

**NRC RESPONSES TO THE NEI COMMENTS
ISG-014 STANDARD REVIEW PLAN SECTIONS 2.4.12 AND 2.4.13,
ASSESSING GROUNDWATER FLOW AND TRANSPORT OF ACCIDENTAL
RADIONUCLIDE RELEASES**

Comment (1) Applicability

ISG-014 applicability should be for initial applications received after date ISG is approved.

NRC Response: The NRC agrees with this comment. ISG-014 has been revised to make that distinction clear for currently licensed entities under 10 CFR Part 50 and Part 52, and for applicants that have committed in their applications to use the current guidance before the effective date of the revision (see “Applicability” section).

Comment (2) General

Appendix A contains extensive required actions by the modeler, with requirements to provide justification of assumptions used in the analysis, along with sensitivity studies for all plausible pathways. Addressing all NRC expectations in the development of the groundwater model will likely result in numerous model iterations conducted over several months.

NRC Response: The referenced appendix and text references to the appendix were removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than the choice of methods for technical analyses.

Comment (3) General

The ISG provides specific guidance that allows applicants to take credit for mitigating design features in precluding an accidental release. Acceptable mitigating design features are defined in BTP 11-6. The ISG indicates that if these features are present, then there is no need to perform a radiological consequence analysis for inclusion in FSAR Section 2.4.13. This position is favorable for the nuclear industry because it would allow siting of nuclear plants at locations where the hydrogeological characteristics are such that Part 20 limits may not be attainable, assuming acceptable design features are provided.

NRC Response: The referenced text was removed to avoid duplication with ISG-013 guidance which provides a discussion on the review of mitigating design features (see item 2 of interim staff guidance).

Comment (4) General

The ISG also gives guidance on hydrogeological characterization requirements. In particular the ISG indicates that aquifer pumping tests should be conducted to characterize hydraulic conductivity (versus aquifer slug tests), in order to obtain values that are representative of areal hydrogeological conditions. The ISG further provides guidance on the Kd testing,

indicating that 2 to 3 aquifer samples from equally divided segments along each identified pathway should be taken for analysis.

Implementing these requirements has the potential for increasing the cost and schedule duration of the hydrogeological characterization effort.

NRC Response: Obtaining representative areal values is a recommendation and not a requirement. No text changes were made in response to this comment.

Comment (5) General

A mark-up of SRP 2.4.12 and 2.4.13, and BTP 11-6 should be provided to identify where the ISG-014 information will added/revised to supplement the existing documents.

NRC Response: The Rationale section of ISG-014 provides a summary of changes to SRP 2.4.12, 2.4.13, and 11.2. SRP markups will be developed when the NRC updates the SRPs in the future. The revision or update of SRPs will be made available for public comment. No text changes were made in response to this comment.

Comment (6) General

The purpose of the mathematical modeling should be specific to each facility or to each site and should consider objectives such as:

- To check the consistency of the Site Conceptual Model internally or with regional conditions;
- To predict concentrations in space and time that can NOT be gathered with reliable, repeatable and real monitoring data;
- To support the design of remedial actions or other controls; and
- Define groundwater pathways of potential accidental liquid releases and associated travel times.

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than the choice of methods for technical analyses, and text has been added that points to existing guidance on modeling strategies.

Comment (7) General

It should be clear in the introduction, in Figure 1, Appendix A and throughout that you should use simple tools first: conceptual models and estimated travel times first. Based on site-specific variables and concerns, the tools should get incrementally more complex to the point where mathematical models and three-dimensional predictive tools are used.

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than the choice of methods for technical analyses, and text has been added that points to existing guidance on modeling strategies.

Comment (8) Page 1, “Purpose”, first paragraph:

Revise ‘radioactive liquid wastes’ to read ‘radioactive liquid effluent’.

NRC Response: The NRC agrees with this comment because effluent encompasses the definition of waste. Text changes were made in response to this comment. Also, note that ISG-013 presents additional detailed information on the selection of the assumed failed tank and development of the radioactive source term assumed to be contained in the failed tank – see Item 3 of interim staff guidance.

Comment (9) Page 3, “Background”

The guidance in SRP Section 11.2 and BTP 11-6 are supposed to be supplemented in the ISG-013 document. Therefore it is not clear what the statement means that ISG-014 is supplementing and clarifying some of the same items.

NRC Response: ISG-014 states that ISG-013 is supplementing SRP Section 11.2 and BTP 11-6, not vice versa. Also, ISG-014 cross-references ISG-013 on the area of radiological release scenario rather than supplementing SRP 11.2, BTP 11-6, and ISG-013. No text changes were made in response to this comment.

Comment (10) Page 3, “Background”

The second bullet under Issues states ‘SRP Section 11.2 and BTP 11-6 specify the use of an ‘annual average hydrological occurrence’.

Please clarify where this term is used since the only references to ‘annual average’ that was obvious in a review were in reference to ‘annual average effluent concentrations’ and ‘annual average releases.’

NRC Response: The term “annual average” and the associated text in ISG-014 were corrected to reflect the use of this term in SRP Section 11.2 as “annual average concentrations of radioactive materials released in gaseous and liquid effluents”. Note that ISG-013 presents additional detailed information on the selection of the assumed failed tank and development of the radioactive source term assumed to be contained in the failed tank – see Item 3 of interim staff guidance.

Comment (11) Page 6, Figure 1

Figure 1 presents a flow chart, entitled “Hierarchical approach to analyzing radiological consequences in groundwater”. A decision point that determines if a conceptual groundwater model is sufficient for a site or if a mathematical model is warranted is represented by the

question “Are mitigating design features present and acceptable”. This decision point needs to be defined in the text of ISG-014.

NRC Response: The decision point is now described in the text and indicates that the Health Physics staff will coordinate its review with other technical disciplines, including civil engineering in evaluating building plant structures and foundations and mechanical engineering for the review of plant systems and components and design of mitigating features. Figure 1 has been modified to be consistent with the text changes. Mitigating design features are described in further detail in ISG-013 - see item 2 of interim staff guidance.

Comment (12) Page 6, Section 2, “Review Interfaces”

Item (a) identifies a review interface between SRP 2.4.12 and 2.4.13 with SRP 2.5.1 and 2.5.4. Will SRP 2.5.1 and 2.4.5 be updated to identify the review interface with SRP 2.4.12 and 2.4.13?

NRC Response: Updating SRP 2.5.1 and 2.5.4 is out of the scope of this ISG. The term “cross referencing” was changed to “referencing” (refer to item 2(a)).

Comment (13) Page 6, “Issues”

This section identifies changes that will be included in ISG-014 related to “alternate conceptual models or numerical groundwater flow models.” It was not obvious that any changes relative to alternate conceptual models were presented or is the use of the term “numerical groundwater flow model” synonymous with alternate conceptual model for the purpose of this document?

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than the choice of methods for the technical analyses, and text has been added that points to existing guidance on modeling strategies.

Comment (14) Page 7, Section 2, “Review Interfaces”

Item (b) includes a function of the LWMS from SRP Section 11.2 that is not evident in a review of that document. The ISG includes that statement that ‘liquid wastes produced during normal operation are handled, processed, recycled as coolant, or released in accordance with NRC regulations.’ In reviewing SRP 11.2 it was clear that the LWMS included ‘collecting, handling, processing, releasing, and disposing of liquid effluents’ but not recycled as coolant.’ Clarify or remove the statement recycled as coolant.

NRC Response: The NRC agrees with the comment, and the referenced text was removed to avoid any discrepancy and any overlap with ISG-013. Note that ISG-013 presents additional detailed information on the selection of the assumed failed tank and development of the radioactive source term assumed to be contained in the failed tank – see Item 3 of interim staff guidance.

Comment (15) Page 7, Section 2, “Review Interfaces”

Item (c) last sentence should be revised to ‘Compliance with 10 CFR Part 20, Appendix B, Table 2, Column 2 for concentration limits.

NRC Response: The referenced text has been removed and text added indicating that the NRC Health Physics staff will determine compliance as described in ISG-013. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (16) Page 8, Section 3, “Regulatory Requirements”

Item (a) last sentence states “This requirement is applicable to the analysis of a maximum groundwater level for subsurface hydrostatic loading in SAR Section 2.4.12.”

Considering that in most sites, the site characterization is based on groundwater level data from a relatively short period of time, please provide more explicit guidance on the definition of the maximum groundwater level for subsurface hydrostatic loading and an acceptable approach for the determination of the maximum groundwater.

NRC Response: This comment is out of the scope of ISG-014; however, the NRC is planning to revise the SRP to address this issue in the future. No text changes were made in response to this comment.

Comment (17) Page 8, Section 3, “Regulatory Requirements”

Item (c) implies that the specific regulatory requirements applicable for SRP 2.4.13 are 10 CFR Part 20 and specifically 10 CFR 20.1101 and 10 CFR 20.1302.

The previous SRP made no reference to 10 CFR Part 20 and did not associate “accidental releases” with the requirement for a Radiation Protection ALARA Program.

The reference to 10 CFR Part 20 should identify the applicable requirement and not reference 10 CFR Part 20 as a regulatory requirement that was not previously applicable. The ISG appear to impose a regulatory requirement that was not specifically referenced in SRP 2.4.13 or 2.4.12 acceptance criteria.

NRC Response: The referenced text has been removed since regulatory requirements will not change as described in the SRPs. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (18) Page 8, Section 3, “Regulatory Requirements”

Item (d) repeats the requirements for SRP Section 11.2; however, since this section identifies Regulatory Requirements for ISG-014, the section should be deleted so that it is not implied that the criteria for accidental releases during normal operations or anticipated operational

occurrences include meeting radionuclide concentrations limits specified in 10 CFR Part 20, Appendix B as applicable to SRP 2.4.12 and 2.4.13

NRC Response: The NRC agrees with this comment. The section was deleted to avoid the implication linking operational releases with the focus (accidental releases) of ISG-014. Note that ISG-013 presents additional detailed on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (19) Page 9, Section 4, “On-Site Hydro”

In item (a) clarification is included on 10 CFR 100.20(c)(3) objectives that include ‘onsite samples’ which was not identified in the requirement for ‘measurements’ of factors important to hydrological radionuclide transport.

Is this a staff interpretation of what was meant by ‘measurements’?

NRC Response: While the referenced text has been removed, remaining text has been clarified to use the term “site-specific information” rather than “measurements” for consistency with 10 CFR 100.20(c).

Comment (20) Page 9, Section 4, “On-Site Hydro”

Item (b) needs to clarify ‘sufficient on-site hydrological data’ to ‘adequately conceptualize and characterize related groundwater systems’.

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than methods for the technical analyses, and text has been added that points to existing guidance on modeling strategies.

Comment (21) Page 9, Section 4, “On-Site Hydro”

Item (c) implies that the radiological consequence analysis should be consistent with the annual dose limits specified in 10 CFR Part 20, Appendix B. This section was referenced as applicable to SRP 11.2 in the regulatory requirements and should not be applicable here.

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than an exposure analyses. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (22) Page 9, Section 4, “On-Site Hydro”

Items (c) and (d) introduce a new requirement for ‘annual average hydrological conditions’ The previous requirement from 10 CFR Part 100, as it relates to identifying and evaluating hydrological features of the site did not identify annual averages.

The annual average identified in SRP 11.2 and BTP 11-6 is probably related to the acceptance criteria for radionuclide concentrations in 10 CFR Part 20, Appendix B.

NRC Response: The concentration values given in 10 CFR Part 20 Appendix B, Table 2 are equivalent to concentration exposures over the course of one year. The purpose of introducing "annual average hydrologic conditions" is to give more flexibility and consistency to licensees in meeting concentration limits of 10 CFR Part 20 Appendix B, while still providing reasonable assurance of adequate protection of the public health and safety rather than introducing a new regulatory requirement. As such, text was added to clarify this issue. Finally, note that ISG-013 presents additional detailed information on the selection of the assumed failed tank and development of the radioactive source term assumed to be contained in the failed tank – see Item 3 of interim staff guidance.

Comment (23) Page 9, Section 4, "On-Site Hydro"

Item (e) appears to introduce new criteria for "areal hydrological conditions" and requirement for in situ testing as key components during the operational and decommissioning lifecycle. This appears to be a new requirement to address contaminant migration during the decommissioning cycle in SRP 2.4.13.

Identify the basis relative to 10 CFR Part 100 or requirements for assessing groundwater flow and transport of accidental radionuclide releases.

NRC Response: The purpose of this ISG is not to propose new regulatory requirements but to clarify acceptable approaches for complying with existing regulations and to reconcile discrepancies between the existing regulatory guides. Although not a requirement, site specific, areal hydrological testing methods where applicable (e.g., pumping tests) represent a larger sampling of a parameter and therefore better represent physical site characteristics (including "hydrology" and "factors important to radionuclide transport" as per 10 CFR 100.20(c)). No text changes were made in response to this comment.

Comment (24) Page 9, Section 4, "On-Site Hydro"

Item (f) appears to specify a minimum number of aquifer samples to take for analysis. Is this consistent with or in lieu of meeting applicable EPA/Industry standards?

NRC Response: The referenced text has been modified. As a result, item (f) is now item (e) and the word "must" in item (e) has been changed to "should" and is included as a recommendation not a requirement.

Comment (25) Page 10, Section 5, "Contamination Sources & Receptor Location"

Item (b) implies that ISG-013 provides guidance on 'all radionuclide containing indoor and outdoor tanks and vessels.

A review of ISG-013 indicates tanks located outside of containment and outdoors is the focus of concern. Please clarify statement in ISG-014.

NRC Response: The referenced text has been removed and a discussion included in ISG-013. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (26) Page 10, Section 5, “Contamination Sources & Receptor Location”

Item (c) should be deleted from this section and incorporated into ISG-013 as appropriate. This section appears to provide explanation of what is meant by basis in ISG-013. The purpose of ISG-013 was to clarify BTP 11-6 guidance that does not need to be repeated or reinterpreted further in ISG-014.

NRC Response: The NRC agrees with the comment. The referenced text has been removed and applicable descriptions included in ISG-013 to avoid duplication. Note that ISG-013 presents additional detailed information on the selection of the assumed failed tank and development of the radioactive source term assumed to be contained in the failed tank – see Item 3 of interim staff guidance.

Comment (27) Page 10, Section 5, “Contamination Sources & Receptor Location”

Item (d) is not clear in defining receptor point applicable to SRP 2.4.13 relative to applicable criteria (i.e., 10 CFR 100) and the use of the term ‘pseudo-compliance point’.

NRC Response: The referenced text has been removed and applicable descriptions included in ISG-013. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (28) Page 11, Section 6, “Ground-water Modeling and Pathway Prediction”

Section 6 should emphasize that mathematical modeling is only a tool and an optional method to evaluate groundwater and surface water conditions. If site conditions and assessment objectives warrant the use of a mathematical model, then it should be used...but it is not required.

NRC Response: The NRC agrees with the comment. The referenced text has been removed and text added pointing to existing guidance on strategies for modeling.

Comment (29) Page 11, Section 6(c), “Groundwater Modeling and Pathway Prediction”

Section 6c states, “A mathematical model is a realistic representation of the physical hydrogeologic system....” The word realistic should be removed. Mathematical models are only as good as the data used to construct them. If the site conceptual model is ill conceived and based on erroneous data, then the mathematical model will likely be far from realistic.

NRC Response: The NRC agrees with the comment. The referenced text has been removed and text added pointing to existing guidance on strategies for modeling.

Comment (30) Page 11, Section 7.1, “Groundwater Modeling”

Item (a) implies that the modeling process is required to consist of ‘conceptualization and mathematical modeling’ that may or may not be applicable depending on site-specific conditions. This statement seems to eliminate any “hierarchical approach” as previously discussed.

NRC Response: The NRC agrees with the comment. The referenced text has been removed and text added that points to existing guidance on strategies for modeling

Comment (31) Page 11, Section 7.1, “Groundwater Modeling”

Item (b) is not clear on how applicant will address ‘uncertainty of the future contamination scenarios’. Please explain.

NRC Response: The text has been removed and replaced to describe the effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing users and known and likely future users of ground water or surface water consistent with SRP 2.4.13.

Comment (32) Page 11, Section 7.1, “Groundwater Modeling”

Item (c) and (d) clarify the use of following terminology: mathematical model, in-depth numerical modeling, numerical modeling, numerical groundwater modeling.

NRC Response: The referenced text has been removed and text added pointing to existing guidance on strategies for modeling for further clarification.

Comment (33) Page 11, Section 7.1, “Groundwater Modeling”

Item (d) the impact of developing groundwater models on ‘engineered backfills’ is implied in this section however no previous interface SRP change is identified relative to the applicable requirements in SRP 2.5.4. This item should be deleted here and clarified in applicable SRP for consideration.

NRC Response: The referenced text has been removed and replaced with “Review Procedures” while text was added to “Pathways”, item (c) for clarification on including the effects of engineered backfill as a component in the post-construction characterization of groundwater movement and pathways rather than the focus of characterization.

Comment (34) Page 12, Section 7.1, “Direct Release to Groundwater”

Item (b) clarifies the acceptance criteria for SRP 2.4.13 versus SRP 11.2 and BTP 11-6. The question of the consequence analysis meeting 10 CFR Part 20 Appendix B concentration limits is not clear.

NRC Response: The referenced text has been removed to avoid duplication with ISG-013. Note that ISG-013 presents additional detailed information on the selection of exposure scenarios, location of a dose receptor, and basis of acceptance criteria – see Items 5 and 6 of interim staff guidance.

Comment (35) Page 12, Section 7.1, “Direct Release to Ground-water”

Item (c) should be deleted since this requirement is not part of this ISG’s “Regulatory Requirements” and it is verified in other SRP’s such as SRP 11.2, SRP 12.3-4.

NRC Response: The referenced text has been removed to avoid duplication with ISG-013. Note that ISG-013 presents additional detailed information on the failure mechanisms and release pathways in unrestricted areas, use of plant design features in mitigating a release given the information presented in NEI 08-08A and Regulatory Guides 4.21 and 1.143, and location of a dose receptor – see Items 1, 2 and 5 of interim staff guidance.

Comment (36) Page 12, Section 7.1, “Direct Release to Groundwater”

Item (e) is not clear on the “consequence analysis” described above’ that may or may not be waived based on BTP 11-6 acceptable criteria.

NRC Response: The referenced text has been removed to avoid duplication with ISG-013. Note that ISG-013 presents additional detailed information on the failure mechanisms and release pathways in unrestricted areas, use of plant design features in mitigating a release, selection of exposure scenarios, and location of a dose receptor – see Items 1, 2 and 5 of interim staff guidance.

Comment (37) Page 12, Section 7.1, “Direct Release to Groundwater”

Item (f) should identify the relevant information applicable to ISG-014 and not restate the information from ISG-013. Also the correct reference to the approved NEI template should be identified (NEI 08-08A).

NRC Response: The referenced text has been removed to avoid duplication with ISG-013. Note that ISG-013 presents additional detailed information on the failure mechanisms and release pathways in unrestricted areas, use of plant design features in mitigating a release given the information presented in NEI 08-08A and Regulatory Guides 4.21 and 1.143, and location of a dose receptor – see Items 1, 2 and 5 of interim staff guidance.

Comment (38) Page 12, Section 7.2, “Direct Release to Groundwater”

The paragraph discussion implies that the staff will “recommend mitigating design features” if detailed model does not meet Part 20 Appendix B limits. Clarify/identify the mitigating design

features applicable, how this differs from the requirements in ISG-014 and BTP 11-6 for “mitigating design features”, and the applicability of 10 CFR Part 20, Appendix B limits.

NRC Response: The referenced text has been removed to avoid duplication with ISG-013. Note that ISG-013 presents additional detailed information on the failure mechanisms and release pathways in unrestricted areas, use of plant design features in mitigating a release given the information presented in NEI 08-08A and Regulatory Guides 4.21 and 1.143, and acceptance criteria – see Items 1, 2 and 6 of interim staff guidance.

Comment (39) Editorial: Page 1, consider revising the following sentences:

First paragraph “The purpose of this interim staff guidance (ISG) is to clarify previous U.S. Nuclear Regulatory Commission (NRC) guidance performed during the licensing review for a new nuclear power plant of the required analysis for the radiological consequences of accidental releases of radioactive liquid wastes to groundwater.”

Last paragraph – “This ISG (ISG-014) provides additional guidance, through the use of a structural hierarchical approach, for analyzing the aqueous transport of radionuclides through the subsurface with groundwater.”

NRC Response: The referenced text was removed as a part of the effort to re-focus the ISG on guidance for a structured hierarchical approach to an accidental release analysis rather than the exposure analyses which is the focus of ISG-013.

Comment (40) Editorial: Page 6, Figure 1.

The last step “Develop Technical Specifications limiting volume and concentration of tank contents to limit potential release”. Imply that shutting down a unit is a logical choice for action to high tank activity, which it is not a logical option.

NRC Response: The text in the referenced step of Figure 1 has been modified and no longer references limiting volume and tank contents. Note that ISG-013 presents additional detailed information on setting technical specifications, as an alternate provision, on a tank’s maximum radioactive material concentrations should the consequence analysis fail to demonstrate compliance with the acceptance criteria – see Items 7 and Attachment B of interim staff guidance.

Comment (41) Editorial: Page 14, verify reference to Part 50.36a or part 50.36(a) and the appropriate title.

NRC Response: The title of Section 50.36a was corrected.