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Assessment of Radioactive Discharges in Ground Water to the Unrestricted Area at Nuclear Power Plant Sites

Comment On: NRC-2015-0272-0002
Assessment of Radioactive Discharges in Ground Water to the Unrestricted Area at Nuclear Power Plant Sites; Request for Comment on Draft Regulatory Guide

Document: NRC-2015-0272-DRAFT-0005
Comment on FR Doc # 2015-31254

Submitter Information

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Name: Jerry Hiatt
Organization: Nuclear Energy Institute

General Comment

4

See attached file(s)

Attachments

02-09-16_NEI_Industry Comments to Draft Regulatory Guide DG–4025

02-09-16_NEI_Industry Comments to Draft Regulatory Guide DG–4025_Attachment

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM -03
Add= T. Nicholson (TSN)
E. O'Donnell (EXD)

JERRY W. HIATT, CHP
Certified Health Physicist
Sr. Project Manager

1201 F Street, NW, Suite 1100
Washington, DC 20004
P: 202.739.8171
jwh@nei.org
nei.org

NUCLEAR ENERGY INSTITUTE

February 9, 2016

Ms. Cindy Bladey
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Industry Comments to draft regulatory guide (DG), DG–4025, "Assessment of Radioactive Discharges in Ground Water to the Unrestricted Area at Nuclear Power Plant Sites" (Federal Register Vol 80, 77028, dated December 11, 2015 – Docket ID NRC-2015- 0272)

Project Number: 689

Dear Ms. Bladey,

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)[1] appreciates the opportunity to provide comments on the proposed draft regulatory guide DG-4025 "Assessment of Radioactive Discharges in Ground Water to the Unrestricted Area at Nuclear Power Plant Sites" which describes an approach that the NRC staff considers acceptable for use in assessing abnormal, inadvertent radioactive releases that may result in discharges of contaminated ground water from the subsurface to the unrestricted area at commercial nuclear power plant sites.

These comments were developed by an industry task force comprised of subject matter experts from utilities' operating nuclear power plants and other organizations. The task force reflects a substantial body of industry technical expertise and experience in radioactive effluents, environmental monitoring and hydrogeology.

Our comments are included in the attachment and consist of two sections – one organized to match the same flow sequence as DG 4025 and the other containing "general" comments on the document.

We thank you for the opportunity to provide you with the nuclear energy industry's comments on the ANPR. If you have any questions or require additional information, please contact me.

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry

Sincerely,

Jerry W. Hiatt, CHP

Attachment

Industry Comments to Draft Regulatory Guide DG-4025

Comment Number/ Page/Section	Comments
	Sequenced Comments
1 Introduction, page 1	Comment: "inadvertent radioactive releases" should be clarified Recommendation: This regulatory guide (RG) describes an approach that the U.S. Nuclear Regulatory Commission (NRC) staff considers acceptable for use in assessing abnormal, inadvertent radioactive releases to the on-site environs which may result in discharges of contaminated ground water from the subsurface to the unrestricted area at commercial nuclear power plant sites. If this change is accepted, a definition for on-site environs in Regulatory Guide 1.21, Revision 2 should be added to this regulatory guide.
2 Purpose, page 1	In the purpose section of the draft guide, it states this model is for use in "assessing abnormal, inadvertent radioactive releases which may result in discharges of contaminated GW from the subsurface to the unrestricted area at commercial nuclear power plant sites". Comment: Please validate the following assumptions: • Based on this guide, normal migration of water into GW onsite/offsite, from monitored ponds, settling basins, and hold up basins are excluded from this guide. Is that correct? • Therefore plants with no abnormal releases or inadvertent releases do not need to implement use of this model or something comparable? This will mean this is not required to be implemented until such an event occurs. But somehow, I get the sense that the utilities are expected to have this or something comparable in place prior to an abnormal release event.... Recommendation: Clarify the expectation for having this tool in place
3 Discussion, page 5	In the "Discussion" section, under "Reason for Issuance," this guide states that due to the lack of routinely monitoring GW pathway discharges, the NRC has drafted this guide to provide guidance on how to determine liquid effluent discharges through GW pathway. Comment: This discussion on the Reason for Issuance appears to be contradictory to the Purpose statement for the

	guide. The reason for issuance implies all discharges of water into Groundwater should be monitored just like the liquid effluents program as described in RG 1.21. If this is the case, then this guide will be applicable to releases that migrate to GW during normal plant operations, for licensees whose licensing basis commits them to following this RG. Recommendation: Clarify the applicability of this guide.
4 Pages 3,4,12	Comment: DG-4025 references several Design Certification/Combined License (DC/COL) documents. Since such guidance is intended for new-construction plants, their applicability to older power plants that are "grandfathered" out of these requirements is suspect. - Recommendation: Provide statement that the DC/COL documents were provided for reference in development of DG-4025, but do not apply to older-vintage power plants.
5 Discussion, page 5 "Background," 3rd paragraph	Comment: The first sentence should be clarified. Recommendation: Industry took action to address inadvertent abnormal releases of radioactivity in ground water to the on-site environs.
6 Discussion, page 5 "Background," 3rd paragraph	Comment: Currently states: *"The program involves development of a ground water site model; onsite ground water monitoring, which includes installation of monitoring wells; and a remediation process and reporting requirements."* Basis: NEI 07-07 defines "communication requirements; not "reporting" requirements. Recommendation: change wording to state "...communication requirements."
7 Discussion, page 5 "Background" – Overall Comment	Comment: Make changes to the following EPRI references Basis: • EPRI Report 1016099 is the version of EPRI Report 1015118 that is available to the public; essentially EPRI Report 1016099 is the public version that doesn't include the appendices of EPRI Report 1015118. These two documents were developed to support nuclear power plant implementation of NEI 07-07, initially, but also support NEI 08-08A. • EPRI Report 1015118 was revised in October 2013 and superseded by EPRI Report 300200546 "*Groundwater Protection Guidelines for Nuclear Power Plants, Revision 1.*" Additions and revisions were made to the technical information that supported the implementation of the

	Guidance Statements in the EPRI Guidelines and the appendices. The Guidance Statements were not changed. EPRI Report 1016099 (Public Version) is still available in its original form. • Furthermore, for the nuclear power plant implementation of NEI 08-08A, EPRI developed report 3002000393 *"Establishing a Groundwater Protection Program for New Nuclear Generating Units: Appendix to the EPRI Groundwater Protection Guidelines for Nuclear Power Plants"* (March 2013.) This report is also reproduced in the appendix to the Revision 1 of the EPRI Groundwater Protection Guidelines for Nuclear Power Plants, EPRI report 3002000546, published in October 2013. Recommendation: (1) Based on this information, it would be helpful to users of the RG for the NRC to replace references to 1015118 with reference to 300200546. (2) Also, it would be helpful to clarify the difference between 300200546 (previously 1015118) and 1016099
8 Discussion, page 5 "Background," 3rd & 4th paragraph	Comment: Currently states: *"The Electric Power Research Institute (EPRI) provided NEI supporting guidance for the ..."* Basis: EPRI more appropriately provides the "nuclear power industry" supporting technical guidance Recommendation: change the wording in paragraph 3 and 4 to read: "*The Electric Power Research Institute (EPRI) provided the nuclear power industry supporting technical guidance for the ..."*
9 Discussion, page 5, "Background," 4th paragraph, last sentence	Comment: Currently states: "*In 2008, it issued EPRI Report 1016099, "Ground Water Protection Guidelines for Nuclear Power Plants" (Ref. 21).* Basis: EPRI Report 1016099 is the version of EPRI Report 1015118 that is available to the public; essentially Report 1016099 is the public version that doesn't include the appendices of EPRI Report 1015118 Recommendation: Change the wording to read: *In 2008, it issued EPRI Report 1016099, "Ground Water Protection Guidelines for Nuclear Power Plants: Public Edition." (Ref. 21).*
10 Discussion, page 6, 1st paragraph	Comment: The reference to EPRI document 1016456 (Page 6) should be replaced with a reference to EPRI report 1021175, "Recommendations for an Effective Program to Control the Degradation of Buried and Underground Piping and Tanks (1016456, Revision 1)" Published on 12/23/2010. Recommendation: Make the suggested revision.

11 Discussion, page 6	Comment: (Ref. [23) should be (Ref. 23),-- by removing the unneeded bracket. Recommendation: Remove the unneeded bracket.
12 Discussion, page 6, 2nd Paragraph	Comment: The paragraph refers to Revision 3 to NEI 09-14 Basis: Revision 4 to NEI 09-14 was published in December 2015. Recommendation: Change the reference to read Revision 4 of 09-14.
13 Section C, page 7, 2nd paragraph	Comment: The glossary defines groundwater as any water in the subsurface including moisture in the vadose zone. However, the "groundwater" model assumes horizontal saturated flow. Use of this model assumes direct application of a contaminant to the saturated zone, without considering vertical infiltration through the unsaturated zone. For some sites, use of this model may be too conservative so use of this model should be used with caution, taking into consideration the site conditions as described in the site conceptual model. Recommendation: 3rd sentence, 2nd paragraph, Section C. Consider stating that the model assumes "steady-state saturated flow in homogeneous porous sand layers."
14 Section D, page 8	Comment: The last sentence in Section D second paragraph is essential to the document: *Current licensees may continue to use guidance the NRC found acceptable for complying with the identified regulations as long as their current licensing basis remains unchanged.* The use of the Appendix, while not unreasonable in its complexity, could require significant revision to some utilities existing methodologies (which may differ from the Appendix) which by this comment are deemed acceptable. Recommendation: Make no changes to these sections.
15 Implementation, page 8	Comment: Title for second paragraph is missing a preceding space. Recommendation: Add a blank line between the first paragraph and the bold text "Use by Applicants

	and Licensees.
16 Glossary, pages 10 & 11	Comment: The glossary has definitions for abnormal release, controlled release, uncontrolled discharge, and uncontrolled release. Although these definitions match those in Regulatory Guide 1.21 Revision 2, none of these terms are actually used within the body of DG-4025. While these definitions might be viewed as useful, it is unclear why they are included in the glossary if they are not use within the document. Recommendation: Determine if there is a need to include these definitions in DG-4025, and consider removing if not, in order to prevent potential conflicts with future revisions of RG-1.21.
17 Glossary, page 10	Comment: The definition of "contaminant" is overly broad. It states that a contaminant is any material that has an "adverse effect" which could be construed to be almost any material. Recommendation: Revise definition to match the definition of "contamination" that is found in the NRC website glossary: *"Undesirable radiological, chemical, or biological material (with a potentially harmful effect) that is either airborne, or deposited in (or on the surface of) structures, objects, soil, water, or living organisms in a concentration that makes the medium unfit for its next intended use."*
18 Glossary, page 10	Comment: In the draft guide, there is a definition for "uncontrolled release" that refers you to the definition for "controlled release". However, there is no definition for "controlled release" in the draft guide. There are definitions for "controlled discharge" and "uncontrolled discharge", but nothing for "controlled release". Recommendation: Add the definition of "controlled release" from Regulatory Guide 1.21 directly into the Regulatory Guide.
19 Glossary, page 10	Comment: In the draft guide, the definition for a controlled discharge differs slightly from NRC Regulatory Guide 1.21. The word "planned" is substituted with the word "pre-planned." Recommendation: Change the definition to mirror ANSI/ANI 2.17-2010.
20 Glossary, p.10	Comment: One of the objectives of the Groundwater Protection Initiative as stated in NEI 07-07 is to "Improve management of situations involving inadvertent radiological releases that get into ground water." In the GPI and NEI 07-07, "releases" refer to leaks and spills. Recommendation: Clarify the difference between the NRC's definition of "release" versus the GPI/NEI 07-

	07 definition of "release."
21 Glossary, page 11	Comment: Include a reference for the term "residual radioactivity." Recommendation: Add NRC Regulatory Guide 1.21 as the reference.
22 Glossary, page 11	Comment: The definition of a vadose zone implies that the meaning is the same as an unsaturated zone; however, ANSI/ANS-2.17-2010 provides different definitions for both terms. Recommendation: Recommend to clarify the definitions: vadose zone and an unsaturated zone.
23 Glossary, page 11	Comment: The definition for "residual radioactivity" mentions "unlicensed sources", but does not provide an example of what constitutes an unlicensed source. Is this the same as "exempt sources"? Recommendation: Add a definition of "unlicensed source" to the Glossary.
24 Glossary, page 11	Comment: The term "Vadose Zone" is used a total of three times in this document and in all cases to state that it means the same as the "unsaturated zone". Since the term "unsaturated zone" is already in use in the document why not just delete the term "vadose zone" from the document? Recommendation: Delete the term "vadose zone" from the document.
25 References, page 13	Comment: Reference 22 includes an unneeded dash after NEI (NEI-09-14). Recommendation: Replace the dash after NEI with a space (NEI 09-14).
26 Appendix, page 1, step 3	Comment: Step 3 instructs the user to "Construct a series of transects between the monitoring wells normal to the approximate direction of ground water flow leaving the site". This step does not specify that the transect must cross-through the known or inferred contaminant plume. Many US nuclear power facilities have hydrogeological settings in which groundwater flow direction varies across the power block or protected area; i.e. a portion of groundwater may discharge to canal while the remaining base flow discharges to a cooling lake. This would mean that groundwater flow vectors within the site's boundaries may vary relative to nearby discharge boundaries and release areas at the facility. Recommendation: Add clarification to step 3: Consider changing step 3 to read: "Construct a series of transects between the monitoring wells normal to the approximate direction of groundwater flow containing the known contaminant plume leaving the site." Multiple independent transects may be required if contaminant plumes exist in groundwater aquifers that flow in different directions.
27 Appendix, page 1, step 3	Comment: Step 3 does not specify that the constructed transect to be modeled must fully cross-through the known or inferred plume area normal to groundwater flow. Monitoring wells at either ends of the transect(s) must define/bound the edge of the contaminant plume by exhibiting no detectable activity. If the modeled transects do not include the plume boundary, the flux calculation may

	underestimate contaminant flux normal to the transect. Recommendation: Add clarification to step 3 to specify that wells at either ends of the modeled transect must bound the edge of the contaminant plume. If wells do not extend beyond the extent of the transect, the user should establish block(s) in the transect beyond the plume extent using reasonable assumptions in the site's conceptual model.
28 Appendix, page 1, step 5	Comment: Step 5 does not specify that the monitoring wells to be used to estimate tritium flux must be hydraulically down-gradient of the groundwater flow direction, normal to the established transect(s), with no groundwater flow boundaries (drains etc.) or barriers to flow (building foundations etc.) between transects and boundary wells. Additionally, Step 5 does not indicate that alternative, down-gradient (near site boundary), groundwater measuring points are acceptable to establish gradient, i.e. surface water bodies such as cooling lakes, rivers etc., which are surface expressions of hydraulic head at groundwater discharge boundaries. These conditions generally occur near site property boundaries. Recommendation: Add clarification to step 5 by indicating that down-gradient (near boundary wells/measuring points) must be in hydraulic communication with transect wells with no barriers to flow or drains between the transect and boundary measuring points. Additionally, step 5 should allow for surface expressions of ground water at or near the site boundary (i.e. lakes, rivers etc.) to be used to establish a head gradient from the transect to the site boundary.
29 Appendix, page 1	Comment: The appendix specifically states that "this appendix provides a simple ground-water flow and transport model for estimating offsite tritium activity flux at nuclear power sites." Is this model intended for estimating activity flux from other radionuclides as well? Recommendation: Clarify this in the Regulatory Guide.
30 Appendix, page 1	Comment: A new step needs to be added to the "model building process" as step 2. Recommendation: Add the following "Determine if nuclear power plant site hydrogeological conditions are considered simple or complex."
31 Appendix, page 2, Step 7b	Comment: Clarify the definition of hydraulic gradient in step 7b. The definition provided: "(change in hydraulic head over distance to discharge point)", cannot be calculated with empirical values unless the wells (or measuring points) down-gradient of the transect are exactly at the boundary. Recommendation: Step 7b should be clarified to indicate that the hydraulic gradient measured between transect wells and near-boundary wells (or measuring points) is an estimated gradient to be projected out to the site boundary.

32 Appendix, page 2, Step 9	Comment: Step 9 does not adequately describe the steps and calculations necessary to estimate the travel time for tritium activity at the transect to reach the site boundary. Although the calculation example in table 1 of the appendix calculates and provides the seepage velocity, which is required to calculate travel time, it is not defined as the value required to estimate travel time to the boundary in the draft guide. Recommendation: 1) Add Seepage velocity to the definitions section of the draft guide. 2) Consider adding detailed instructions to estimate tritium travel time from the transect to the site boundary: Example: To estimate travel time from the transect to the site boundary the following parameters must be known: Distance from transect to the site boundary (l[ft]), and the seepage velocity (v[ft/day]), which is also known as the average linear velocity of groundwater flow. Seepage velocity is calculated as follows: specific discharge (flux) (Q [ft/day]) divided by the aquifer's effective porosity (ne [dimensionless]): $v = Q / ne$ Travel time (T[days]) is calculated by dividing the distance from transect to the boundary (l) by the seepage velocity (v): $T = l / v$
33 Appendix – General Comment	Comment: No plan or methodology is provided if well data is not available at the site boundary (either <LLD at boundary but a leak in progress inside OCA or no wells at all). The appendix appears to only be relevant if you have actual detected tritium at the boundary wells. Recommendation: Provide clarification of when to use the Appendix and how to handle plumes which are wholly contained onsite (not exiting the plant property.)
34 Appendix – General Comment	Comment: DG-4025 does not address how to consider non-detectable activity results. In all rights, they should be treated as zero. However, the data in Tables 4 and 5 of the Appendix are not consistent with this assumption. Table 4 indicates that all results for the shallow and deep sections of W1-s and W1-d are <MDL. However, Table 5 indicates a tritium flux from this segment based on an assumed concentration of 500 pCi/L, as indicated at the bottom of Table 4.

	Is there a technical basis for 500 pCi/L? Why not zero? Why not the MDC achieved on the individual analysis? Recommendation: Provide discussion and guidance regarding acceptable approaches to handle non-detectable concentration values.
35 Appendix – General Comment	Comment: The model does not: 1. Address on site pumping of wells for either production or to remove contaminated water, mitigation of a known plume. 2. Address infiltration rates from precipitation. 3. Take into account dynamics of the environment (floods, droughts, etc.). The flux is only instantaneous and does not represent the entire year. 4. Does not account for vertical velocity or aquitards-aquicludes. 5. Atmospheric temperature changes with regard to frost zones, deserts or areas of high evapotranspiration. 6. Water table fluctuates over time are variations that a flux model cannot replicate. 7. No standard for hydraulic conductivity is stated. What is the standard? EPA, DOA, Academic. 8. No accuracy standard for the cross section. Can I use Google Earth, professional survey, a ruler, or laser to determine cross section? Recommendation: Provide additional guidance with standards. One recommendation -- USGS groundwater standards.
36 Spreadsheet	Comment: The width and thickness of each transect stack and the blocks of aquifer within the stacks affect the calculated bulk ground water flux and total transect activity flux. The spreadsheet provided in DG-4025 calculates the width and thickness of each aquifer block. The calculations are valid for the simplified example provided in the Draft Regulatory Guide where the monitoring wells on either end of the transect contain no contamination and, therefore, there is no need to consider the cross-sectional area of contaminated aquifer that lies beyond the ends of the transect. Recommendation: If contamination is detected in a well at either end of the transect, the spreadsheet should allow entry of an estimate of the width and thickness of aquifer flowpath blocks that extend beyond the well. That estimate could be based on the spacing of other site wells in which contamination is detected, or some default distance (of perhaps 20 feet) could be assumed.
37 Spreadsheet	Comment: The spreadsheet is simple, but fails to address aquitards or aquicludes within the transect or the impact the site construction might have on gradient flow. For example, excavation of native soil and backfilling with clay. In addition, the wells along the transect should be spaced evenly with borehole data (logs) to support strata identification.

	Recommendation: The model mirrors a surface-water slope conveyance discharge model. Each partition should not represent more than 8% of the total discharge in order for the measurement or discharge determination to be considered fair. Anything over 8% per section is considered poor.
38 Spreadsheet	Comment: There is currently no guidance on how to use the spreadsheet. Recommendation: Develop a "user's guide" with instructions on how to use supplemental spreadsheet. Consider including guidance as an additional Appendix in DG-4025, or as a separate worksheet within the supplemental spreadsheet.
39 Spreadsheet	Comment: Has the spreadsheet been subjected to appropriate software verification and validation? Recommendation: Subject the spreadsheet to NRC-acceptable levels of V&V and provide a statement in the user's guide.
40 Spreadsheet	Comment: The excel spreadsheet contains titles of the factors used to calculate groundwater flux as identified in the equations in the DG 4025 appendix. Rows 9 & 10 of the "Overview" worksheet identifies the factor names but does not include the associated mathematical symbols as provided in DG 4025 (e.g. ∇hj = hydraulic gradient) Recommendation: Insert the mathematical symbols associated with the factor names found in rows 9 & 10 of the Overview worksheet.
41 Spreadsheet	Comment: The excel spreadsheet contains the substitute value of 500 pCi/L for any non-detect. It's unclear if this substitute value has any basis, or if it is intended that the site would revise this value based on the actual LLD used in the analysis. Recommendation: Provide guidance on deriving substitute values for any non-detect sample result
	General Comments
42 General Comment	Comment: For licensees who are committed to this guide, in the event of a spill and leak, based on the discussion in this guide, the NRC would expect that site to implement this model or something comparable, to describe the flow of contaminants to GW. Despite the fact that this is supposed to be used during abnormal events, it appears the NRC, based on the calculation in the spreadsheet, expects that the sites will develop the transect cross section and maintain the spreadsheet, prior to or without an abnormal event occurring. Recommendation: For licensees committed to follow this guide, please clarify if the spreadsheet needs to

	be revised for each spill and leak event? Or are they expecting the spreadsheet to be dynamic over time, which negates the write up in the "Purpose" section about applicability?
43 General Comment	Comment: The document provides a methodology for calculating the flux of groundwater and contained radioactivity from the site. However, it does not specify how that discharge/release is to be characterized for reporting purposes. Per the definitions in RG-1.21 Rev 2, would it be characterized as an abnormal discharge, abnormal release, uncontrolled discharge, uncontrolled release, unplanned discharge, or unplanned release? Should this "discharge" be included in the Supplemental Information Table, Table 2A, or Table 2B of the ARERR? As it now stands, there is no linkage to the ARERR. Recommendation: Provide clarification on how to characterize and report the calculated "discharge".
44 General Comment	Comment: While having a simplistic model is useful, the simplicity of the approach limits its applicability to tritium. Since the approach relies on water flux, soluble and ionic radionuclides other than tritium would likely not be characterized correctly due to soil adsorption, exchange processes, Kd factors, etc. Recommendation: Provide appropriate cautionary statements to describe the limitations of the model used in DG-4025 as applied to other radionuclides.
45 General Comment	Comment: The document does not recognize the importance of additional dilution that may be provided by other water sources that the groundwater enters into. For example, if the groundwater leaving the site enters a pond, canal, river, lake, or ocean, the additional dilution provided would reduce the impact. Although the purpose of DG-4025 is to provide an estimate of the groundwater that would leave the site and enter the other water body, the consideration of dilution should be recognized. Recommendation: Provide discussion about the importance of additional sources of dilution.
46 General Comment (re: page 18)	Comment: The described method and illustration on Page 18 implies all wells are of equal importance with regard to concentration leaving the site. However, if one has a perimeter well close to the site boundary and downgradient of an indicator or sentinel well that is located farther onsite, the perimeter well should carry more "weight" with regard to its concentration contribution. For example, if a sentinel well located 300-feet from the site boundary shows 5000 pCi/L, whereas a downgradient perimeter well located 50-feet from the boundary indicates 500 pCi/L, the flux through that sector of the boundary transect should be calculated using primarily the data from the perimeter well. The upgradient sentinel well should carry little or no contribution. Recommendation: Provide discussion and guidance on how to handle sentinel and perimeter wells in the model.
47 General Comment	Comment: Several licensees have already developed methods to estimate the flux of water and entrained radioactivity offsite through groundwater. It should be stated clearly in DG-4025 that

	continued use of these site-developed models is an acceptable alternative to the approach described in DG-4025. Recommendation: Explicitly clarify that alternate methods and site-developed models are an acceptable alternative to this guide.