Title 40 CFR Part 191
Subparts B and C
Compliance Recertification Application 2014
for the
Waste Isolation Pilot Plant

Consideration of Underground Sources of Drinking Water (40 CFR § 194.53)

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Field Office
Carlsbad, New Mexico

Compliance Recertification Application 2014
Consideration of Underground Sources of Drinking Water
(40 CFR § 194.53)

Table of Contents

This page intentionally left blank.

Acronyms and Abbreviations

CARD	Compliance Application Review Document
CCA	Compliance Certification Application
CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
L	liters
ppm	parts per million
TDS	total dissolved solids
USDW	Underground Source of Drinking Water
WIPP	Waste Isolation Pilot Plant

This page intentionally left blank.

53.0 Consideration of Underground Sources of Drinking Water (40 CFR § 194.53)

53.1 Requirements

> §194.53 Consideration of Underground Sources of Drinking Water
> In compliance assessments that analyze compliance with part 191, subpart C of this chapter, all underground sources of drinking water in the accessible environment that are expected to be affected by the disposal system over the regulatory time frame shall be considered. In determining whether underground sources of drinking water are expected to be affected by the disposal system, underground interconnections among bodies of surface water, groundwater, and underground sources of drinking water shall be considered.

53.2 Background

40 CFR § 194.53 (U.S. EPA 1996) requires the U.S. Department of Energy (DOE) to consider, in compliance assessments, underground sources of drinking water (USDWs) near the Waste Isolation Pilot Plant (WIPP) and their interconnections. A USDW is defined in 40 CFR §191.22 (U.S. EPA 1993) as "an aquifer or its portion which: (1) Supplies any public water system, or (2) Contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 milligrams of total dissolved solids per liter." The groundwater protection requirements limit releases to the maximum contamination level established in the Safe Drinking Water Act Regulations at 40 CFR Part 141 as they existed on January 19, 1994.

53.3 1998 Certification Decision

The Compliance Certification Application (CCA) (U.S. DOE 1996), Chapter 8.0, discusses the assumptions and approaches used to consider USDWs and the uncertainty associated with the analyses. The DOE provided detailed information on the location and nature of the USDWs, indicated the estimated concentrations of radionuclides in a hypothetical USDW in the accessible environment, and showed that the maximum contamination levels for radionuclides will not be exceeded during the regulatory time period.

In the CCA, the DOE presented an evaluation of the USDWs near the WIPP that could potentially be affected by the disposal system over the regulatory time frame. This information was included in the CCA, Chapter 8.0, Section 8.2, and Appendix USDW, Section USDW.3. Based on the definitions in section 191.22, the DOE identified three subcriteria to determine whether a water-bearing horizon located within the WIPP-controlled area would qualify as a USDW:

1. A minimum pumping rate of five gallons per minute (gpm)
2. A supply of water at a rate of five gpm for a 40-year period
3. A maximum of 10,000 milligrams per liter (10,000 parts per million [ppm]) of total dissolved solids (TDS)

These requirements characterize the capacity and quality of a public water system. A public water system is defined in section 191.22 as a system providing piped water for human consumption to 25 individuals, or one that has at least 15 service connections.

Applying these criteria, the DOE identified the Culebra Dolomite Member of the Rustler Formation (hereafter referred to as Culebra), the Dewey Lake Formation, and the Santa Rosa Formation as potential USDWs. The DOE conducted a bounding analysis of the contaminants' concentrations to assess compliance with 40 CFR Part 191, Subpart C. In this analysis, the DOE assumed 10,000 ppm TDS, which is much less than the observed concentration of brine derived from the Salado anhydrite marker beds. A USDW was also assumed to be present at and beyond the WIPP Land Withdrawal Boundary. The DOE indicated in the CCA, Chapter 8.0, Section 8.3, that the bounding analysis showed that the resulting radionuclide concentrations in the USDWs would be less than half the maximum limit specified in Part 141 (the U.S. Environmental Protection Agency's [EPA's] National Primary Drinking Water Standards), and the dose to a receptor drinking from the USDW would be a factor of 10 less than the individual protection standard.

The DOE believed the assumption that all contaminants reaching the accessible environment are directly available to the receptor is not realistic but conservative, because this results in overestimating potential doses to an individual. The DOE's findings indicated that even with this conservative approach, the estimated potential dose to an individual was below the Part 191 requirements. The CCA analysis also assumed that all contaminants reaching the accessible environment were directly available to the receptor so that the interconnections of surface, ground, and underground drinking water were all considered and treated as a single source.

The EPA examined the DOE's approach and assumptions associated with the USDW determination in the CCA. The EPA found the analyses to be well supported and accurate, including the uncertainty associated with these analyses. In addition, the EPA assessed all possible aquifers to determine how USDWs were identified and discussed in the CCA. The EPA also examined whether the flow rates and directions were included in the description. The modeling assumptions and specifications for the bounding analysis were examined to assess reliability and assurance of safety. The EPA reviewed the estimated concentrations of radionuclides to determine if they complied with the groundwater protection standard (see CCA Compliance Application Review Document [CARD] 53 (U.S EPA 1998) for details of the EPA's CCA review).

The EPA found that the DOE's determination of the USDWs was in accordance with definitions contained in section 191.22 and with the compliance criteria in section 194.53. The bounding analysis was performed with conservative assumptions for a hypothetical USDW to estimate contamination and potential doses to a receptor.

A complete description of the EPA's 1998 Certification Decision for section 194.53 is provided in CARD 53 (U.S. EPA 1998).

53.4 Changes in the CRA-2004

In the 2004 Compliance Recertification Application (CRA-2004) (U.S. DOE 2004), Chapter 8.0, the DOE updated some aspects of the USDW analysis. The DOE updated the data for groundwater quantity determination to define a USDW. In the CCA, the DOE used 1990 census data to determine the average water usage per person per day of 1067 liters (L) (282 gallons). (In the CRA-2004, the DOE used 2000 census data to determine that the average water usage per person per day had increased to 1155 L (305 gallons). The DOE did not believe it was necessary to change the subcriterion of a 5 gpm rate of production from a well to define a USDW (see the CRA-2004, Chapter 8.0, Section 8.2.1.1).

The DOE monitored and evaluated new wells drilled in the area since the completion of the CCA. A new well, C-2737, was drilled to replace H-1 in 2001. Water sampled from the Dewey Lake Formation showed 2,590 ppm TDS. Additional wells were drilled at the WIPP site to investigate the extent of groundwater at the contact of the Santa Rosa and Dewey Lake Formations. The groundwater samples indicated TDS at both below and above 10,000 ppm TDS. The DOE was unable to pump water from any one of these boreholes at a rate of 5 gpm or more.

The updates and changes made by the DOE in the CRA-2004 did not significantly impact the conclusions regarding USDWs in the CCA. In the CRA-2004, the DOE continued to identify the Culebra, Dewey Lake, and Santa Rosa as the only potential USDWs. The DOE stated that the conservative bounding analysis used for the 1998 Certification Decision compliance assessment was still applicable (see the CRA-2004, Chapter 8.0, Section 8.2.1.1).

53.5 EPA's Evaluation of Compliance for the 2004 Recertification

The EPA evaluated the information on the USDWs contained in the CRA-2004, Chapter 8.0 and examined data from the new wells drilled within the study area since the 1998 Certification Decision. The EPA determined that the DOE applied adequately conservative assumptions to the data for a hypothetical USDW to determine compliance with section 194.53.

Because of the lack of significant changes to the parameters for the protected individual, the potential exposure pathways, and the USDWs, the EPA agreed that the bounding analysis performed for the dose calculation in the CCA still applied. See CRA-2004 CARD 55 (U.S. EPA 2006) for more information on the results of the compliance assessment.

The EPA received no public comments on the DOE's continued compliance with the consideration of USDW requirements in section 194.53.

Based on a review and evaluation of the CRA-2004 and supplemental information provided by the DOE, the EPA determined that the DOE continued to comply with the requirements of section 194.53.

53.6 Changes or New Information Between the CRA-2004 and the CRA-2009 (Previously: Changes or New Information Since the 2004 Recertification)

In support of the CRA-2009 (U.S. DOE 2009), the DOE reviewed and updated information provided in the CCA and the CRA-2004, Chapter 8.0, Individual and Groundwater Protection Requirements. The updated material was provided as Appendix IGP-2009. Changes or new information pertaining to the update were as follows:

1. Updated information regarding average household water consumption in communities near the WIPP was obtained from the New Mexico Office of the State Engineer to assess the continued appropriateness of criteria for making USDW determinations. The updated information was included in Appendix IGP-2009, Section IGP-3.1.1. A review of these new data indicated that no change in the criteria for making USDW determinations was warranted.

2. Several new boreholes were drilled near the WIPP since the CRA-2004. These include wells to further characterize flow characteristics in the Culebra and to better understand shallow groundwater flow near the WIPP salt storage piles. Detail regarding these new wells was included in Appendix IGP-2009, Section IGP-3.2. Data from these wells indicated that no changes to the previous USDW determinations were warranted.

3. Based on the review of available data in support of the CRA-2009, the DOE concluded that no modification of the USDW determinations reported in the CCA, Chapter 8.0 and Appendix USDW was warranted (see Appendix IGP-2009, Section IGP-3.2). The DOE continued to conclude that USDWs are present in the Culebra, and potential USDWs are present in the Dewey Lake and the Santa Rosa. Based on this, the DOE concluded that all USDWs in the accessible environment expected to be affected by the disposal system over the regulatory time frame had been considered. In addition, the DOE approach ensured that underground interconnections among bodies of surface water, groundwater, and USDWs were considered.

Based on these considerations, the DOE believed that continued compliance with the provisions of section 194.53 was demonstrated for the CRA-2009.

53.7 EPA's Evaluation of Compliance for the 2009 Recertification

The EPA evaluated the information on USDWs contained in the CRA-2009, Section 53 and Appendix IGP-2009. The EPA examined the data from the new wells drilled within the study area since the 1998 Certification and the 2004 Recertification Decisions and determined that the DOE applied adequately conservative assumptions to determine compliance with 40 CFR 194.53.

The EPA concurred that there were no significant changes to the parameters for the protected individual, the potential exposure pathways, or the sources of underground drinking water. The EPA determined that the bounding analysis that was performed for the dose calculation in the CCA still applied. For the CRA-2009 evaluation (Appendix IGP-2009), the DOE noted that the maximum potential dose remained below the CCA value and continued compliance with the

individual protection standard was maintained. The EPA concurred that the potential concentrations of contaminants in the hypothetical USDW and the maximum potential dose to a receptor that drinks from the hypothetical USDW continued to be bounded by the CCA analysis results.

The EPA did not receive any public comments on the DOE's continued compliance with the consideration of underground sources of drinking water requirements of section 194.53.

Based on the EPA's review of the CRA-2009 and supplemental information provided by the DOE, the EPA determined that the DOE continued to comply with the requirements of section 194.53 (U.S. EPA 2010a and U.S. EPA 2010b).

53.8 Changes or New Information Since the CRA-2009

In support of the CRA-2014, the DOE reviewed and updated information provided in the CCA and previous CRA's individual and groundwater protection requirements. The updated material is provided as Appendix IGP-2014. Changes or new information pertaining to the update are as follows:

1. Updated information regarding average household water consumption in communities near the WIPP was obtained from the latest census to assess the continued appropriateness of criteria for making USDW determinations. The updated information is included in Appendix IGP-2014, Section IGP-3.1.1. A review of these new data indicated that no change in the criteria for making USDW determinations is warranted.

2. There were no new boreholes drilled at new locations since the CRA-2009. Five existing wells were plugged and replaced with new wells at the same locations. No new information relating to USDW was generated (see also Appendix HYDRO-2014, Section HYDRO-4.0).

3. No additional USDW investigations were performed as part of the CRA-2014 (see Appendix IGP-2014). Based on this review, no modification of the USDW determinations reported in the CCA, Appendix USDW is warranted. The DOE continues to conclude that there are no USDWs at the site boundary. In the vicinity of the WIPP, USDWs are present in the Culebra, and potential USDWs are present in the Dewey Lake and the Santa Rosa. Based on this, the DOE concludes that all USDWs in the accessible environment expected to be affected by the disposal system over the regulatory time frame have been considered. In addition, the DOE approach ensured that underground interconnections among bodies of surface water, groundwater, and USDWs were considered.

Based on these considerations, the DOE believes that continued compliance with the provisions of section 194.53 is demonstrated.

53.9 References

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

U.S. Department of Energy (DOE). 1996. *Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant* (October). 21 vols. DOE/CAO-1996-2184. Carlsbad, NM: Carlsbad Area Office.

U.S. Department of Energy (DOE). 2004. *Title 40 CFR Part 191 Compliance Recertification Application for the Waste Isolation Pilot Plant* (March). 10 vols. DOE/WIPP 2004-3231. Carlsbad, NM: Carlsbad Field Office.

U.S. Department of Energy (DOE). 2009. *Title 40 CFR Part 191 Compliance Recertification Application for the Waste Isolation Pilot Plant* (March). DOE/WIPP 09-2434. Carlsbad, NM: Carlsbad Field Office.

U.S. Environmental Protection Agency (EPA). 1993. "40 CFR Part 191 Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule." *Federal Register*, vol. 58 (December 20, 1993): 66398–416.

U.S. Environmental Protection Agency (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. Environmental Protection Agency (EPA). 1998. "CARD No. 53: Consideration of Underground Sources of Drinking Water." *Compliance Application Review Documents for the Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR 191 Disposal Regulations: Final Certification Decision* (May) (pp. 53-1 through 53-6). Washington, DC: Office of Radiation and Indoor Air.

U.S. Environmental Protection Agency (EPA). 2006. "Recertification CARD No. 55: "Results of Compliance Assessments." *Compliance Application Review Documents for the Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR 191 Disposal Regulations: Final Recertification Decision* (March) (pp. 55-1 through 55-6). Washington, DC: Office of Radiation and Indoor Air.

U.S. Environmental Protection Agency (EPA). 2010a. "Recertification CARD Nos. 53: Consideration of Underground Sources of Drinking Water." *2009 Compliance Recertification Application (2009 CRA) Compliance Application Review Documents (CARD) Nos. 53.* EPA Docket FDMS Docket ID No. EPA-HQ-OAR-2009-0330 (November 18, 2010). Washington, DC: Office of Radiation and Indoor Air.*

U.S. Environmental Protection Agency (EPA). 2010b. "40 CFR Part 194 Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the Disposal Regulations: Recertification Decision; Final Notice." *Federal Register*, vol. 75 (November 18, 2010): 70584 - 595.*