



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 2.4.12

DISPERSION, DILUTION, AND TRAVEL TIMES
OF ACCIDENTAL RELEASES OF LIQUID EFFLUENTS IN SURFACE WATERSREVIEW RESPONSIBILITIES

Primary - Site Analysis Branch (SAB)

Secondary - None

I. AREAS OF REVIEW

The ability of the surface water environment to disperse, dilute, or concentrate normal or severe cases of accidental radioactive liquid effluent releases is reviewed with emphasis on relating the effects of such releases to existing and known future uses of surface water resources. (Note that effects of normal releases and of the more likely accidents are discussed in the applicant's environmental report.)

II. ACCEPTANCE CRITERIA

Dispersion characteristics and dilution capability of the surface water environment with respect to existing and known future users must be described for both normal and accident conditions. Estimates and bases for dilution factors, dispersion coefficients, flow velocities, and travel time between the site and existing or known future users must be described for both normal and accident conditions. Potential pathways of contamination to surface water users must be identified. Sources of data must be described and referenced. Acceptance is based on a comparison of applicant and staff results.

III. REVIEW PROCEDURES

Independent conservative calculations will be made for dispersion coefficients, dilution factors, flow velocities, travel times, recirculation, and potential contamination pathways. Dispersion coefficients for surface waters are estimated using methods such as those suggested by Brooks (Ref. 1) and Fisher (Refs. 2 and 3). The minimum historic low flow rate of a receiving stream (where applicable), adjusted for diversions or other phenomena that may have affected or likely will affect that rate, is assumed coincident with the spill. Conservatism should be used in the selection of coefficients and parameters for use in any of these methods to determine accident effects. The applicant's design basis is compared to the staff's calculations to determine whether it is adequate, and is reviewed to see that it reflects any potential future changes that might result from variations in precipitation or by the construction of known future wells, reservoirs, and intakes.

Any missing data, information, or analyses necessary to conduct the above reviews and evaluations will be requested in first-round questions. Applicant responses will be

USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to Revision 2 of the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20545.

evaluated using the above referenced, or similar methods, and staff positions will be developed and supplied to the applicant. If responses to staff positions are unacceptable, resolution will be attempted with the applicant prior to preparing evaluation findings, or differences will be noted therein.

IV. EVALUATION FINDINGS

For construction permit (CP) reviews, the findings will consist of a statement of the applicant and staff estimates of dilution factors, dispersion coefficients, flow velocities, travel times, and potential contamination pathways between the site and the nearest water user. If the estimates are similar, or if no potential problem exists, staff concurrence with the applicant's estimates will be stated. If the staff predicts substantially more conservative conditions, a statement of the staff basis will be made.

For operating license (OL) reviews of plant designs that have had detailed reviews of severe accidental effluent releases at the CP stage, the CP conclusions will be referenced. If no CP review of effluent releases was undertaken of the scope indicated herein, this will be indicated. Any new potential pathways or changes in water usage that can be identified in the OL review will also be analyzed and reported.

Sample statements for CP reviews follow:

"At the staff's request, the applicant provided analyses of the effects (travel times, dispersion coefficients, dilution factors, etc.) of an accidental spill of liquid radioactive wastes into the surface water. A postulated failure of the condensate storage tank, releasing 500,000 gallons of water containing low-level activity was evaluated. The applicant assumed that this volume of water would travel overland to the adjacent stream before any dilution would occur. The applicant concluded, and the staff concurs, that adequate dilution would occur in the surface water prior to reaching any potential users. The applicant also investigated the possibility of the spill being recirculated through the plant circulating water system. This analysis showed that it was extremely unlikely that recirculation could occur since the condensate storage tank is located downstream of the circulating water intake structure. The staff concurs in this evaluation. Accidental spills that could enter the groundwater and reach potential users before or after discharging into surface waters are discussed in Sections 2.4.13 and Section 15 of this report."

"No accidental release of sufficient volume of liquids containing radioactivity directly into surface waters is considered reasonable at the site because storage facilities are located inside of safety-related buildings and the manner in which liquids are to be handled at the site precludes this possibility. Accidental spills of liquids into the groundwater, which could eventually reach surface waters, are discussed in Sections 2.4.13 and 15 of this report."

V. REFERENCES

In addition to the following references describing methods and techniques of evaluation, published data by federal, state, and other agencies and organizations will be used as available.

1. N. H. Brooks, "Diffusion of Sewage Effluent in an Ocean Current," in "Waste Disposal in the Marine Environment," Pergamon Press, New York (1960).
2. H. B. Fisher, "The Mechanics of Dispersion in Natural Streams," Jour. Sanitary Engineering Division, Proc. Am. Soc. Civil Engineers, Vol. 93, No. HY6, pp. 187-216 (1968).
3. H. B. Fisher, "Dispersion Predictions in Natural Streams," Jour. Sanitary Engineering Division, Proc. Am. Soc. Civil Engineers, Vol. 94, No. SA5, pp. 927-943 (1968).
4. E. Gaspar and M. Oncescu, "Radioactive Tracers in Hydrology," Elsevier Publishing Co., New York (1972).
5. S. N. Davis and R. J. M. DeWiest, "Hydrogeology," John Wiley & Sons, Inc., New York (1966).
6. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," Revision 2.

11/24/75

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