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

# Monitoring
# (40 CFR § 194.42)

## United States Department of Energy
## Waste Isolation Pilot Plant

**Carlsbad Field Office**
**Carlsbad, New Mexico**

# Monitoring
# (40 CFR § 194.42)

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## Acronyms and Abbreviations

| | |
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| CARD | Compliance Application Review Document |
| CCA | Compliance Certification Application |
| CMP | Compliance Monitoring Program |
| COMP | Compliance Monitoring Parameter |
| CRA | Compliance Recertification Application |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| PA | performance assessment |
| PABC | Performance Assessment Baseline Calculation |
| SNL | Sandia National Laboratories |
| WIPP | Waste Isolation Pilot Plant |

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# 42.0 Monitoring (40 CFR § 194.42)

## 42.1 Requirements

§ 194.42 Monitoring

(a) The Department shall conduct an analysis of the effects of disposal system parameters on the containment of waste in the disposal system and shall include the results of such analysis in any compliance application. The results of the analysis shall be used in developing plans for pre-closure and post-closure monitoring required pursuant to paragraphs (c) and (d) of this section. The disposal system parameters analyzed shall include, at a minimum:

1. Properties of backfilled material, including porosity, permeability, and degree of compaction and reconsolidation;
2. Stresses and extent of deformation of the surrounding roof, walls, and floor of the waste disposal room;
3. Initiation or displacement of major brittle deformation features in the roof or surrounding rock;
4. Ground water flow and other effects of human intrusion in the vicinity of the disposal system;
5. Brine quantity, flux, composition, and spatial distribution;
6. Gas quantity and composition; and
7. Temperature distribution.

(b) For all disposal system parameters analyzed pursuant to paragraph (a) of this section, any compliance application shall document and substantiate the decision not to monitor a particular disposal system parameter because that parameter is considered to be insignificant to the containment of waste in the disposal system or to the verification of predictions about the future performance of the disposal system.

(c) Pre-closure monitoring. To the extent practicable, pre-closure monitoring shall be conducted of significant disposal system parameter(s) as identified by the analysis conducted pursuant to paragraph (a) of this section. A disposal system parameter shall be considered significant if it affects the system's ability to contain waste or the ability to verify predictions about the future performance of the disposal system. Such monitoring shall begin as soon as practicable; however, in no case shall waste be emplaced in the disposal system prior to the implementation of pre-closure monitoring. Pre-closure monitoring shall end at the time at which the shafts of the disposal system are backfilled and sealed.

(d) Post-closure monitoring. The disposal system shall, to the extent practicable, be monitored as soon as practicable after the shafts of the disposal system are backfilled and sealed to detect substantial and detrimental deviations from expected performance and shall end when the Department can demonstrate to the satisfaction of the Administrator that there are no significant concerns to be addressed by further monitoring. Post-closure monitoring shall be complementary to monitoring required pursuant to applicable federal hazardous waste regulations at parts 264, 265, 268, and 270 of this chapter and shall be conducted with techniques that do not jeopardize the containment of waste in the disposal system.

(e) Any compliance application shall include detailed pre-closure and post-closure monitoring plans for monitoring the performance of the disposal system. At a minimum, such plans shall:

(1) Identify the parameters that will be monitored and how baseline values will be determined;

(2) Indicate how each parameter will be used to evaluate any deviations from the expected performance of the disposal system; and

(3) Discuss the length of time over which each parameter will be monitored to detect deviations from expected performance.

## 42.2 Background

In 40 CFR §194.42 (U.S. Environmental Protection Agency 1996), the U.S. Environmental Protection Agency (EPA) provides criteria to demonstrate compliance with the assurance requirement at 40 CFR §191.14(b) (U.S. Environmental Protection Agency 1993) to monitor the disposal system. The purpose of this monitoring is "to detect substantial and detrimental deviations from expected performance," with the expected performance predicted by performance assessment (PA). The criteria also require both a preclosure and postclosure

monitoring program using techniques that do not jeopardize the containment of waste in the disposal system. Ten monitoring parameters were identified in an analysis performed to fulfill the section 194.42 requirement during the original certification process. More detailed information describing the section 194.42 monitoring program is located in the U.S. Department of Energy (DOE) Compliance Monitoring Implementation Plan (U.S. Department of Energy 2005); the 2004 Compliance Recertification Application (CRA-2004) (U.S. Department of Energy 2004), Chapter 7.0, Section 7.2; and Appendix MON-2009.

The 10 parameters, their associated monitoring programs, the frequency of data collection and reporting, related PA parameters, and related screening decisions used to support the PA are listed in Appendix MON-2009, Table MON-1. These parameters are periodically evaluated to determine if there is an impact on the PA-related parameters, conceptual models, or features, events, and processes screening decisions (Wagner 2008a).

## 42.3 1998 Certification Decision

Based on information in the Compliance Certification Application (CCA) (U.S. Department of Energy 1996) and supplemental monitoring-related information for the CCA submitted to the EPA in response to their request for additional information regarding the methodology of the MONPAR analysis, the EPA determined that DOE was in compliance with the criteria of section 194.42 (U.S. Environmental Protection Agency 1998a, Section VIII.D.2, Monitoring). Additional details of the EPA's evaluation of compliance can be found in the Compliance Application Review Document (CARD) 42, Monitoring (U.S. Environmental Protection Agency 1998b).

## 42.4 Changes in the CRA-2004

Since 1998, the DOE has monitored and evaluated the 10 monitoring parameters listed in Appendix MON-2004, Table MON-1. For the CRA-2004, the DOE reassessed the CCA monitoring parameter analysis in light of changes in the monitoring program. This reassessment is documented in Kirkes and Wagner (2003), and described in the CRA-2004, Chapter 7.0, Section 7.2. It was determined that the CCA, Appendix MON, Attachment MONPAR monitoring parameter analysis performed to comply with section 194.42 requirements was adequate and did not need to be redone for the CRA-2004. The 10 monitoring parameters identified in the CCA were still sufficient to be included in the Compliance Monitoring Program (CMP) to detect substantial deviations from performance expectations and to comply with the requirements of section 194.42. Supplemental information was submitted to the EPA in response to their request for compliance monitoring annual reports and monitoring data references (Response C-42-1 through C-42-4; Detwiler [2004a], Response C-42-5 and C-42-6 Detwiler [2004b]). Since the CCA, the DOE found four monitoring parameters that either did not fall within the set trigger values or indicated a change from values used in the CCA. These parameters include

- Changes in the Culebra Dolomite Member of the Rustler Formation (hereafter referred to as Culebra) water level that may impact Culebra groundwater flow direction and/or composition
- A change in the probability of encountering a Castle brine reservoir

- A change in the drilling rate because of continued oil and gas drilling in the Delaware Basin
- Changes in the waste activity caused by changes in the waste inventory

The impacts of these changes were considered in the CRA-2004, Appendix PA and the EPA-mandated CRA-2004 Performance Assessment Baseline Calculation (PABC) to assess their impact on compliance; see CARD 23, Models and Computer Codes (U.S. Environmental Protection Agency 2006a), which documents EPA's review of these impacts and their determination of continued compliance with the disposal standards.

## 42.5 EPA's Evaluation of Compliance for the 2004 Recertification

In the EPA's CARD 42, the EPA stated that through their annual monitoring and waste emplacement inspections they had determined that the DOE meets the requirements of section 194.42 (U.S. Environmental Protection Agency 2006b). The results of these inspections are documented in CARD 21, Tables CARD 21-1 and 21-2 (U.S. Environmental Protection Agency 2006c).

## 42.6 Changes or New Information since the 2004 Recertification

The CMP outlined in Section 42.2 was developed to implement the requirements of section 194.42; the program continues to monitor the WIPP to detect substantial and detrimental deviations from expected performance. This program has not indicated such a condition. No changes have been made to this program from that described in the CRA-2004, Chapter 7.0, Section 7.2, and Attachment MON-2004. New information that supplements the information in the CRA-2004, Chapter 7.0, Section 7.2 includes the following:

1. Results of the CMP since 2004 (Appendix DATA-2009 contains these reports)
2. Assessment of the impact of changes on the CMP (Wagner 2008b)

The annual Compliance Monitoring Parameters (COMPs) report presents monitoring results and determines whether the results are within PA expectations, whether they impact the assumptions or parameters used in PA, or whether they impact the monitoring program. A review of the conclusions in the last four annual COMPs reports (Wagner 2008b) shows the following:

- The results of the COMPs assessments concluded that there were no reportable conditions or events.
- Water levels in the Culebra continue to rise across the monitored region. DOE continues their investigation of these events. These investigations led to the inclusion of updated water-level information during the CRA-2004 PABC (see preface to Appendix TFIELD-2009). The CRA-2009 PA uses the CRA-2004 PABC transmissivity fields.
- The CMP is investigating sample collection and analytical laboratory techniques to reduce uncertainties in water chemistry results.

- No changes to the COMPs or CMP were recommended.

The results of the COMPs reports validate the need to monitor groundwater and demonstrate the importance of continued monitoring and the need to incorporate results into the PA (Sandia National Laboratories 2004).

The CCA, Appendix MON, Attachment MONPAR documents an analysis that is used to determine which monitoring parameters should be included in the CMP. A reassessment of this analysis, documented in Wagner (2008b), determines whether changes to elements of the WIPP program since the last certification affect the conclusions in the CCA, Appendix MON, Attachment MONPAR analysis. The reassessment first determined which changes should be considered, and then determined the impact of these changes on the conclusions drawn in the CCA, Appendix MON, Attachment MONPAR analysis. Changes to the following disposal system elements were evaluated:

1. Monitoring results
2. Experimental activities
3. PA changes: methodology, parameters, and implementation
4. WIPP operational changes
5. Proposed changes to activities and conditions approved by the EPA

Based on the review of operational activities, conditions, monitoring data, the PA, and experimental programs that occurred since the CRA-2004, the reassessment concludes, "the conclusions of the MONPAR analysis remain valid and its conclusions continue to be adequate for inclusion in the CRA-2009" (Wagner 2008b).

The DOE believes the information presented in the CRA-2004, Chapter 7.0, Section 7.2; the CRA-2004, Attachment MON-2004; Appendix MON-2009; and the supplemental information provided in this section continue to demonstrate compliance with the provisions of section 194.42.

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