user's guide. See specific comments below.

5. Are the source material and photonic energy data used for the volume calculator comprehensive, appropriate, and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? Are they appropriate for residential and worker exposures? If not, what do you recommend?
6. Are the choice of detectors and detector heights appropriate and based on supportable reasoning? If not, what do you recommend?

It was not clear from my review where the detectors and detector heights were discussed.

7. Are the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend?

They appeared to be to me.

8. Are the standard recommended default factors adequately explained, sourced, and reasonable?

In general yes, some questions presented in the specific comments below.

9. Is there anything else you recommend for the user's guides to improve them for their stated purpose?

Specific recommendations for improvements to the user guide are provided below.

B. Calculator

1. Are the results clearly explained and presented? If not, what do you recommend?

I like the PDF export feature. Provides all the information in one package. The time stamp on it will be helpful for determining differences if changes to the calculator are made.

2. Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?

I defer to those more experienced with the algorithms and calculators than I am to provide comment on this.

3. Do the results provide defensible explanation of how they were derived, or are they the result of a “black box”? Do you recommend anything different?
4. Are there aspects of other Superfund guidance that should have been used or incorporated into the calculator?

Not that I’m aware of.

5. Are the radionuclides appropriate, and do the results adequately explain the variability among radionuclides? If not, what do you recommend?

The list of radionuclides seems appropriately comprehensive to me.

6. Is there anything else you recommend for the calculator to improve it for its stated purpose?
- C. Anything Else?

Is there anything else you would recommend to improve the PRG’s utility, accuracy, completeness, or supportability?

See specific comments below:

- 1) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/resairimage.html>
- 2) 4. Technical Support Documentation under the Preliminary Remediation Goals for Radionuclides page. Would be good if the page would allow you to go back to expanded view of this subsection when clicking the back button after viewing one of the scenarios presented.
- 3) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/res2Dsoilimage.html>
- 4) On page <http://epa-prgs.ornl.gov/radionuclides/res2Dsoilimage.html> the area considered is provided as a range of 1-1,000,000 square meters. In all subsequent pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.
- 5) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/comworkairimage.html>
- 6) On page <http://epa-prgs.ornl.gov/radionuclides/comworkairimage.html> it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the composite scenario.
- 7) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/comwork2Dsoilimage.html>
- 8) On page <http://epa-prgs.ornl.gov/radionuclides/comworksoilimage.html> it states the composite worker only differs from the outdoor worker in that it uses the more protective 250 day per year exposure. Page <http://epa-prgs.ornl.gov/radionuclides/outworksoilimage.html> it states the outdoor worker is the “most highly exposed receptor in the outdoor environment”. Not clear to the reviewer

how the outdoor worker exposure exceeds that of the composite worker. Additional clarification of the two scenarios is needed.

- 9) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/outworkairimage.html>
- 10) On page <http://epa-prgs.ornl.gov/radionuclides/outworkairimage.html> it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the scenario.
- 11) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/outwork2Dsoilimage.html>
- 12) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/inworkairimage.html>
- 13) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/inwork2Dsoilimage.html>
- 14) On page <http://epa-prgs.ornl.gov/radionuclides/inwork2Dsoilimage.html> gamma shielding is misspelled "gamma shilding" and account is misspelled "accound."
- 15) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/con1worksoilimage.html>
- 16) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html>
- 17) On page <http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html> the page title says "Construction Worker (Other than Standard Vehicle Traffic)" while the lead to the paragraph says "Construction Worker (Standard Vehicle Traffic)". The latter needs corrected.
- 18) From the descriptions provided on pages <http://epa-prgs.ornl.gov/radionuclides/con1worksoilimage.html> and <http://epa-prgs.ornl.gov/radionuclides/con2worksoilimage.html> it is unclear what the difference in exposure is. The descriptions should at least describe the parameters that are changed between the two scenarios.
- 19) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/conworkairimage.html>
- 20) On page <http://epa-prgs.ornl.gov/radionuclides/conworkairimage.html> it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the outdoor worker of the scenario.
- 21) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/conwork2Dsoilimage.html>
- 22) On page <http://epa-prgs.ornl.gov/radionuclides/conwork2Dsoilimage.html> the area considered is provided as a range of 1-1,000,000 square meters. In most prior pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.
- 23) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/recsoilimage.html>
- 24) Graphic missing on the following page:<http://epa-prgs.ornl.gov/radionuclides/recairimage.html>
- 25) On page:<http://epa-prgs.ornl.gov/radionuclides/recairimage.html> recreational is misspelled "reacrecational"
- 26) On page <http://epa-prgs.ornl.gov/radionuclides/recairimage.html> this scenario should include the description from the previous scenario, "This receptor spends time outside involved in recreational activities."

- 27) On page <http://epa-prgs.ornl.gov/radionuclides/recairimage.html> it would be good to provide an outdoor example for the second scenario of ambient air. The provided example of indoor air radon is not applicable to the assumed outdoor activity of the scenario.
- 28) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/recwaterimage.html>
- 29) On page <http://epa-prgs.ornl.gov/radionuclides/recwaterimage.html> the header reads "Tapwater Graphic and Supporting Text" and the paragraph lead reads "Recreator Surface Water" Recreator Surface Water is the correct text
- 30) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/rec2Dsoilimage.html>
- 31) On page <http://epa-prgs.ornl.gov/radionuclides/rec2Dsoilimage.html> this scenario should include the description from the previous recreational scenario, "This receptor spends time outside involved in recreational activities." Also the area considered is provided as a range of 1-1,000,000 square meters. In most prior pages for 2Dsoil there is a list of areas evaluated presented, please explain the discrepancy.
- 32) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/recgameimage.html>
- 33) On page: <http://epa-prgs.ornl.gov/radionuclides/restapwaterimage.html> the title reads "ResidnetTapwater Graphic". It should be corrected to read "Resident..."
- 34) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/agtapwaterimage.html>
- 35) Graphic missing on the following page: <http://epa-prgs.ornl.gov/radionuclides/fishimage.html>
- 36) On page: http://epa-prgs.ornl.gov/radionuclides/download/summary_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 37) On page: http://epa-prgs.ornl.gov/radionuclides/download/summary_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 38) On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 39) On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 40) On page: http://epa-prgs.ornl.gov/radionuclides/download/resair_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 41) On page: http://epa-prgs.ornl.gov/radionuclides/download/resair_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 42) On page: http://epa-prgs.ornl.gov/radionuclides/download/restap_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 43) On page: http://epa-prgs.ornl.gov/radionuclides/download/restap_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.

- 44) On page: http://epa-prgs.ornl.gov/radionuclides/download/res2D_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 45) On page: http://epa-prgs.ornl.gov/radionuclides/download/res2D_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 46) On page: http://epa-prgs.ornl.gov/radionuclides/download/resfish_rprg_table_run_pCi_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 47) On page: http://epa-prgs.ornl.gov/radionuclides/download/resfish_rprg_table_run_Bq_25NOV14.pdf it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 48) On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil2gw_rprg_table_run_pCi_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 49) On page: http://epa-prgs.ornl.gov/radionuclides/download/ressoil2gw_rprg_table_run_Bq_25NOV14.pdf the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 50) On page: <http://epa-prgs.ornl.gov/radionuclides/download.html> all remaining PDF tables with frozen header the Actinium (89) Ac-223 row is frozen with the header row. Ac-223 row should be released to prevent confusion.
- 51) On page: <http://epa-prgs.ornl.gov/radionuclides/download.html> for all PDFs where the header is not frozen it would be better if this PDF was set up like the soil table with the header frozen and the ability to scroll the table.
- 52) On page: <http://epa-prgs.ornl.gov/radionuclides/download.html> for all Excel files it would be more user friendly if the header was fixed so they heading scrolled with the data, otherwise the very lengthy tables are hard to utilize.

THOMAS A. SCHNEIDER

Ohio Environmental Protection Agency
401 East Fifth Street
Dayton OH 45402
(937) 285-6466

EDUCATION

University of Dayton, Dayton, OH 45469
Biology
Bachelor of Science, *Cum Laude* 1988

Ohio State University, Columbus, OH
Natural Resources
Master of Science, 1990

WORK EXPERIENCE

Environmental Supervisor

- I manage all aspects of the Division of Air Pollution Control operations for the Southwest District Office of Ohio EPA. I ensure permitting operations are meeting and exceeding program expectations. I direct inspection goal setting and monitor progress to ensure USEPA commitments are met or exceeded quarterly. All enforcement activities are coordinated through me. I ensure staff coordinate activities with other divisions within SWDO as appropriate and consult with management in other programs to ensure effective communication and operation of the air program.
- I am responsible for implementing a \$13 million watershed protection program (Paddys Run Conservation Project), which resulted from the largest natural resource damages settlement ever received from the federal government. I manage the program, coordinating efforts among three federal agencies (US Department of Energy, US Fish & Wildlife Service, US Department of Agriculture), Ohio EPA staff, a local land trust, local governments and landowners. I direct program development, outreach activities, contract management, criteria selection, priority setting and progress tracking for the long term protection of land use within the watershed. To date over 2000 acres of farmland, forest and riparian corridor have been enrolled in permanent easements.
- Direct staff in developing process improvements for the following: progress tracking, work distribution, permit writing, and citizen complaint investigations. Reduced review times and eliminated backlogged workload. One of the few district/local air agency offices with no permit backlog.
- Motivated staff to improve work place morale, teamwork and work output.
- Revised and developed improved protocols for follow up activities and enforcement actions. Coordinate enforcement activities with Central Office and U.S.EPA.
- Ensure attainment of district commitments for inspections and permitting actions as well as other commitments to USEPA or Central Office.

Thomas A. Schneider

- Monitor consistency with agency goals. Participate in the development of district programs, goals and reporting. Coordinate district activities with local air agencies.
- Assist staff in coordinating activities with Central Office. Resolve issues with Central Office regarding consistency, programmatic changes, etc.
- Provide technical assistance to the AK Steel corrective action project. Utilize my expertise in remediation and restoration oversight to review and comment on interim measures on this project. This project included the remediation and restoration of ~2000 feet of PCB contaminated stream channel. Coordinated agency efforts with USACOE and USEPA as well as various Ohio EPA divisions.
- Represent management and the division on district committees including the SWDO Health and Safety Committee.
- Currently serve as the co-chair for Interstate Technology and Regulatory Council (ITRC). During 2012, I represented member states, as the State-At-Large Representative, on the ITRC Board of Advisors. Previously I represented Ohio as the Point of Contact for the ITRC. I coordinated Ohio's efforts and involvement in ITRC including outreach to Ohio EPA staff and individuals/companies interested in products and services of ITRC including free internet training.
- Participate in national organizations relating to state oversight of DOE facility remediation and development/acceptance of new technologies for site cleanups. Assume role as State of Ohio representative to the State and Tribal Working Group. Ohio representative on the National Governors Association Federal Facilities Task Force. Represent Ohio on the Environmental Council of States (ECOS) Federal Facilities Forum. Represented ECOS on the Combined Intergovernmental Working Group

Division of Air Pollution Control
Ohio Environmental Protection Agency
401 East Fifth Street
Dayton OH 45402
April, 2007 to present

Environmental Supervisor/Project Manager

- Lead a diverse team of staff and support contractors implementing the State of Ohio's oversight and environmental monitoring programs at the U.S. Department of Energy (DOE) Fernald site. Coordinate efforts with multiple state agencies, local governments, federal agencies and non-governmental organizations.
- Develop cost/staffing projections for federal grants, negotiate grants and ensure Ohio's obligations under federal grants are completed effectively (~\$1.5m annually).

- Manage direct report staff as well as staff assigned to the project from other program areas. Conduct interviews and evaluations, provide guidance, support professional development, ensure safe work environment and address other personnel issues.
- Administer technical oversight program including project tracking, budget projections, staffing assignments, and inter- and intra-agency coordination/negotiation.
- Facilitate outreach activities including activities at local schools, annual report and fact sheet publication, website development/maintenance and participate in numerous public meetings/committees.
- Work closely with staff and management regarding the difficult challenges associated with reducing and subsequently dissolving the Office of Federal Facilities Oversight. Challenges ranged from fiscal management to physical and emotional stress to mentoring staff in career changing decisions.
- Participate in agency management teams evaluating employee recognition techniques and environmental success measurements. Activities included data gathering, research, alternative evaluation and implementation of selected alternative.
- Conduct primary technical review and field oversight for CERCLA-based investigation and remediation including characterization plans, human and ecological risk assessments, feasibility studies, decision documents, remediation designs and long-term management plans.
- Participate in national organizations (Interstate Technology & Regulatory Council, Community Leaders Network, National Governors Association, etc) made up of state and federal employees, contractors and stakeholders concerning the cleanup of federal facilities.
- Co-lead a national committee (ITRC Radionuclide Team) of state, federal, contractor and stakeholder representatives in the development of guidance documents and training relating to the remediation of radioactively contaminated sites. Co-authored and edited four documents relating to the remediation and long-term management of radioactively contaminated sites. Along with USEPA & Colorado representatives instruct ITRC internet trainings regarding the cleanup of radioactively contaminated sites. Train/mentor others in team management, develop team budget, and report team progress.
- Participate in Ohio EPA Natural Resource Damages Assessment Program Development Workgroup. This work group develops draft policy and procedures for Ohio's natural resource damage assessment/response program. Evaluate programs used by other states as well as those within the state for appropriate incorporation into the NRD policies
- State of Ohio natural resource trustee representative for the DOE Fernald site. Participate in the development, review and public notice of natural resource impact assessment, restoration plan and restoration designs. Participate in legal negotiations regarding outstanding lawsuit claims. Testify as witness for the State in depositions. Participate as technical assistant to Attorney General, while taking depositions of defense expert and fact witnesses.

- Work on restoration designs for multiple habitat types including wetlands, prairies, woodlands and riparian zones. Including appropriate design elements to address water storage, erosion control, vegetation selection, monitoring design and implementation of adaptive management principles.
- Conduct research and monitoring regarding natural resource restoration success. Research involves amphibian/macroinvertebrate indicators in wetlands, benefits of donor soils in wetland creation, and native vegetation seeding response to various planting/management techniques.
- Research and develop briefing information for agency management, governor's office, attorney general's office and congressional staff regarding project issues including options, impacts and projections.
- Worked with local, state and national print, radio and television media in regards to site remediation, natural resource restoration, and national organization activities.
- Conducted numerous technical presentations at national meetings and technical conferences covering topics from radioactive waste cleanup technologies to amphibian monitoring of wetland quality.
- Worked with schools, Master Gardeners, and others in development and implementation of native plant gardens for aesthetics and education.
- Authored or co-authored multiple publications/documents on natural resource restoration, wetlands, amphibian monitoring, radioactive site remediation, and long-term site management.
- Participated in numerous training sessions including team facilitation training, media training, Hazardous Materials Response Operations and subsequent refresher courses, CPR and first aid.

Office of Federal Facilities Oversight
Ohio Environmental Protection Agency
401 East Fifth Street
Dayton OH 45402
March, 2004 to January 2007

Environmental Specialist II/Site Coordinator

- Conducted primary technical review for the CERCLA-based investigation and remediation of sites contaminated by hazardous and radioactive substances. Reviews included characterization plans, human and ecological risk assessments, feasibility studies, decision documents and remediation designs.
- Lead division work group (SIRP) tasked with streamlining the investigation and remediation process for cleanup sites.

Thomas A. Schneider

- Conducted site inspections to ensure compliance with approved sampling and remediation plans.
- Represented agency at public meetings and provided technical assistance.

Division of Emergency & Remedial Response
Ohio Environmental Protection Agency
401 East Fifth Street
Dayton OH 45402
June, 1990 to April, 1994

PROFESSIONAL ASSOCIATIONS

Interstate Regulatory and Technology Council, 1996-present

Co-Chair of ITRC 2013-present

State-At-Large Representative, Board of Advisors 2012

State Point of Contact – 2006-2011

Co-chair Radionuclide Team, 1998-2005

State and Tribal Working Group (STGWG)

Ohio representative, 2009-present

Natural Resource Injury Assessment/Long Term Stewardship Subcommittee 2008-present

Environmental Council of States (ECOS)

Federal Facilities Forum

Ohio representative, 2006-2013

DOE Combined Intergovernmental Working Group

ECOS representative 2008-2011

National Governor's Association Federal Facilities Task Force

Ohio Co-representative, 2006- p2013

Natural Resource Damages Assessment Program Development Workgroup, DERR,
2004-2008

US Department of Homeland Security Consequence Management, Site Restoration, Cleanup
and Decontamination Subgroup's Focus Group, 2004

USDOE Community Leaders Network, 1993-1997

Chair 1997, Vice-Chair 1995-1996

Planning Committee 1995-1997, Chair 1995-1996

Society for Ecological Restoration, 1997 – 2005

HONORS/AWARDS

Ohio EPA George B. Garret Professionalism Award, 2001

Thomas A. Schneider

National Performance Review, Hammer Award, 1996

Ohio EPA Outstanding Achievement Award, 1991

INTERESTS AND ACTIVITIES

Vernal Pool Monitoring Project with Bellbrook High School and Five Rivers Metroparks
2006-present

Beavercreek Wetlands Association 1993-present

Wild Ones: Native Plants, Native Landscapes, 2000-present
Seeds for Education Grant Reviewer, 2009-2010

DEPOSITIONS

United States of America ex rel. Phillip A. Tetsuwari vs Fluor Fernald, Inc.; Case No 1:06CV235; August 12, 2009.

State of Ohio vs U.S. Department of Energy, et al; Case No 1:86-CV-00217; 30(b)6 testimony as representative of the State; February 10, 2006.

State of Ohio vs U.S. Department of Energy, et al; Case No 1:86-CV-00217; 30(b)6 testimony as representative of the State; March 29, 2006

State of Ohio vs U.S. Department of Energy, et al; Case No 1:86-CV-00217; fact witness testimony; March 29, 2006

SELECTED PUBLICATIONS/PRESENTATIONS

Schneider, Thomas. "From Weapons to Wetlands...a case history in change". River Leadership ASI 345. University of Dayton, Dayton Ohio November 4

Schneider, Thomas. 2014. "From Weapons to Wetlands, the Fernald Story" Lifelong Learning Institute Central Ohio Technical College. Columbus OH June 7.

Schneider, Thomas. 2013. "Update on Activities of the Interstate Technology and Regulatory Council". Environmental Council of States. 2013 Annual Meeting. September 16.

Schneider, Thomas. 2013. "From Weapons to Wetlands." Fish and Wildlife Society. Ohio State University. Columbus OH September 4.

Schneider, Thomas. 2013. "NRD Settlement at Fernald" and "Early Restoration – Success at Fernald". State and Tribal Governments Working Group Spring Meeting. Fernald OH. June 4.

Thomas A. Schneider

Schneider, Thomas 2013. "Paddys Run Conservation Project, Our Future Flows Through Our Land" University of Dayton. River Stewards Orientation. Dayton OH. March 8.

Schneider, Thomas and Dawn Dyer. 2012. Spring Vernal Pool Monitoring at Sugarcreek Metropark 2012 Monitoring Report. Five Rivers Metroparks. December 31.

Jane Powell, US DOE; Tom Schneider, Ohio Environmental Protection Agency; William Hertel, John Homer, S.M. Stoller Corporation, Pastures to Prairies to Pools: An Update on Natural Resource Damages Settlement Projects at the Fernald Preserve – 13198 Waste Management Symposium Pheonix AZ February 2013 (accepted paper)

Schneider, Tom. 2012. From Weapons to Wetlands...*A case history in change*. River Leadership ASI 345. University of Dayton, Dayton Ohio October 9.

Schneider, Tom. 2012. Paddys Run Conservation Project, Our Future Flows Through Our Land. River Leadership ASI 345. University of Dayton, Dayton Ohio October 9

Jane Powell, US DOE; Tom Schneider, Ohio Environmental Protection Agency; William Hertel, John Homer, S.M. Stoller Corporation (USA) Natural Resource Damages Settlement Projects at the Fernald Preserve – 12316. Waste Management Symposium. Phoenix AZ. February 29, 2012.

Schneider, Tom. 2012. Watershed Case Study and Managing Land Conservation. A Forum for Natural Lands Management and Conservation Sponsored by Green Umbrella. Fernald Preserve. OH February 9.

Schneider, Tom. 2011. From Weapons to Wetlands, The Cleanup of Fernald. Guest Lecture, Hazardous Waste Engineering. University of Dayton Engineering Class. Dayton OH. October 19.

Schneider, Tom. 2011. Interdisciplinary Symposium: Past Successes and Future Opportunities, The Fernald Community. Panel Session: Community Engagement was the Key to Successful Cleanup of the Site. University of Cincinnati. Cincinnati OH. September 9.

Schneider, Tom. 2011. Paddy Run Conservation Project, Our Future Flows Through Our Land. Trustee public meeting. Fernald Preserve. Harrison OH. April 13.

Schneider, Tom. 2011. Paddy Run Conservation Project, Our Future Flows Through Our Land. Three Valley Conservation Trust Annual Meeting. Oxford OH. February 5.

Schneider, Tom. 2010. ITRC and Ohio Working Together. Environmental Council of States Fall Meeting. San Diego CA. November 8.

Trinity Broadcasting Network, "Joy in Our Town". 2010. Live taped interview on state of environment in southwest Ohio. November 20.

Schneider, Tom 2010. Fernald NRD Case Study. Environmental Council of States Natural Resource Damages Webinar. October 21

Thomas A. Schneider

Schneider, Tom. 2010. Soak It In, Porous Pavement, Rain Barrels & Gardens. Café' Sci. Five Rivers Metroparks. Dayton OH June.

Schneider, Tom. 2010. Vernal Pools, a Race Against Dryness. Bellbrook High School. Bellbrook OH February.

Schneider, Tom. 2010. Environmental Progress in Ohio. Five Rivers Metroparks, Wegerzyn Gardens. Dayton. January 16.

Planning and Promoting Ecological Land Reuse of Remediated Sites. Interstate Technology and Regulatory Council, Ecological Land Reuse Technologies Team. July 2006

Real Time Data Collection for Radionuclides: Measurement Technologies, Methodologies, Case Studies and Regulatory Issues. Interstate Technology and Regulatory Council, Radionuclides Team. February 2006

Issues of Long Term Stewardship: State Regulators' Perspectives. July 2004. Interstate Technology and Regulatory Council, Radionuclides Team.

Homer, J.J., W.E. Woods, T. Schneider, J. Bartoszek, J. Lapachin, D. Geiger, and M. Fuchs. 2002. Ecological restoration monitoring at the Fernald Site. Abstracts for the combined 87th annual meeting of the Ecological Society of America/14th Annual International Conference of the Society for Ecological Restoration, Tucson, AZ, August 3-9.

Bartoszek, Joseph E., T. Schneider, and S. Snyder. 2002. Donor Soils Jumpstart Revegetation of Created Wetlands (Ohio). Ecological Restoration 20(1):52-53.

Determining Cleanup Goals at Radioactively Contaminated Sites: Case Studies. April 2002. Interstate Technology and Regulatory Council, Radionuclides Team.

Schneider, Thomas.A., Stewardship and Technology: Keys to Long-Term Success. 2002. Invited Presentation to U.S. DOE Long-Term Stewardship Science and Technology Roadmap Working Group Meeting. Dallas TX January 28-30.

Schneider, Thomas A., Getting to Stewardship: The Fernald Journey. 2002. Invited Presentation to the Environmental Stewardship Promising Solutions to Uncertainty Conference. New Orleans LA, February 5-7.

Peer Reviewer Conflict of Interest Certification

Peer Review: U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals (PRG) for Radionuclides Electronic Calculator" and User's Guide.

A conflict of interest or lack of impartiality exists when the proposed peer reviewer personally (or the peer reviewer's immediate family), or his or her employer, has financial interests that may be affected by the results of the peer review; or may provide an unfair competitive advantage to the peer reviewer (or employer); or if the peer reviewer's objectivity in performing the peer review may be impaired due to other factors. When the Peer Reviewer knows that a reasonable person with knowledge of the facts may question the peer reviewer's impartiality or financial involvement, an apparent lack of impartiality or conflict of interest exists.


The following questions, if answered affirmatively, represent potential or apparent lack of impartiality (*any affirmative answers should be explained on the back of this form or in an attachment*):

- Did you contribute to the development of the document under peer review, or were you consulted during its development, or did you offer comments or suggestions to any drafts or versions of the document during its development? ☒ No ☐ Yes
- Do you know of any reason that you might be unable to provide impartial advice on the matter under consideration in this peer review, or any reason that your impartiality in the matter might be questioned? ☒ No ☐ Yes
- Have you had any previous involvement with the review document(s) under consideration? ☒ No ☐ Yes
- Have you served on previous advisory panels, committees, or subcommittees that have addressed the topic under consideration? ☐ No ☒ Yes
- Have you made any public statements (written or oral) on the issue? ☒ No ☐ Yes
- Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration? ☒ No ☐ Yes
- Do you, your family, or your employer have any financial interest(s) in the matter or topic under peer review, or could someone with access to relevant facts reasonably conclude that you (or your family or employer) stand to benefit from a particular outcome of this peer review? ☒ No ☐ Yes

With regard to real or apparent conflicts of interest or questions of impartiality, the following provisions shall apply for the duration of this peer review:

(a) Peer Reviewer warrants, to the best of his/her knowledge and belief, that there are no relevant facts or circumstances that could give rise to an actual, apparent, or potential organizational or personal conflict of interest, or that Peer Reviewer has disclosed all such relevant information to EMS or to EPA.

(b) Peer Reviewer agrees that if an actual, apparent, or potential personal or organizational conflict of interest is identified during performance of this peer review, he/she immediately will make a full disclosure in writing to EMS. This disclosure shall include a description of actions that Peer Reviewer (or his/her employer) has taken or proposes to take after consultation with EMS to avoid, mitigate, or neutralize the actual, apparent, or potential organizational conflict of interest. Peer Reviewer shall continue performance until notified by EMS of any contrary action to be taken.


Signature

11/12/14
Date

☒ Check here if any explanation is attached

Thomas A. Schneider
Printed Name

Ohio Environmental Protection Agency
Affiliation/Organization

- Have you served on previous advisory panels, committees, or subcommittees that have addressed the topic under consideration? ☐ No ☒ Yes

I have participated in ITRC for over 15 years during which discussion of radionuclide PRGs has occurred as part of the Radionuclides Team activities. I participated in the US Department of Homeland Security Consequence Management, Site Restoration, Cleanup and Decontamination Subgroup's Focus Group at which discussions were held regarding cleanup levels following the detonation of a dirt bomb on US soil. Not sure if these are the kinds of activities that the question is referring to or not but wanted to be clear about my activities.

A handwritten signature in black ink, consisting of several stylized, overlapping loops and a long horizontal stroke extending to the right.

January 15, 2015

Keith D. Arnold
Environmental Management Support, Inc.
8601 Georgia Avenue, Suite 500
Silver Spring, MD 20910

SUBJECT: The U.S. Nuclear Regulatory Commission Peer Review for U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator."

Dear Mr. Arnold:

By your e-mail dated November 03, 2014, you requested for the NRC to perform an independent review of the "Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator." Enclosed please find comments in response to the peer review charge questions. If you have any questions concerning the above, please contact me at (301) 415-6043 or via email at Leah.Parks@nrc.gov.

Sincerely,

/RA/

Christopher McKenney, Branch Chief
Performance Assessment Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Enclosure: Peer Review for US EPA
PRG Electronic Calculator

Keith D. Arnold
Environmental Management Support, Inc.
8601 Georgia Avenue, Suite 500
Silver Spring, MD 20910

SUBJECT: The U.S. Nuclear Regulatory Commission Peer Review for U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator."

Dear Mr. Arnold:

By your e-mail dated November 03, 2014, you requested for the NRC to perform an independent review of the "Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator." Enclosed please find comments in response to the peer review charge questions. If you have any questions concerning the above, please contact me at (301) 415-6043 or via email at Leah.Parks@nrc.gov.

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Christopher McKenney, Branch Chief
Performance Assessment Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Enclosure: Peer Review for US EPA
PRG Electronic Calculator

ML15012A627

OFFICE:	NMSS/DUWP	NMSS/DUWP	NMSS/DUWP
NAME:	LParks	TMoon	CMckenney
DATE:	1/ 13 /15	1/ 14 /15	1/ 15 /15

OFFICIAL RECORD COPY

Comments related to the PRG website

Charge Questions:

A. Overall Web Site:

1. **Is the web site clearly organized, described, easy to navigate, and generally “user friendly?” If not, what do you recommend?**

Generally, yes. However, with the use of some browsers, the choices under the Preliminary Remediation Goals for Radionuclides (PRG) Calculator for Select PRG Types overlap the options for Select Media. The website should be viewed on various versions of commonly used browsers (Microsoft Internet Explorer [32- and 64-bit], Firefox, etc.) to ensure that formatting is maintained.

2. **Have the objectives of the PRG calculator, as stated in the documentation, been realized? If not, what do you recommend?**

Yes

3. **Does the documentation (user’s guides) match the online PRG calculator tools and vice-versa? If not, what do you recommend?**

- No. The following recommendations are provided concerning the User’s Guide:
- Recommend including an option for viewing the User’s Guide in pdf format for easier printing and/or storing notes.
- Section 2.1: this section has a list of the “most common land uses and exposure assumptions” with links to the equations in the sections below. For better transparency a comment should be added stating that this list is not inclusive and that equations for other scenarios (e.g., Recreator) are all included. In addition, the list refers to “Agricultural” as a common land use while the sections below refer to the individual under the heading of “Farmer.” The calculator also refers to this scenario as “Farmer.” For better consistency a single term should be used to describe this scenario.
- Section 2.3.2: Include a description of how the hierarchy of parameters is used in addition to listing the priority in the user’s guide.
- Section 3.0: Include a link to the Download Area in the user’s guide and rename “Download Area” to “Download Parameter Tables”
- Section 3.1: Suggest being able to click on the image provided below this phrase and have a larger version pop up in a new window.
- Section 3.1: Include a hyperlink to “Part 2 and Attachment A of the Soil Screening Guidance for Radionuclides: Users Guide (EPA 2000a) contains the steps for developing a CSM”
- Section 3.2: Suggest renaming from “Radionuclide Background” to “Background Radiation”
- Section 4.0: See comment in Section B.

Enclosure

- Section 4.1 to 4.25: Suggest listing these scenarios in alphabetical order. Suggest including the definitions (e.g., SF, TR, IFS, IRS, ED, EF, etc.) for the parameters given in the equations when they appear. It is noted that they also appear in Table 1 but it is cumbersome to go back and forth between the equation and the Table. Alternatively, a hyperlink should be inserted which directs the user to the appropriate parameter definition in the table.
- Section 4.25: Suggest defining SSL upon first instance.
- Section 4.26.7: Suggest defining (TR) in the first paragraph as an acronym after “target risk”. Also suggest expanding this discussion to include more than one specific example and rationale of why it may be more practical to remediate one medium vs. another.

4. Do you have any other recommendations to improve the usability of the web site?

Are the “Introduction” text on the “PRG Home” webpage and the “PRG User’s Guide” webpage text supposed to match? If so, there are some discrepancies that need to be addressed. For example, the first sentence of the second to last paragraph of the “PRG Home” webpage states: “This website combines current EPA, SF with “standard” exposure factors to estimate ...” The “PRG User’s Guide” webpage replaces EPA with a link to the Center for Radiation Protection Knowledge.

To provide all stakeholders with a better understanding all acronyms should be spelled out. This could be done the first time the term is used in the text or listed on a separate webpage. Examples of acronyms that are not spelled out when they first appear (and their presumed meaning) include:

- DCC – Dose Compliance Concentrations for Radionuclides
- OSWER – Office of Solid Waste and Emergency Response
- CERCLA -- Comprehensive Environmental Response, Compensation, and Liability Act
- RAGs – Risk Assessment Guidance
- RI/FS study → Remedial Investigation (RI) Report or Feasibility Study (this is actually spelled out further down in the text, beyond its initial use)
- RPM – Remedial Project Manager
- SSL – Soil Screening Level
- TR – Target Risk

For better transparency and better understanding by various stakeholders it might be better to use Recreationalist instead of Recreator when describing that scenario. Recreationalist is the term typically used when describing this scenario in other regulatory documents.

The term landuses, which occurs throughout the webpage and documentation, is two words (land uses). This comment applies to its use throughout the website.

The first sentence in the response to Question 1 on the “Frequently Asked Questions about Radionuclide PRGs” webpage needs to be modified to read better. It currently reads:

- “PRGs (Preliminary Remediation Goals), presented on this site, are for the Superfund/RCRA programs are risk-based concentrations, derived from standardized equations combining exposure information assumptions with EPA toxicity data.”

One possible revision, provided below, breaks this sentence into two sentences:

- PRGs (Preliminary Remediation Goals), presented on this site are for Superfund/RCRA programs. These PRGs are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data.

The first sentence in the response to Question 7 on the “Frequently Asked Questions about Radionuclide PRGs” webpage is difficult to read. It would read better if the commas are removed.

B. User’s Guides:

1. Are the tool and web site clearly explained?

a. Are the assumptions clear and reasonable? If not, what do you recommend?

With the exception of the derivation of the equations, which is noted in Question 4 below, the assumptions are clear and seem reasonable.

b. Does it adequately describe the calculator’s limitations? If not, what do you recommend?

The web site does not highlight the limitations of the tool. Recommend including a separate section of the User’s Guide that discusses the limitations. Section 4.26 on Supporting Equations and Parameter Discussion hints at some of the limitations, but they are not clearly described as such.

c. Is it well written and clearly organized? If not, what do you recommend?

There were two issues that were encountered when reviewing the graphical representation and brief descriptions of the various exposure routes listed under the Section 4.0, Technical Support Documentation heading. In most cases the graphic did not appear (a small box with an “X” was shown where the graphic should be). Also, when selecting the Microsoft Internet Explorer back arrow to return to the previous page the website is returned to the subsections for the individual pathways related to the scenario and not the list provided under the Technical Support Documentation heading (the origination point). The Technical Support Documentation heading is also no longer expanded when returning to that section. These issues may be the result of

browser version issues or could be an issue with the website programming and should be evaluated.

For easier understanding and better organization combine the graphical representation, brief description, and equations into individual subsections under the section heading of Technical Support Documentation. Also, suggest listing all scenarios in alphabetical order and using consistent titles for each scenario in graphics and equations. For example, the subheading in Section 4, Technical Support Documentation, is "Ingestion of Fish." The corresponding Section 4.18 uses the heading "Consumption of Fish." For consistency these two headings should be the same. Also, there should be a description associate with each set of equations, which does not appear to be the case currently.

In Section 4.0, in the description of "Residnet Tapwater Graphic and Supporting Text", resident is misspelled.

d. Is the technical support documentation complete, well organized, and easy to follow? If not, what do you recommend?

Recommend providing a more adequate description or citation for the derivation of the current equations. Also recommend defining the equation parameters along with the equations. Also, text should indicate that Table 1 is located at the bottom of the webpage.

2. Are the sources and citations appropriate, and do they represent the current state of knowledge? If not, what do you recommend?

Yes for those included. (See next comment.)

References used to justify some of the equations and parameter values are not included in the Reference section of the User's Guide. For example, the Residential Soil section mentions studies in Calabrese et al. 1989, Davis et al. 1990, and Van Wijnen et al. 1990. These three documents are not included in the Reference section. Table 1 also includes references that are not listed in the References section (e.g., Miller, 1980 and Hinton, 1992).

Document #7 listed in the Sources section (2.3.1) is the 3-volume "Understanding Variation in Partition Coefficient, K_d, Values" document. The link is labeled "EPAKD." The label should be modified to "EPA K_d" or something similar that is consistent with the other documents listed in this section.

Documents included as links in the text should also be included in the References section. For example, the report "Simulating Radionuclide Fate and Transport in the Unsaturated Zone: Evaluation and Sensitivity Analyses of Select Computer Models" should be included in the References section.

3. Are the models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?

- Resident
- Farmer
- Soil to Groundwater
- Indoor Worker
- Outdoor Worker
- Composite Worker
- Recreator
- Construction Worker – Unpaved Road Traffic (Site-specific only)
- Construction Worker – Wind Erosion and Other Construction Activities (Site-specific only)

This list of scenarios includes a wide range of likely scenarios that range from conservative (e.g., farmer) to those likely to be associated with site-specific scenarios. However, it is difficult to distinguish between some scenarios (e.g., Resident Tapwater vs. Farmer Tapwater) given the descriptions available. Also, there is a Soil to Groundwater scenario that will allow the user to calculate the groundwater concentrations, but there does not seem to be a groundwater pathway for the resident or the farmer who encounters contaminated soil. Suggest including a groundwater pathway for these scenarios.

Please see the comment above regarding the use of Recreationalist in place of Recreator.

Please see the comment above regarding documentation of citations in the References section of the User's Manual. Recommend including the appropriate citation for each particular scenario in the description of the scenario that follows the scenario graphic. Also, the scenarios, as they are defined in the User's Guide, do not seem to exactly match those described in the Soil Screening Guidance for Radionuclides or in RAGS Part B. Suggest explaining the reason for any derivation from these previous guidance documents on scenario definitions and equations.

Suggest matching the names of the scenarios in the User's Guide to those in the PRG Calculator. The order in which they appear in the User's Guide and the PRG Calculator should also be consistent. Some examples are provided for Resident and Farmer scenarios, but the comment applies to all scenarios. For example Resident Air, Resident Soil, and Resident Tapwater names match the options in the PRG Calculator, but the Resident Soil Alternate External Exposure Analysis is called "2-D External Exposure" in the PRG Calculator. Also, in the User's Guide there is a scenario called "Farmer Direct Consumption of Agricultural Products", which may correspond to "Farmer – Biota Direct" in the PRG Calculator. Similarly, "Farmer Direct Exposure and Consumption of Agricultural Products – Back Calculated to Soil" might describe "Combined Soil and Biota" in the PRG Calculator. The matching of these names is not obvious and it should be clearer.

In Section 2.3.2, Hierarchy by Parameter, “half-life” should be changed to half-life.

Are the updates included in OSWER Directive 9200.1-120, “Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors,” dated February 6, 2014, included? If not, will they be?

- 4. Are the equations for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations or derivations? Are the equation variables adequately explained in terms of relative sensitivities? Are the equation constants adequately explained and sourced? If not, what do you recommend?**

- a. Area (surface) contamination?**

The equations appear comprehensive but they do not seem to be adequately supported by citations or derivations. The way in which the equations are presented in Section 4 separately from Table 1 makes reviewing the equations difficult. It is also difficult to determine the primary guidance source for the equations. It appears that they are based on the following three guidance documents: “Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)”, “Soil Screening Guidance for Radionuclides: User’s Guide”, and “Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (Peer Review Draft)”. However, the equations in these documents do not exactly match the equations in the User’s Guide. The primary source for this equation does not seem to be listed, and a description of how the information is used in these three documents to derive the equations presented is not apparent. The reviewer recommends clearly pointing to the document that describes how the equations were derived. If no such document exists, recommend including the derivation description in this User’s Guide.

- b. Volumetric contamination?**

In terms of volumetric contamination, it is not clear where the user inputs the thickness of the contaminated zone. There is an option to “Select cover layer thickness for GSFO (gamma shielding factor – outdoor), but this seems to represent the thickness of a clean cover over the contaminated zone and not the contaminated zone itself. Suggest more clearly describing the options for surface only contamination versus volumetric contamination.

- 5. Are the source material and photonic energy data used for the volume calculator comprehensive, appropriate, and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? Are they appropriate for residential and worker exposures? If not, what do you recommend?**

Yes, the area correction factors (ACFs) for volumetric contamination of less than infinite area (for various depths) were developed by ORNL (ORNL/TM-2013/00), published September 2014. This document lists all the photon energy data for parent and progeny radionuclides. However, refer to Comment above on the lack of clarity regarding inputs for volumetric contamination.

6. Are the choice of detectors and detector heights appropriate and based on supportable reasoning? If not, what do you recommend?

The reviewer was unable to find a description of the assumptions regarding detectors and detector heights in the User Guide to answer this question.

7. Are the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend?

Yes, the majority of the decay chains and slope coefficients are adequately described in ORNL/TM-2013/00, published in July 2014. ORNL/TM-2013/00 does not contain the slope factors for the following three +D chains which are listed as options in the calculator: Ag-103 +D, As-69+D, and Ra-227+D. Reviewer recommends the citation be provided for these “radionuclide +D” options.

8. Are the standard recommended default factors adequately explained, sourced, and reasonable?

Minimal information is provided. Additional information should be added to assist the user.

9. Is there anything else you recommend for the user’s guides to improve them for their stated purpose?

See comment regarding the sources used to derive the pathway-specific equations in Sections 4.1 – 4.26. It would be beneficial to the user to include the reference with the equation to allow the user to easily find additional information.

C. Calculator:

1. Are the results clearly explained and presented? If not, what do you recommend?

When scrolling from left to right to view the PRG results, it would be helpful if the first column remained frozen so that you can view the radionuclide corresponding to the result. Or, consider transposing this table for easier viewing.

2. Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?

See comment regarding documenting sources for the derivation of equations.

- 3. Do the results provide defensible explanation of how they were derived, or are they the result of a “black box”? Do you recommend anything different?**

See comment regarding documenting sources for the derivation of equations.

- 4. Are there aspects of other Superfund guidance that should have been used or incorporated into the calculator?**

As questioned above, are the updates included in OSWER Directive 9200.1-120, “Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors,” dated February 6, 2014, included in the calculator?

- 5. Are the radionuclides appropriate, and do the results adequately explain the variability among radionuclides? If not, what do you recommend?**

Suggest including graphical representation options for viewing the relative risk associated with each radionuclide.

- 6. Is there anything else you recommend for the calculator to improve it for its stated purpose?**

“Site specific” listed under the heading “Select PRG type” should be changed to “Site-specific” (with dash).

Provide the user with the ability to go back to the PRG calculator after selecting “Retrieve” to get the results. In situations when the user is evaluating various scenarios with the calculator this feature would enable the user to avoid having to reenter the radionuclides and exposure pathways. This could be completed by programming a ‘return’ button at the bottom of the results page or allowing the website to retain the inputs when using the web browser’s back arrow.

Links should be added to the headings in the results to direct the user to the definitions or descriptions of each result, providing a better understanding. For example, provide a link to the “Food Ingestion Slope Factor (risk/pCi)” that directs the user back to the explanation of what this slope factor discusses.

D. Anything Else?

Is there anything else you would recommend to improve the PRG’s utility, accuracy, completeness, or supportability?

Christopher A. McKenney

Statement of Professional Qualifications

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety
and Safeguards
Division of Decommissioning, Uranium
Recovery, and Waste Programs

CONTACT INFORMATION

Work Address

Mail Stop T8F5
11545 Rockville Pike
Rockville, MD 20850
INTERNET: christopher.mckenney@NRC.GOV
Phone: (301) 415-6663
FAX: (301) 415-5369

EXPERIENCE:

Oct 2014 – current	Chief , Performance Assessment Branch, Division of Decommissioning, Uranium Recovery, and Waste Programs; Activities include oversight of staff and budget, management interactions with upper management and outside stakeholders in the arenas of low-level waste, waste incidental to reprocessing, decommissioning, and financial assurance.
Mar 2009 – Oct 2014	Chief , Performance Assessment Branch, Division of Waste Management and Environmental Protection; Activities include oversight of staff and budget, management interactions with upper management and outside stakeholders in the arenas of low-level waste, waste incidental to reprocessing, and decommissioning.
May 2004 – Mar 2009	Senior System Performance Analyst , Division of Waste Management and Environmental Protection; Activities included biosphere modeling for low-level waste disposal and decommissioning activities; responses to Congressional questions; interfacing with other Federal and State Agencies.
Jan 2009 – Mar 2009	Rotation as Branch Chief of Performance Assessment Branch within Division of Waste Management and Environmental Protection.
Nov 2008 - Jan 2009	Detail as Branch Chief of Low Level Waste Branch within Division of Waste Management and Environmental Protection.
Nov 2006 - June 2007	Rotation as Branch Chief of Performance Assessment Branch within Division of Waste Management and Environmental Protection.

Oct 1993 - May 2004	System Performance Analyst (Health Physicist/Engineer) , Division of Waste Management, Activities included biosphere modeling for high-level waste disposal, low-level waste disposal, decommissioning activities and uranium recovery wastewater disposal options; NRC Representative to the International Atomic Energy Agency's Biosphere Modeling and Assessment Methods (BIOMASS) program; technical reviewer of operational health physics; responses to Congressional questions; interfacing with other Federal and State Agencies.
July 1991 - Oct 1993	Nuclear Engineer - Intern , Office of Nuclear Material Safety and Safeguards; Activities included multiple rotations to numerous NRC offices and divisions.
June 1993 - Oct 1993	Rotation with Region III/Division of Nuclear Materials Safety; Activities involved inspection of NRC licenses including hospitals, universities, military applications, and radiography.
Jan 1993 - June 1993	Rotation with Division of Industrial and Medical Nuclear Safety, Director's Office; Activities included paper for European Union Council and project management of NRC's safety assessment of the Leksell Gamma Unit, a gamma stereotactic radiosurgical device.
Oct 1992 - Jan 1993	Rotation with Division of Industrial and Medical Nuclear Safety, Operations Branch; Activities included drafting inspection guidance, answering generic questions for Part 20 implementation.
Aug 1992 - Oct 1992	Rotation with Region IV/Uranium Recovery Field Office; Activities included safety and environmental reviews of licensee requests and inspections of uranium recovery facilities.
July 1992 – Aug 1992	Rotation with Office of State Programs; Activities included technical support of Agreement State programs, and assisting in coordination of an All-Agreement States meeting on Low-Level Radioactive Waste.
July 1991 - July 1992	Initial assignment to Low-Level Waste Management and Decommissioning Division; Activities included biosphere modeling for low-level waste disposal, and decommissioning activities; technical reviewer of operational health physics.
June 1990 - Sept 1990	Summer Intern , Westinghouse-Hanford Company, Health Physics Support; Activities included coordinating bioassay program.

Education

Oregon State University

Bachelor's of Science in Nuclear

Corvallis, Oregon

Engineering, Radiation Protection
Option, June 1991

Peer Reviewer Conflict of Interest Certification

Peer Review: U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals (PRG) for Radionuclides Electronic Calculator" and User's Guide.

A conflict of interest or lack of impartiality exists when the proposed peer reviewer personally (or the peer reviewer's immediate family), or his or her employer, has financial interests that may be affected by the results of the peer review; or may provide an unfair competitive advantage to the peer reviewer (or employer); or if the peer reviewer's objectivity in performing the peer review may be impaired due to other factors. When the Peer Reviewer knows that a reasonable person with knowledge of the facts may question the peer reviewer's impartiality or financial involvement, an apparent lack of impartiality or conflict of interest exists.

The following questions, if answered affirmatively, represent potential or apparent lack of impartiality (*any affirmative answers should be explained on the back of this form or in an attachment*):

- Did you contribute to the development of the document under peer review, or were you consulted during its development, or did you offer comments or suggestions to any drafts or versions of the document during its development? ☒ No ☐ Yes
- Do you know of any reason that you might be unable to provide impartial advice on the matter under consideration in this peer review, or any reason that your impartiality in the matter might be questioned? ☒ No ☐ Yes
- Have you had any previous involvement with the review document(s) under consideration? ☒ No ☐ Yes
- Have you served on previous advisory panels, committees, or subcommittees that have addressed the topic under consideration? ☒ No ☐ Yes
- Have you made any public statements (written or oral) on the issue? ☒ No ☐ Yes
- Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration? ☒ No ☐ Yes
- Do you, your family, or your employer have any financial interest(s) in the matter or topic under peer review, or could someone with access to relevant facts reasonably conclude that you (or your family or employer) stand to benefit from a particular outcome of this peer review? ☒ No ☐ Yes

With regard to real or apparent conflicts of interest or questions of impartiality, the following provisions shall apply for the duration of this peer review:

(a) Peer Reviewer warrants, to the best of his/her knowledge and belief, that there are no relevant facts or circumstances that could give rise to an actual, apparent, or potential organizational or personal conflict of interest, or that Peer Reviewer has disclosed all such relevant information to EMS or to EPA.

(b) Peer Reviewer agrees that if an actual, apparent, or potential personal or organizational conflict of interest is identified during performance of this peer review, he/she immediately will make a full disclosure in writing to EMS. This disclosure shall include a description of actions that Peer Reviewer (or his/her employer) has taken or proposes to take after consultation with EMS to avoid, mitigate, or neutralize the actual, apparent, or potential organizational conflict of interest. Peer Reviewer shall continue performance until notified by EMS of any contrary action to be taken.

Signature

Date

☐ Check here if any explanation is attached

Printed Name

Affiliation/Organization

LEAH SPRADLEY PARKS, PHD

20 Wood End Lane, Bronxville, NY 10708 ▪ 615.598.8500 ▪ leah.parks@nrc.gov

SUMMARY

A systems and environmental engineer, specializing in risk analysis, with experience in environmental, health, and safety regulation, and advanced quantitative analytical skills. An ambitious candidate with demonstrated leadership ability and dedication to environmental stewardship.

EXPERTISE

- Environmental Impact Assessment
 - Regulatory Compliance
 - Environmental Due Diligence
 - Contaminant Fate and Transport
 - Forecasting and Data Analysis
 - Risk and Decision Modelling
-

PROFESSIONAL EXPERIENCE

NUCLEAR REGULATORY COMMISSION – WASHINGTON, DC

2008 – present

SYSTEMS PERFORMANCE ANALYST, DIVISION OF WASTE MANAGEMENT

- Lead team for technical review of DOE waste determination for nuclear site at West Valley, NY
- Serve as Division Knowledge Management ‘Champion’ and MS SharePoint Administrator
- Build models for estimating risk from radioactive contamination and decommissioning activities

TECHNICAL ASSISTANT TO COMMISSIONER OSTENDORFF

- Selected for rotational assignment to assist in radioactive waste policy development
- Advised on NRC guidance for assuring funds for decommissioning of nuclear reactors
- Developed vote for Final Rule on 10 CFR Part 72, License Terms for Spent Fuel Storage Installations
- Prepared Commissioner’s speech delivered at the Organization of Agreement States Annual Meeting

ENVIRONMENTAL TECHNICAL SUPPORT, OFFICE OF NEW REACTORS

- Managed and led workshop with Army Corps of Engineers on new reactor application reviews
- Assessed Need for Power for new reactor applications
- Revised guidance on Cumulative Impacts including transmission corridor impacts
- Participated in pre-hearing activities, local and state government scoping meetings, and site audits
- Assisted in the writing and development of Draft Environmental Impact Statements

IAEA CONFERENCE ON HR DEVELOPMENT FOR NUCLEAR POWER PROGRAMS

- Co-chaired session on Young Generation in Nuclear, organizing speakers from 3 countries
- Presented NRC strategies and programs for recruiting and retaining young professionals
- Delivered speech to students at Khalifa University on opportunities in engineering fields

WORLD NUCLEAR UNIVERSITY FELLOW – OXFORD UNIVERSITY, UK

- Participated in broad-based intensive curriculum for leadership development in nuclear industry
- 1st NRC Staffer to be selected as one of 101 Fellows from 37 different countries
- Forum presentation on non-proliferation through multinational approaches to the fuel cycle

ENGINEER, ADVISORY COMMITTEE ON NUCLEAR WASTE

Summer 2005 and 2006

- Performed PhD-related research on Yucca Mountain pre-closure activities
- Assessed suitability of air dispersion model for estimating volcanic ash deposition
- Presented work to the Advisory Committee on Nuclear Waste and NRC management

BBN TECHNOLOGIES – COLUMBIA, MD

2003 – 2004

SYSTEMS AND SOFTWARE ENGINEER

- Researched, developed, and implemented cyber security technologies
- Assessed security enhancements for classified internal network with over 10,000 users
- Assisted in development of security protocol for Department of Defense (DoD) client

LEAH SPRADLEY PARKS, PHD

TECHNICAL SKILLS

- GoldSim Pro Simulation
 - MS Access
 - MS SharePoint& Designer
 - RESRAD Family of Codes
 - Visual Sample Plan (VSP)
 - Matlab Statistics Toolbox
-

EDUCATION

VANDERBILT UNIVERSITY, GPA: 3.85/4.00

NASHVILLE, TN

PhD, Environmental Management, May 2008 (Vanderbilt Center for Environmental Management Studies)

MS, Environmental Engineering, August 2007

Awards/Honors:

- VCEMSBridgestone Firestone Fellow
- National Science Foundation (IGERT Fellow)
- Graduate School Teaching Certificate Program
- Roy G. Post Scholarship 2008
- 2007ANS Award for Best Presentation

Activities:

- Founder and Former President American Nuclear Society (ANS) Student Section
- Vanderbilt Commons LEED Building Initiative
- Vanderbilt Biodiesel Initiative
- Net Impact Vanderbilt Chapter

UNIVERSITY OF VIRGINIA, GPA: 3.62/4.00

CHARLOTTESVILLE, VA

BS, Systems and Information Engineering, May 2003

Concentration in Business Management, Minor in Spanish

Awards/Honors:

- Raven Society
- Golden Key National Honors Society

Activities:

- Founder United Trauma Relief Club 2001
 - Study Abroad Valencia, Spain, Summer 2000
-

PROFESSIONAL DEVELOPMENT

PE Certification, Environmental Engineering (October 2011)

American Nuclear Society

- Vice Chair, Environmental Sciences Division; Near Surface Disposal Standards Working Group

Nuclear Engineering Student Delegation, 2005 - 2007

- Convened in Washington, D.C. to advocate for nuclear education with key policymakers
-

PUBLISHED WORKS AND PROFESSIONAL PRESENTATIONS

- Parks, L, D Esh, C Grossman (2011). "The Impact of Uncertainty Type and Representation in Performance Assessment," presented at PSAM 11 and ESREL 2012 June 2012, Helsinki, Finland.
- Parks, L, C Ridge, C Barr, et. al, (2011). "NRC Consultation and Monitoring at the Savannah River Site: Focusing Reviews of Two Different Disposal Actions," presented at Waste Management 2012, Phoenix, AZ.
- Spradley, L, J Clarke, and M Abkowitz, (2010). "Estimating Surface Facility Throughput During the Pre-Closure Emplacement Period at Yucca Mountain, NV," Nuc. Technology: Vol. 169: Issue 2, Pages 180-194.
- Spradley, L, J Clarke, and M Abkowitz, (2010). "Estimating the Frequencies of Drop Events During the Pre-Closure Emplacement Period at Yucca Mountain, NV," Nuc. Technology: Vol. 170: Issue 2, Pages 322-335.
- Spradley, L, J Clarke, and M Abkowitz, (2009). "Evaluation of Transportation and Acceptance Strategies Associated with the Yucca Mountain Waste Management System," Nuc. Technology: Vol. 165: Issue 2, Pages 209-222.
- Spradley, L, (2008). "A Systematic Approach to Analyzing Pre-Closure Operational Performance of the Proposed Repository for High-Level Nuclear Waste at Yucca Mountain, NV," PhD dissertation, Vanderbilt University.
- Spradley, L, J Clarke, and M Abkowitz, (2008). "Evaluating the Impact of Using the Transport Aging and Disposal Canister on Pre-Closure Operations for the Proposed Repository for High Level Waste at Yucca Mountain, NV," Best Paper Award Waste Management Conference, (printed in RADWASTE Magazine).
- Spradley, L, J Clarke, and M Abkowitz, (2006). "A Risk Assessment Methodology for Intentional Chemical and Biological Contamination of Distribution Systems," Journal of Homeland Security and Emergency Management: Vol. 3: Iss. 3, Article 2, (presented at Society for Risk Analysis Conference, December 2005).
- Spradley, L, and R Codell, (2006). "Alternative Lagrangian Model for Volcanic Plume Dispersion at Yucca Mountain," in press International High Level Radioactive Waste Management Conference Proceedings.

Peer Reviewer Conflict of Interest Certification

Peer Review: U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals (PRG) for Radionuclides Electronic Calculator" and User's Guide.

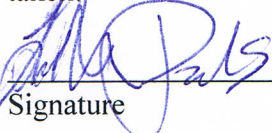
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- Do you know of any reason that you might be unable to provide impartial advice on the matter under consideration in this peer review, or any reason that your impartiality in the matter might be questioned? ☒ No ☐ Yes
- Have you had any previous involvement with the review document(s) under consideration? ☒ No ☐ Yes
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- Have you made any public statements (written or oral) on the issue? ☒ No ☐ Yes
- Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration? ☒ No ☐ Yes
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Signature

11/6/14
Date

☐ Check here if any explanation is attached

LEAH PARKS
Printed Name

NRC
Affiliation/Organization

Adam L. Schwartzman
United States Nuclear Regulatory Commission
Office of Nuclear Materials, Safety, and Safeguards
11555 Rockville Pike
Rockville, Maryland 20852

Education

M.S., Environmental Toxicology, December 2001

Clemson University, Clemson, SC

Thesis: Evaluating the Performance of a Model Constructed Wetland System Designed for Decreasing Concentrations and Bioavailability of Copper in Water

Oak Ridge Institute for Science and Education (ORISE) Fellowship, May 1997 – August 1998 & Summer 1996

Westinghouse Savannah River Company, Savannah River Site, SC

B.S., Biological Sciences, May 1997

Clemson University, Clemson, SC

Work Experience

U.S. NUCLEAR REGULATORY COMMISSION – WASHINGTON, DC

SYSTEMS PERFORMANCE ANALYST

2008 – Present

OFFICE OF NUCLEAR MATERIALS, SAFETY, AND SAFEGUARDS, DIVISION OF DECOMMISSIONING, URANIUM RECOVERY, AND WASTE PROGRAMS

- Review and evaluate Licensee exemption requests associated with the disposal of radioactive waste and the decommissioning of sites containing radioactive materials
- Address technical assistance requests from state regulators, Agreement States, and other NRC offices on a wide range of decontamination and decommissioning issues
- Develop regulatory guidance for use by Licensees, state regulators, and NRC staff when evaluating issues associated with the disposal of radioactive material and the decommissioning activities

ENVIRONMENTAL MODELING SCIENTIST / PROJECT MANAGER

2002 -- 2008

OFFICE OF NUCLEAR REGULATORY RESEARCH, DIVISION OF RISK ANALYSIS

- Project Manager for the Residual Radioactivity (RESRAD) family of computer codes
- Researched and evaluated different exposure scenarios, parameters, and assumptions used to estimate doses associated with a range of decontamination and decommissioning issues
- Utilized available models and data to answer questions from NRC staff and the public related to the transport of contaminants through various media via assorted environmental pathways and assessed their impacts (i.e., dose)
- Worked with other NRC staff to update and revise Regulatory Guides to meet current regulations and technologies
- Provided written and oral testimony for hearings related to the decommissioning of a site currently owned and operated by the United States Army
- Served as a Radiation Information Conference (RIC) Session Organizer (2007 and 2008 meetings), developing a program that provided attendees with insights into the use of modeling and monitoring of environmental systems by the NRC and its licensees

- Completed a rotational assignment in the Office of Nuclear Materials, Safety, and Safeguards, verifying the use of the Total Performance Analysis (TPA) code for evaluating various scenarios associated with the Yucca Mountain repository and using RESRAD to evaluate different scenarios and risks associated with decommissioning of NRC-licensed sites
- Completed a rotational assignment as a Visiting Scientist at the United States Department of Agriculture's Agricultural Research Service conducting field studies to evaluate uncertainty estimates associated with various groundwater recharge methods and performing tracer studies to evaluate surface-subsurface flow interactions and the movement of groundwater in a field setting

CLEMSON INSTITUTE OF ENVIRONMENTAL TOXICOLOGY (CIET), DEPARTMENT OF ENVIRONMENTAL TOXICOLOGY, CLEMSON UNIVERSITY

RESEARCH ASSISTANT / GRADUATE STUDENT (DR. JOHN H. RODGERS, JR.)

AUGUST 1998 – DECEMBER 2001

- Evaluated the ability of a specifically designed model constructed wetland to remove aqueous copper and associated toxicity from wastewater
- Evaluated the effects of three forms of copper (copper sulfate, Cutrine-Plus, Clearigate) on algae (*Raphidocelis subcapitata*) and non-target organisms
- Evaluated the influence of different plant-sediment combinations on the oxidation-reduction potential in the environment
- Conducted aqueous and sediment toxicity experiments with wetland vegetation, invertebrates, and fish

WESTINGHOUSE SAVANNAH RIVER TECHNOLOGY CENTER, SAVANNAH RIVER SITE

ORISE FELLOWSHIP (DR. DAVID DUNN)

SUMMER 1996, MAY 1997 – AUGUST 1998

- Planned and implemented a groundwater surface water interface project to analyze chemical interactions between groundwater and surface water on the site and qualify the use of a newly-designed multi-level water sampling well
- Qualified the use of a field fluorometer to measure real-time dispersion rates of contaminants in streams via fluorescent tracer studies
- Updated a central database of bioconcentration factors across a wide range of wildlife and plant material by coordinating the collection of data from different investigators on the site
- Participated on site-wide environmental monitoring projects evaluating surface water, groundwater, sediment, and fish samples to update and maintain various environmental monitoring databases and maps describing the site

Recent and Relevant Publications and Presentations

Schwartzman, 2014. "The Strange World of Risk-Informed Performance Assessment: Consideration of Site-Specific Dose Assessment Scenarios." Presented at the U.S. NRC Health Physics Seminar, August 13, 2014.

Schwartzman, 2014. "RESRAD Use at the U.S. Nuclear Regulatory Commission." Presented at the "NRC / National Nuclear Regulator (NNR) South Africa Bilateral Meeting, April 22, 2014.

Fuhrmann, M. and A.L. Schwartzman. 2007. Correspondence: Corrected K_d Values for Selenium. Health Physics. 94(2): 192.

Dehmel, J.C., Schwartzman, A.L., and Lewis, D.E., 2005. "Controlling the Release of Potentially Clearable Soils – An Overview of NRC Staff Analysis." Presented at the 50th Annual Meeting of the Health Physics Society. July 2005. Spokane, WA.

Schwartzman, A.L., 2004. "Development of an Environmental Effluent Database." Presented at the 2004 Nuclear Safety Research Conference. October 2004. Washington, D.C.

Schwartzman, A.L., 2001. "Evaluating the Performance of a Model Constructed Wetland System Designed for Decreasing Concentrations and Bioavailability of Copper in Water." Thesis.

Dunn, D.L., K.L. Dixon, R.L. Nichols, A. Schwartzman, R. Roseberry, 1998. "Using StratasamplerTM Multi-Level Wells to Examine the Hyporheic Zone Within a Riparian Wetland." WSRC-TR-98-00046. Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC.

Dixon, K.L. and A.L. Schwartzman, 1997. "Monitoring of the Water Levels in the Wetlands of Fourmile Branch near the F- and H-Areas of SRS: FY97." WSRC-TR-97-O0318. Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC.

Friday, G.P., C.L. Cummins, and A.L. Schwartzman, 1996. "Radiological Bioconcentration Factors for Aquatic, Terrestrial, and Wetland Ecosystems at the Savannah River Site (U)." WSRC-TR-96-0231. Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC.

Peer Reviewer Conflict of Interest Certification

Peer Review: U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals (PRG) for Radionuclides Electronic Calculator" and User's Guide.

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- Have you had any previous involvement with the review document(s) under consideration? ☒ No ☐ Yes
- Have you served on previous advisory panels, committees, or subcommittees that have addressed the topic under consideration? ☒ No ☐ Yes
- Have you made any public statements (written or oral) on the issue? ☒ No ☐ Yes
- Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration? ☒ No ☐ Yes
- Do you, your family, or your employer have any financial interest(s) in the matter or topic under peer review, or could someone with access to relevant facts reasonably conclude that you (or your family or employer) stand to benefit from a particular outcome of this peer review? ☒ No ☐ Yes

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Signature

11/17/2014
Date

☐ Check here if any explanation is attached

ADAM SCHWARTZMAN
Printed Name

U.S. NUCLEAR REGULATORY COMMISSION
Affiliation/Organization

Peer Review Charge for:

U.S. Environmental Protection Agency (EPA), “Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator.”

Background:

EMS, under contract EP-W-13-016 with EPA’s Office of Solid Waste and Emergency Response, has been requested to obtain external, independent reviews of the “Preliminary Remediation Goals for Radionuclides (PRG) Electronic Calculator.” The purpose of this peer review is to identify any technical problems, omissions, or inconsistencies in the PRG calculator, and to obtain expert opinion as to the calculator’s usefulness and appropriateness for its intended function. Your comments and recommendations will be used to revise the calculator so that the final version will reflect sound technical information and guidance.

EPA developed the electronic calculator to help risk assessors, remedial project managers, and others involved with risk assessment and decision making at sites with radioactively contaminated soil, water, and air. The electronic calculator provides guidance for establishing risk-based preliminary remediation goals (PRGs) for radioactively contaminated Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial sites.

Initially applied at the scoping phase of a project using readily available information, risk-based PRGs generally are modified based on site-specific data gathered during the Remedial Investigation and Feasibility Study (RI/FS). PRG development and use in screening should assist staff in streamlining the consideration of remedial alternatives. Radionuclide-specific PRGs usually are derived from two general sources: (1) concentrations based on potential applicable or relevant and appropriate requirements (ARARs); and (2) concentrations based on risk assessment. ARARs often include concentration limits set by other environmental regulations, such as Safe Drinking Water Act maximum contaminant levels (MCLs). The second source for PRGs, and the focus of this database tool, is risk-based calculations that set concentration limits using toxicity values under specific exposure conditions.

EPA issued guidance entitled “Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination” (OSWER No. 9200.4-18, August 22, 1997). This 1997 guidance clarified how to establish protective cleanup levels for radioactive contamination at CERCLA sites. The guidance reiterated that cleanup levels of radionuclides generally should be within the risk range for carcinogens established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) when ARARs are not available or are not sufficiently protective. Thus, cleanups generally should achieve a level of risk within the 10^{-4} to 10^{-6} carcinogenic risk range based on the reasonable maximum exposure for an individual. As addressed in the 1997 guidance, regions should include exposures from all potential pathways and through all media (e.g., soil, ground water, surface water, sediment, air, structures, etc.), when calculating cleanup levels. The guidance also provides a listing of radiation standards that are likely to be used as ARARs to establish cleanup levels or to conduct remedial actions.

Peer Review Charge:

Review the web site (instructions for accessing the site can be found on p. 3) to become familiar with its structure, organization, subpages, and links. The PRG calculator, for purposes of this peer review, includes:

- PRG Calculator Home page, with introduction and links to subpages
- PRG Calculator User's Guide, which include instructions, explanations, equations, default data, assumptions, and sources
- PRG Calculator
- Frequently Asked Questions (FAQs)
- What's New, which includes information on previous revisions to the calculator that change the results of modeling runs
- Equations
- Download Tables

We request that you review the overall web site, user's guides, and the calculator, and answer the charge questions below. You should focus your review on the user's guides, which provide a complete overview, explanation, and instructions, together with supporting data, models, equations, and references and citations. Please note any inconsistencies between the user's guide and calculator.

Charge Questions:

A. Overall Web Site

1. Is the web site clearly organized, described, easy to navigate, and generally "user friendly?" If not, what do you recommend?
 - a. Agreed the web site is good organized, easy to navigate and generally "user friendly". No comments;
 - b. The "symbol" for the *PRG-Equations* is not equal to applied "symbol" at the *fact sheet* for the general public. This might give confusions to some persons of the public (e.g. laypersons);
 - c. Web page "Fact sheet":
 - i. Opening the *fact sheet*. The *fact sheet* for the public does not automatically scale to the size of the monitor;
 - ii. At the *fact sheet* the model/option "Recreation" is missing, instead a "Fish Ingestion Exposure" is presented. Recommendations: Present at both web pages the same model/options;
 - d. Web page "What's new": No comments.
 - e. Web page "FAQ": No comments.
 - f. Web page "Equations": All the equations are presented, however you cannot find at this web page the meaning of the applied symbols in the those equations. Recommendation: Present at this web page also the table or a link to section 4.26.7 from the "User's Guide".
2. Have the objectives of the PRG calculator, as stated in the documentation, been realized? If not, what do you recommend?
3. Does the documentation (user's guides) match the online PRG calculator tools and vice-versa? If not, what do you recommend?
 - a. Web page "User's Guide":
 - i. Section 2.2.2 "Associated Decay Chains for "+D" PRGs" in combinations with the web-page "PRG Calculator" part Select Individual Isotopes. In Section 2.2.2 guidance is provided when to apply "+D". In the list of Isotopes you can select Bi-214+D, but not Pb-214+D. Measuring NORM

the nuclides Pb-214 and Bi-214 are mostly in equilibrium. This is also valid for the other Pb-Bi parent-daughter relations in the other U-decay and Th-232 decay chain. Recommendation: Update the list with Pb+D and investigate how the parent nuclides of Pb can be taken into account in a sufficient way. These parent nuclides may be alpha emitting nuclides.

4. Do you have any other recommendations to improve the usability of the web site?
Web page “Home”, section block “Contents” bullet point “Download”. From the applied Instruction the bullet point is called “Download **Tables**”. The part “Tables” is not visible. Further in Section 2.4 of the User's Guide is a link to tables in the "Download Area". This term give the expectation that in this area are links to all documents that can be downloaded not only tables. Recommendation: Change “Download” into “Download Tables” (see figure below) and apply this term consistent.

B. User's Guides

1. Are the tool and web site clearly explained?
 - a. Are the assumptions clear and reasonable? If not, what do you recommend?
 - The assumptions are clear and reasonable. However, some are mentioned/explained at the web page “FAQ”. Recommendation: Direct or advise the reader/user at the web page “User Guide” to look first at the web page “FAQ” to understand and become acquainted with the aim, applied assumptions and limitations of the PRG at a high level before going into more detail.
 - b. Does it adequately describe the calculator's limitations? If not, what do you recommend?
 - Limitations. Recommendation: Clear statements about the misapplication (limitation) of the PRG-calculator can be found in Section 3.3 "Potential Problems" of the User's Guide. I didn't expect to find the information about limitations here. Recommendation: Change title of Section 3.3 in "Potential Problems & Limitations".
 - c. Is it well written and clearly organized? If not, what do you recommend?
 - Well written: No comments.
 - Clearly organized: Minor Remarks. As example: In Section 4 of the "User's Guide" links to web pages are provide to "Residential Soil, etc.". Clicking on this links gives no problems, however going back to the former web page works not well. Some web pages are still under development like "Residential Soil 2D" and others. If this development and others are limiting the PRG calculator as tool it should be mentioned (e.g. in Section 3.3) and clear for users. In the fact sheet for the public a "Fish Ingestion Exposure" model is mentioned. Question is the model "Ingestion of Fish" in Section 4 this exposure model? Yes, makes titles consistent. If no, take care that titles are mentioning really different models.
 - d. Is the technical support documentation complete, well organized, and easy to follow? If not, what do you recommend?
 - See above point "B.1.c. second bullet".
2. Are the sources and citations appropriate, and do they represent the current state of knowledge? If not, what do you recommend?
 - Citations are appropriate. No comments.

- See also above point "B.1.c" second bullet.
3. Are the models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?
- Resident
 - "Resident Soil": Two citations are mentioned both from 1990. Recommendation: Include if possible a newer one.
 - Section 4.1.1: Above the applied formulas is written the text e.g. "Direct external exposure to contamination at 1 cm". Below the formulas is written ".....the SF used is the 1 cm soil volume for external exposure". The inconsistency here is, that the text above the formula gives the impression that the activity is present in a very thin layer at a depth of 1 cm from the soil surface, while the applied model is for the case the activity is homogeneously distributed in the top 1 cm. Recommendation: make the text consistent. Check this consistency also for other models.
 - User's Guide Section 4.2: No comments.
 - User's Guide Section 4.3: Here a special limitation is mentioned that the inhalation exposure is only calculated for C-14,.... Recommendation: Make a note in e.g. Section 3.3, like: that special limitations of models are mentioned at the models
 - Farmer
 - User's Guide Section 4.19: No comments.
 - User's Guide Section 4.20: Formula "Consumption of eggs. Table 13-40.", the applied variable Q_{p-po} is not mentioned in Table 1.1. Other variables are: Q_{p-sw} , Q_{s-sw} , f_{p-sw} , f_{s-sw} , Recommendation: General check all formulas if the applied variables are explained in Table 1.
 - User's Guide Section 4.21: variable SF_{water} , .. not explained in Table 1.
 - User's Guide Section 4.22: No comments. Have not checked variables.
 - User's Guide Section 4.23: No comments. Have not checked variables.
 - User's Guide Section 4.24: See comments above at User's Guide Section 4.3"
 - Soil to Groundwater
 - User's Guide Section 4.25: Check if the abbreviation SSL has been explained earlier in the text. Recommendation: If SSL is not explained earlier, explain the abbreviation now.
 - Indoor Worker
 - User's Guide Section 4.8: No comments.
 - User's Guide Section 4.8.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".
 - Outdoor Worker
 - User's Guide Section 4.6: No comments.

- User's Guide Section 4.6.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".
 - User's Guide Section 4.7: No comments.
 - Composite Worker
 - User's Guide Section 4.4: No comments.
 - User's Guide Section 4.4.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".
 - User's Guide Section 4.5: No comments.
 - Recreator
 - User's Guide Section 4.14: No comments.
 - User's Guide Section 4.14.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".
 - User's Guide Section 4.15: Variables IRA_{recsc} , ET_{recsa} , have not been explained in Table 1.
 - User's Guide Section 4.16: No comments.
 - User's Guide Section 4.17: Variable $DFA_{rec-adj}$ have not been explained in Table 1.
 - Construction Worker – Unpaved Road Traffic (Site-specific only)
 - User's Guide Section 4.10: No comments.
 - User's Guide Section 4.10.1: See comments made at section 4.1.1 "Resident Soil Alternate External Exposure Analysis".
 -
 - Construction Worker – Wind Erosion and Other Construction Activities (Site-specific only)
 - User's Guide Section 4.12: No comments.
 - General Recommendation: Check all formulas if the applied variables are explained in Table 1.
 - Recommendation Table 1: Place the symbols in alphabetical order; it will be easier to find the symbol. Further, apply a consistent layout.
4. Are the equations for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations or derivations? Are the equation variables adequately explained in terms of relative sensitivities? Are the equation constants adequately explained and sourced? If not, what do you recommend?
- a. Area (surface) contamination?
 - b. Volumetric contamination?
- Agree with the equations.
 - Sufficient supported by citations.
 - As these equations are the same as in the User's Guide the comments made at point B.3 are also applicable here.

- General Recommendation: Check all formulas if the applied variables/symbols are explained in Table 1
5. Are the source material and photonic energy data used for the volume calculator comprehensive, appropriate, and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? Are they appropriate for residential and worker exposures? If not, what do you recommend?
 - Agree with the source material and photonic energy data.
 - See comments made at point A.3.a.i (see above). Recommendation: Check if the nuclides with a "+D" are correct. Especially if the parent as well as the daughter has (very) short decay times. In such cases it can be important to change the parent nuclide. As example the decay chain of Ra-226. Bi-214 cannot be present without Pb-214, and Pb-214 cannot be present without the presence of Rn-222, so in fact Ra-226. There are similar chains of nuclides in the Th-232 decay chain and U-235 decay chain. The correct treatment in the PRG-calculator of these three NORM decay chains are quite important as large area's are contaminated with NORM (e.g. uranium mining and milling sites, phosphate production sites, mineral sand production, etc.)
 6. Are the choice of detectors and detector heights appropriate and based on supportable reasoning? If not, what do you recommend?
 - I think that this question is not applicable for this peer review. I have not read at the PRG-calculator web site any information about detectors or measuring techniques. If I am wrong, please send me the info were to look and I will review those sections.
 7. Are the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend?
 - See comments made at point A.3.a.i and at point B.5 (see above).
 - See references:
 - Calculation of Slope Factors and Dose Coefficients; September 2014; ORNL/TM-2013/00
 - Exposure Factors Handbook: 2011 Edition; EPA/600/R-090/052F.
 8. Are the standard recommended default factors adequately explained, sourced, and reasonable?
 - Yes, No comments.
 9. Is there anything else you recommend for the user's guides to improve them for their stated purpose?
 - Layout of Table 1: Symbols in a logical (e.g. alphabetical order).
 - Layout of Table 1: Rows same layout (e.g. all centered or outlined left).
 - User's Guide line Section 3.1: Check the terms used in overview of the CSM and make them consistent e.g. applied in CSM "pork" versus applied in equations "swine". In the CSM is indicated that the model "Recreator-Exposure Route Biota-Game/animal" is present. However, I have looked at the User's Guide Sections for Recreator. Section 4.16 is called "Recreator consumption of game" and herein a model for a fowl has been given. I agree a fowl is an animal; however writing in the "CSM game/animal" the expectation is created that different animals are be able to

taken into account. So, one unique animal a fowl is a limitation. This has to be mentioned. Recommendation: Make a note as limitation and change the text appropriately in the CSM overview. **Note:** In the PRG-calculator it is possible to select the Media: Game and Fowl!!!!

C. Calculator

1. Are the results clearly explained and presented? If not, what do you recommend?
 - a. Yes and No. Yes the results are clear. No, in my opinion there is some inconsistency in the presentation of the results and in the order the results are presented.
 - b. Recommendations:
 - i. Most of the results are presented like "Total PRG [Bq/g]" this is correct. Some of the results are presented like "Lambda" with no dimension mentioned/added. As physicist I agree and understand the notation, however a layperson perhaps not. Therefore, I would advise to present results like "Lambda" as "Lambda []" equally like "Total PRG [Bq/g]".
 - ii. Describing the "Default variables" equally as the results e.g. " t_r (time - resident) yr" as " t_r (time - resident) [yr]".
 - iii. When I read the results I was asking myself, which parameters I had selected in the PRG-calculator and where are they mentioned in the results. This information is not easy to extract out of data. Therefore I would like to recommend adding a third page in which the user selected input and manual added values are reported.
 - iv. Reading the results report you have to go the *last* cells of the *last* column to find the most important result "Total PRG [Bq/g]" for unique isotopes. It is evident that all other reported results and values of variables are important to understand how they have derived. However, this information is needed in the case that the reported value of the "Total PRG [Bq/g]" is unexpected. Therefore I recommend a different layout of presenting the results. See attachments: Appendix A is an example of the actual PRG-report and Appendix B is the recommended version including remarks made at point C.2.i.
2. Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?
 - a. Yes and No. Yes the results are appropriately described and qualified. No, to the extent that may be relied upon and defended. This list of parameters and results can be created in different ways not necessarily by the PRG-calculator e.g. by typing or by other software, etc.
 - b. Recommendations:
 - i. Print at every output ".pdf" page the (release) version of the PRG-calculator.
 - ii. Take care that the ".xls" outputs are "read only" and also contains information with which PRG-calculator version the ".xls" has been created.
3. Do the results provide defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?
 - a. See point C.2.b.

4. Are there aspects of other Superfund guidance that should have been used or incorporated into the calculator?
 - a. Not able to answer, as I am not familiar with "Superfund Guidance".
 5. Are the radionuclides appropriate, and do the results adequately explain the variability among radionuclides? If not, what do you recommend?
 - a. See also earlier comments under point B.
 6. Is there anything else you recommend for the calculator to improve it for its stated purpose?
 - a. Yes, see point C.1.b.iv.
- D. Anything Else? Is there anything else you would recommend to improve the PRG's utility, accuracy, completeness, or supportability?
- a. To create the possibility to select in some models a sensitivity analysis for one or more parameters.

Attachments

Appendix A: An example of the result report of PRG-calculator

Appendix B: An example of the result report of PRG-calculator according to the proposed recommendations.

When your review is complete, e-mail your comments to EMS's Project Manager (Keith Arnold, keith.arnold@emsus.com, 301-589-5318, ext. 28) on or before **January 15, 2015**. For specific comments or text edits on the user's guide, you may copy and paste text into Microsoft Word and indicate edits or comments using track changes or the comments feature. You also may detail edits by listing the section number and paragraph/sentence number (e.g., User's Guide, Section 2.3.2, paragraph 1, sentence 3:[comment]). *Please do not hand write your comments.*

How to Use the Calculator:

The PRG calculator is available for review at <http://epa-prgs.ornl.gov/radionuclides/>.

In step 1 you to select an exposure scenario. The PRG calculator has nine exposure scenarios:

1. Resident
2. Farmer
3. Soil to Groundwater
4. Indoor Worker
5. Outdoor Worker
6. Composite Worker
7. Recreator
8. Construction Worker – Unpaved Road
9. Construction Worker – Wind Erosion and Other Construction Activities.

Some of these exposure scenarios have multiple media choices; other scenarios will only involve one media so a choice will not appear.

In step 2 you may select either "Generic" in which case the runs use a pre-determined set of default input parameters, or "Site-Specific" where the user can change some of the input parameters.

In step 3 you may select if you want to get estimates of the cancer risk posed by radionuclides at your site, in addition to the target risk-based concentrations that will be provided as PRGs.

In step 4 you are also given a choice of having your results in either pico curies per gram, which are the units usually used in the United States, or in bequerals per gram which most of the rest of the world uses.

In step 5 you must select one or more radionuclides that you want to develop PRGs for.

You see here that some of the radionuclides and radioactive decay chain products are designated with the suffix "+D" to indicate that cancer risk estimates for these radionuclides include the contributions from their short-lived decay products, assuming secular equilibrium.

The decay chain for +D radionuclide ends in 100 years.

Default Appendix A - page 1

Resident Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	0.000001
t_r (time - resident) yr	26
ED_r (exposure duration - resident) yr	26
ET_r (exposure time - resident) hr/day	24
ET_{r-c} (exposure time - resident child) hr/day	24
ET_{r-a} (exposure time - resident adult) hr/day	24
ET_{r-i} (exposure time - indoor resident) hr/day	16.416
ET_{r-o} (exposure time - outdoor resident) hr/day	1.752
ED_{r-c} (exposure duration - resident child) yr	6
ED_{r-a} (exposure duration - resident adult) yr	20
EF_r (exposure frequency - resident) day/yr	350
EF_{r-c} (exposure frequency - resident child) day/yr	350
EF_{r-a} (exposure frequency - resident adult) day/yr	350
IRS_{r-a} (soil intake rate - resident adult) mg/day	100
IRS_{r-c} (soil intake rate - resident child) mg/day	200
IRA_{r-a} (inhalation rate - resident adult) m^3 /day	20
IRA_{r-c} (inhalation rate - resident child) m^3 /day	10
IFS_{r-adj} (age-adjusted soil ingestion factor - resident) mg	1120000
IFA_{r-adj} (age-adjusted soil inhalation factor - resident) m^3	161000
GSF_i (gamma shielding factor - indoor) unitless	0.4
MLF (produce plant mass loading factor) unitless	0.26
IRF_{r-a} (fruit consumption rate - resident adult) g/day	178.1
IRF_{r-c} (fruit consumption rate - resident child) g/day	68.1
IRV_{r-a} (vegetable consumption rate - resident adult) g/day	126.2
IRV_{r-c} (vegetable consumption rate - resident child) g/day	41.7
IFV_{r-adj} (age-adjusted vegetable ingestion factor - resident) g	970970
IFF_{r-adj} (age-adjusted fruit ingestion factor - resident) g	1389710
CPF_r (contaminated plant fraction) unitless	0.25
CF_{fish} (contaminated fish fraction) unitless	1
IRF_a (fish intake rate - adult) g/day	54
TR (target cancer risk) unitless	0.000001
EF_r (exposure frequency - resident) day/yr	350
ED_r (exposure duration - resident) yr	26
City (Climate Zone) PEF Selection	Default
A_s / (acres) PEF Selection	0.5
at center of a square source (g/m^2 -s per kg/m^3) PEF Selection	93.77
V / fraction of vegetative cover (unitless)	0.5
U_m / mean annual wind speed (m/s)	4.69
U_t / equivalent threshold value (m/s)	11.32
$F(x)$ / function dependant on U_m/U_t derived using Cowherd et al. (1985) (unitless)	0.194
PEF (particulate emission factor) m^3/kg	1359344438

Default**Appendix A - page 2**

Resident PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/Bq)	External Exposure Slope Factor (risk/yr per Bq/g)	Food Ingestion Slope Factor (risk/Bq)	Soil Ingestion Slope Factor (risk/Bq)
Co-60	M	2.72E-09	3.35E-04	6.03E-10	1.03E-09

Particulate Emission or Volatilization factor (m ³ /kg)	Lambda	Halflife (years)	Default Soil Volume Area Correction Factor	Default Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (L/kg)
1.36E+09	1.31E-01	5.27E+00	1.00E+00	1.00E+00	7.40E-03

Ingestion PRG (Bq/g)	Inhalation PRG (Bq/g)	External Exposure PRG (Bq/g)	Produce Consumption PRG (Bq/g)	Total PRG (Bq/g)	Total PRG (mg/kg)
3.06E+00	1.10E+04	1.22E-03	3.71E-02	1.18E-03	2.83E-11

Output generated 14JAN2015:15:52:20

Isotope	Total PRG (Bq/g)	Total PRG (mg/kg)	Ingestion PRG (Bq/g)	Inhalation PRG (Bq/g)	External Exposure PRG (Bq/g)	Produce Consumption PRG (Bq/g)
Co-60	1.18E-03	2.83E-11	3.06E+00	1.10E+04	1.22E-03	3.71E-02

ICRP Lung Absorption Type	Inhalation Slope Factor (risk/Bq)	External Exposure Slope Factor (risk/yr per Bq/g)	Food Ingestion Slope Factor (risk/Bq)	Soil Ingestion Slope Factor (risk/Bq)	Particulate Emission or Volatilization factor (m ³ /kg)	Lambda
M	2.72E-09	3.35E-04	6.03E-10	1.03E-09	1.36E+09	1.31E-01

Halflife (years)	Default Soil Volume Area Correction Factor	Default Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (L/kg)
5.27E+00	1.00E+00	1.00E+00	7.40E-03

Variable	Value
TR (target cancer risk) unitless	0.000001
t_r (time - resident) yr	26
ED _r (exposure duration - resident) yr	26
ET _r (exposure time - resident) hr/day	24
ET _{r-c} (exposure time - resident child) hr/day	24
ET _{r-a} (exposure time - resident adult) hr/day	24
ET _{r-i} (exposure time - indoor resident) hr/day	16.416
ET _{r-o} (exposure time - outdoor resident) hr/day	1.752
ED _{r-c} (exposure duration - resident child) yr	6
ED _{r-a} (exposure duration - resident adult) yr	20
EF _r (exposure frequency - resident) day/yr	350
EF _{r-c} (exposure frequency - resident child) day/yr	350
EF _{r-a} (exposure frequency - resident adult) day/yr	350
IRS _{r-a} (soil intake rate - resident adult) mg/day	100
IRS _{r-c} (soil intake rate - resident child) mg/day	200
IRA _{r-a} (inhalation rate - resident adult) m ³ /day	20
IRA _{r-c} (inhalation rate - resident child) m ³ /day	10
IFS _{r-adj} (age-adjusted soil ingestion factor - resident) mg	1120000
IFA _{r-adj} (age-adjusted soil inhalation factor - resident) m ³	161000
GSF _i (gamma shielding factor - indoor) unitless	0.4
MLF (produce plant mass loading factor) unitless	0.26
IRF _{r-a} (fruit consumption rate - resident adult) g/day	178.1
IRF _{r-c} (fruit consumption rate - resident child) g/day	68.1
IRV _{r-a} (vegetable consumption rate - resident adult) g/day	126.2
IRV _{r-c} (vegetable consumption rate - resident child) g/day	41.7
IFV _{r-adj} (age-adjusted vegetable ingestion factor - resident) g	970970
IFF _{r-adj} (age-adjusted fruit ingestion factor - resident) g	1389710
CPF _r (contaminated plant fraction) unitless	0.25
CF _{fish} (contaminated fish fraction) unitless	1
IRF _a (fish intake rate - adult) g/day	54
TR (target cancer risk) unitless	0.000001
EF _r (exposure frequency - resident) day/yr	350
ED _r (exposure duration - resident) yr	26
City (Climate Zone) PEF Selection	Default
A _s / (acres) PEF Selection	0.5
Q/C _{wp} / inverse of the ratio of the geometric mean air concentration to the emission flux at center of a square source (g/m ² -s per kg/m ³) PEF Selection	93.77
V / fraction of vegetative cover (unitless)	0.5
U _m / mean annual wind speed (m/s)	4.69
U _t / equivalent threshold value (m/s)	11.32
F(x) / function dependant on U _m /U _t derived using Cowherd et al. (1985) (unitless)	0.194
PEF (particulate emission factor) m ³ /kg	1359344438
A (Dispersion Constant)	16.2302

B (Dispersion Constant)	18.7762
C (Dispersion Constant)	216.108
City (Climate Zone) VF Selection	Default
A _s / (acres) VF Selection	0.5
Q/C _{vol} / inverse of the ratio of the geometric mean air concentration to the emission flux at center of	
a square source (g/m ² -s per kg/m ³) VF Selection	68.18
foc / (fraction organic carbon in soil) g/g	0.006
ρ _b / (dry soil bulk density) g/cm ³	1.5
ρ _s / (soil particle density) g/cm ³	2.65
θ _w / (water-filled soil porosity) L _{water} /L _{soil}	0.15
T / (exposure interval) s	950000000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845

Selected input for PRG-calculator

Scenario	Resident
Media	Soil
PRG type	Defaults
Units	Bq
Individual Isotopes	Co-60



Europass Curriculum Vitae

Personal information

First name(s) / Surname(s)	Leo P. M. van Velzen		
Address(es)			
Telephone(s)	+31 26 356 8593	Mobile:	+31 6 1055 2267
Fax(es)	+31 26 356 8538		
E-mail	vanvelzen@nrg.eu		
Nationality	Dutch		
Date of birth	20 April 1953		
Gender	male		

Work experience

Dates	1981-present.
Occupation or position held	Senior consultant for advice on Environmental Remediation, Radiological Waste Characterization and NORM.
Main activities and responsibilities	Senior expert with regard to Environmental Remediation, quality checking of Waste Characterization and NORM by non-destructive techniques. Lead engineer in the development of fast non-destructive in-situ measuring techniques/procedures for environmental, waste and NORM related issues. Project Management.
Name and address of employer	NRG, PO box 25, 1755 LE Petten, The Netherlands.
Type of business or sector	Nuclear research & consultancy, Business Unit Consultancy and Safety.
Dates	1969 -1976
Occupation or position held	Petty Officer Specialized in Air & Navigation and Artillery Radar, Sonar, Transmission/Receiver installations including crypto.
Main activities and responsibilities	Served as a Petty Officer for four years at Her Majesty Submarines. Responsible for maintaining and operational availability of Radar, Sonar and crypto, Transmission/Receiver installations.
Name and address of employer	
Type of business or sector	Royal Dutch Navy.

Education and training

	<i>Many courses during employment at Royal Dutch Navy and NRG, like:</i> <ul style="list-style-type: none">• Radiation Protection / health Physics level-3 for the radiation protection expert, since 1982.• Project management.• Reporting in English.• Etc.
Dates	1981
Title of qualification awarded	Bachelor of Science in Physical Engineering.

Principal subjects/occupational skills covered

Engineering, physics, electronics.

Name and type of organisation providing education and training

Higher Technical Education of Rijswijk, Netherlands.

Personal skills and competences

Mother tongue(s)

Dutch

Other language(s)

Self-assessment

European level ()*

English

German

French

Understanding		Speaking		Writing
Listening	Reading	Spoken interaction	Spoken production	
C1	C2	C1	C1	C1
B1	B2	B1	B1	A1
A1	A1	A1	A1	A1

() Common European Framework of Reference for Languages*

C2 is the highest level

Social skills and competences

Communication skills achieved in international projects and networks.

Organisational skills and competences

Senior Consultant in Project management and planning.

Technical skills and competences

Senior Engineer in non-destructive radiological measurement techniques and procedures for the quality control of radioactive waste packages and Environmental Remediation; Radiation protection, adviser on NORM issues.

Computer skills and competences

Microsoft Office, Programming languages.

Driving licence

Yes.

Additional information

Member of professional bodies:

- Member of the Dutch Society for Radiation Protection (1982-present),
- Member of the Steering Committee of industrial branch of the Dutch Society for Health Physics (2014-present),
- Member of the American Health Physics Society (2001-present).

Relevant experience

- Editor "Environmental Remediation and Restoration of Contaminated Nuclear and NORM Sites", to be published in 2015 by Woodhead Publishing (ISBN 978-1-78242-231-0),
- Member of the Steering Committee of the IAEA Network "LABONET", (2011-present),
- Member of the Steering Committee of the IAEA Network "ENVIRONET", (2010 - present),
- Member and Treasurer of the Steering Committee of the European Network of Testing Facilities for the Quality Checking of Radioactive Waste Packages (ENTRAP), (1993 - present),
- Chief Editor of the "Environmental Radiation Survey and Site Execution Manual (EURSSEM, <http://www.eurssem.eu/>), (2009 - present),
- Member of the International Program Advisory Committee of the US Waste Management Conference, (2010 - present),

Peer Reviewer Conflict of Interest Certification

Peer Review: U.S. Environmental Protection Agency (EPA), "Preliminary Remediation Goals (PRG) for Radionuclides Electronic Calculator" and User's Guide.

A conflict of interest or lack of impartiality exists when the proposed peer reviewer personally (or the peer reviewer's immediate family), or his or her employer, has financial interests that may be affected by the results of the peer review; or may provide an unfair competitive advantage to the peer reviewer (or employer); or if the peer reviewer's objectivity in performing the peer review may be impaired due to other factors. When the Peer Reviewer knows that a reasonable person with knowledge of the facts may question the peer reviewer's impartiality or financial involvement, an apparent lack of impartiality or conflict of interest exists.

The following questions, if answered affirmatively, represent potential or apparent lack of impartiality (*any affirmative answers should be explained on the back of this form or in an attachment*):

- Did you contribute to the development of the document under peer review, or were you consulted during its development, or did you offer comments or suggestions to any drafts or versions of the document during its development? ☒ No ☐ Yes
- Do you know of any reason that you might be unable to provide impartial advice on the matter under consideration in this peer review, or any reason that your impartiality in the matter might be questioned? ☒ No ☐ Yes
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- Have you served on previous advisory panels, committees, or subcommittees that have addressed the topic under consideration? ☒ No ☐ Yes
- Have you made any public statements (written or oral) on the issue? ☒ No ☐ Yes
- Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration? ☒ No ☐ Yes
- Do you, your family, or your employer have any financial interest(s) in the matter or topic under peer review, or could someone with access to relevant facts reasonably conclude that you (or your family or employer) stand to benefit from a particular outcome of this peer review? ☒ No ☐ Yes

With regard to real or apparent conflicts of interest or questions of impartiality, the following provisions shall apply for the duration of this peer review:

- (a) Peer Reviewer warrants, to the best of his/her knowledge and belief, that there are no relevant facts or circumstances that could give rise to an actual, apparent, or potential organizational or personal conflict of interest, or that Peer Reviewer has disclosed all such relevant information to EMS or to EPA.
- (b) Peer Reviewer agrees that if an actual, apparent, or potential personal or organizational conflict of interest is identified during performance of this peer review, he/she immediately will make a full disclosure in writing to EMS. This disclosure shall include a description of actions that Peer Reviewer (or his/her employer) has taken or proposes to take after consultation with EMS to avoid, mitigate, or neutralize the actual, apparent, or potential organizational conflict of interest. Peer Reviewer shall continue performance until notified by EMS of any contrary action to be taken.


Signature

2014-11-13

Date

☐ Check here if any explanation is attached

L.P.M. van Velzen
Printed Name

Nuclear Research and Consultancy Group
Affiliation/Organization (NRG)