40 CFR Part 191
Subparts B and C
Compliance Recertification Application 2026
for the
Waste Isolation Pilot Plant

Peer Review
(40 CFR 194.27)

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Field Office
Carlsbad, New Mexico

Compliance Recertification Application 2026
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TABLE OF CONTENTS

27.0 PEER REVIEW (40 CFR 194.27) 27-1
27.1 Requirements 27-1
27.2 Background 27-1
27.3 Changes or New Information Since the CRA-2019 27-2
27.4 References 27-3

ACRONYMS AND ABBREVIATIONS

APPA	Additional Panels Performance Assessment
CBFO	Carlsbad Field Office
CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
CTAC	Carlsbad Technical Assistance Contract
DBR	Direct Brine Release
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
MP	management procedure
NRC	U.S. Nuclear Regulatory Commission
PA	Performance Assessment
TRU	transuranic
WIPP	Waste Isolation Pilot Plant

27.0 PEER REVIEW (40 CFR 194.27)

27.1 Requirements

§ 194.27 Peer Review.

(a) Any compliance application shall include documentation of peer review that has been conducted, in a manner required by this section, for:

(1) Conceptual models selected and developed by the Department;

(2) Waste characterization analyses as required in § 194.24(b); and

(3) Engineered barrier evaluation as required in § 194.44.

(b) Peer review processes required in paragraph (a) of this section, and conducted subsequent to the promulgation of this part, shall be conducted in a manner that is compatible with NUREG–1297, ''Peer Review for High-Level Nuclear Waste Repositories,'' published February 1988. (Incorporation by reference as specified in § 194.5.)

(c) Any compliance application shall:

(1) Include information that demonstrates that peer review processes required in paragraph (a) of this section, and conducted prior to the implementation of the promulgation of this part, were conducted in accordance with an alternate process substantially equivalent in effect to NUREG–1297 and approved by the Administrator or the Administrator's authorized representative; and

(2) Document any peer review processes conducted in addition to those required pursuant to paragraph (a) of this section. Such documentation shall include formal requests, from the Department to outside review groups or individuals, to review or comment on any information used to support compliance applications, and the responses from such groups or individuals.

27.2 Background

Title 40 Code of Federal Regulations (CFR) 194.27 (U.S. EPA 1996) requires the U.S. Department of Energy (DOE) include, in any compliance application, documentation of peer review of changes in conceptual models, waste characterization analyses, and engineered barrier evaluation. A peer review is a mechanism by which an independent group of experts performs an in-depth critique of the assumptions, calculations, extrapolations, alternative interpretations, methodology and acceptance criteria employed, as well as conclusions drawn in the original work, and confirms the adequacy of the work under review. Peer reviews are performed in accordance with the guidance for the conduct and documentation of peer reviews for nuclear waste repositories, NUREG-1927 (U.S. NRC 1988). The provisions in 40 CFR 194.27(c)(2) also require the DOE to document in the compliance application any additional peer reviews beyond those explicitly required by 40 CFR 194.27(a).

The DOE Carlsbad Field Office (CBFO) management procedure (MP) 10.5, Peer Review, is used to guide Waste Isolation Pilot Plant (WIPP) peer reviews in accordance with 40 CFR 194.27 and NUREG-1297. The latest version of MP 10.5 (U.S. DOE 2018) provides the current criteria for establishing the peer review selection committee, selecting peer review panel members, peer review process used, interface requirements, the review of plan development requirements,

the peer review report preparation requirements, and other aspects of the peer review process.

Information and data from previous compliance certification and recertification applications that form the basis of past DOE compliance positions and past U.S. Environmental Protection Agency (EPA) decision documents are found in the 2019 Compliance Recertification Application (CRA-2019) (U.S.DOE 2019).

27.3 Changes or New Information Since the CRA-2019

The DOE has conducted one peer review since the CRA-2019 cut-off date of January 8, 2018. The WIPP Additional Panels Performance Assessment (APPA) Changed Conceptual Models Peer Review evaluated changes to conceptual models required to support a performance assessment (PA) that represented two new transuranic (TRU) waste disposal panels (Panels 11 and 12) in the western area of the WIPP repository.

Regarding Panels 11 and 12, there are 3 revised conceptual models among the 24 conceptual models employed in the original WIPP PA. A review of the 24 conceptual models used in PA was conducted by Hansen (2021) and concluded that 3 of these models would need modification to adequately represent the addition of Panels 11 and 12 within the overall system model. The 3 changed models are Disposal System Geometry, Repository Fluid Flow, and Direct Brine Release (DBR). The Disposal System Geometry conceptual model expresses the dimensionality of the engineered system and surrounding geologic/hydrogeologic formations. The addition of new repository areas to the BRAGFLO grid is a change in this conceptual model. The Repository Fluid Flow conceptual model addresses: (1) fluid distribution in the waste, (2) long-term fluid flow to-and-from the Salado Formation and shafts, and (3) long-term fluid flow between the repository and intrusion boreholes. The Repository Fluid Flow conceptual model is a complex description of simultaneous, interacting hydrologic, chemical, geomechanical, engineering design, and human intrusion scenarios whose effects can be described separately but require numerical modeling to identify the combined, integrated outcome. The conditions controlling repository fluid flow include brine inflow rates, halite creep rates, and gas generation, which are themselves the objects of related but separately described conceptual models. The Repository Fluid Flow model accepts inputs from these related models and provides descriptions of pressures, saturations, flow rates, and flow directions for brine and gas within the excavated areas of the repository. The DBR conceptual model addresses the scenario where brine, containing actinides, may flow from the waste panels up a borehole to the surface during drilling. In general, the important features of the DBR grid are retained in the APPA, however, the representation of TRU waste disposal panels in the western waste area in the DBR grid is a change to the conceptual model.

The WIPP APPA Changed Conceptual Models Peer Review was conducted in Carlsbad, New Mexico, and through bi-weekly peer-review teleconferences from July to November of 2021. On July 21-22, 2021, representatives from the EPA, the DOE, and the Carlsbad Technical Assistance Contract (CTAC) quality assurance team observed the Sandia National Laboratories

technical presentation in Carlsbad, New Mexico, as well as the peer review panel's questions and deliberations. The peer review chairperson coordinated peer review logistics and provided project control support (i.e., cost and schedule reporting). The process and records created during the peer review were subject to all the protocols described in CBFO MP 10.5. A surveillance of the proceedings, conducted by CTAC on behalf of the CBFO, found that the peer review was satisfactorily performed in accordance with CBFO MP 10.5 (U.S. DOE 2022), which complies with all of the applicable peer review requirements.

The final peer review report (Falta et al. 2021) was published by the peer review panel in December 2021 and submitted to the EPA on March 2, 2022. Based on the peer review criteria in 40 CFR 194.27 and NUREG-1297, the peer review panel determined that the changes to the three conceptual models reviewed are adequate and reasonable for their intended use. In April 2023, the EPA accepted the WIPP APPA Changed Conceptual Models Peer Review as fulfilling the peer review requirements (U.S. EPA 2023).

Therefore, the DOE believes it has demonstrated continued compliance with the provisions of 40 CFR 194.27.

27.4 References

(*Indicates a reference that has not been previously submitted.)

Falta, R.W., M. Hu, E.M. Kwicklis, C.I. Steefel, S.C. Williams-Stroud, and J.A. Thies. 2021. Additional Panels Performance Assessment (APPA) Changed Conceptual Models Peer Review Report. Carlsbad, NM: Carlsbad Field Office.*

Hansen, C. 2021. Conceptual Models for the Additional Panels Performance Assessment. Carlsbad, NM: Sandia National Laboratories.*

U.S. Department of Energy (DOE). 2018. CBFO Management Procedure: Peer Review (Revision 10). MP No. 10.5. Carlsbad, NM: Carlsbad Field Office.*

U.S. DOE. 2019. Title 40 CFR Part 191 Subparts B and C. Compliance Recertification Application for Waste Isolation Pilot Plant (March). DOE/WIPP-19-3609, Rev. 0, Carlsbad, NM: Carlsbad Field Office.*

U.S. DOE. 2022. Carlsbad Field Office, Final Surveillance Report of the Additional Panels Performance Assessment (APPA) Changed Conceptual Models, Peer Review (April). Carlsbad, NM: Carlsbad Field Office. Surveillance Number S-21-22*

U.S. Environmental Protection Agency (U.S. EPA). 1996. 40 CFR Part 194: Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations; Final Rule. *Federal Register*, vol. 61 (February 9, 1996): 5223–45.

U.S. EPA. 2023. EPA Review of DOE Peer Review of Conceptual Changes Incorporated in the APPA Model. (April). EPA-HQ-OAR-2001-0012-0774. Washington, DC.*

U.S. Nuclear Regulatory Commission (U.S. NRC). 1988. Peer Review for High-Level Nuclear Waste Repositories: Generic Technical Position. NUREG-1297. Washington, DC.