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## WIPP Compliance Certification Application

### Calculations Parameters

#### Part 2: Parameter Documentation

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### Introduction

The Waste Isolation Pilot Plant (WIPP) in southeast New Mexico has been studied as a transuranic waste repository for the past 23 years. During this time, an extensive site characterization, design, construction, and experimental program was completed, which provided in-depth understanding of the dominant processes that are most likely to influence the containment of radionuclides for 10,000 years. Nearly 1500 parameters were developed using information gathered from this program and were input to numerical models for WIPP Compliance Certification Application (CCA)<sup>1</sup> Performance Assessment (PA) calculations.

The CCA probability models require input parameters that are defined by a statistical distribution. Developing parameters begins with the assignment of an appropriate distribution type, which is dependent on the type, magnitude, and volume of data or information available. Parameter development may require interpretation or statistical analysis of raw data, combining raw data with literature values, scaling laboratory or field data to fit code grid mesh sizes, or other transformations. Documentation of parameter development is designed to answer two questions: "What source information was used to develop this parameter?" and "Why was this particular data set/information used?" Therefore, complete documentation requires integrating information from code sponsors, parameter task leaders (PTLs), performance assessment analysts (PAAs), and experimental principal investigators (PIs).

This paper, Part 2 of two parts, contains a discussion of the WIPP CCA PA Parameter Tracking System, document traceability and retrieveability, and lessons learned from related audits and reviews. Part 1 of this paper contains a discussion of the parameter development process, roles and responsibilities, and lessons learned.

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## Discussion

When reviewing or auditing parameters used in the WIPP CCA PA calculations, the regulators and auditors assessed parameter traceability, retrieveability, justification, and the qualification of supporting data or other source information. The WIPP CCA PA Parameter Tracking System provides the framework for tracing from WIPP CCA PA Parameter Database values through the parameter documentation to data or other underlying source information.

The original intent was that users could trace from the parameter information contained in the WIPP CCA PA Parameter Database to supporting information using only the information contained in Parameter Record Packages (PRPs). However, during the CCA parameter reviews, Environmental Protection Agency (EPA) staff and others requested additional supporting documentation and/or clarification for many parameters. New information and clarifications were documented in memoranda that were filed within the appropriate PRPs, attached to Form 464 or contained within PRP or Form 464 correspondence files, and (in some cases) entered into the WIPP CCA PA Parameter Database. As this process continued, tracing through the supporting information to pertinent information became more cumbersome as the complexity of the information-linking network increased. In addition, no single source compiled all the information related to parameter development, documentation, and qualification.

As a result, general parameter information was documented in the Parameter Guidebook.<sup>2</sup> Additional documentation, direct ties to supporting information, and clarification of rationale and justification were documented in the EPA Parameter Database (WIPP Project Office Number [WPO#] 46878 and 46879), which supplements the WIPP CCA PA Parameter Database. Because the EPA Parameter Database complements the information found in the PRPs, both systems should be used to trace to the data or other supporting information for a parameter, as illustrated in Figure 1. The user will eventually trace to the same source information using either system. For example, as shown in Figure 1, either system will lead the tracer to Sources 3 and 5. The EPA Parameter Database will shorten the process (i.e., bypassing Sources 1, 2, and 4); however, relevant supporting information may be overlooked.

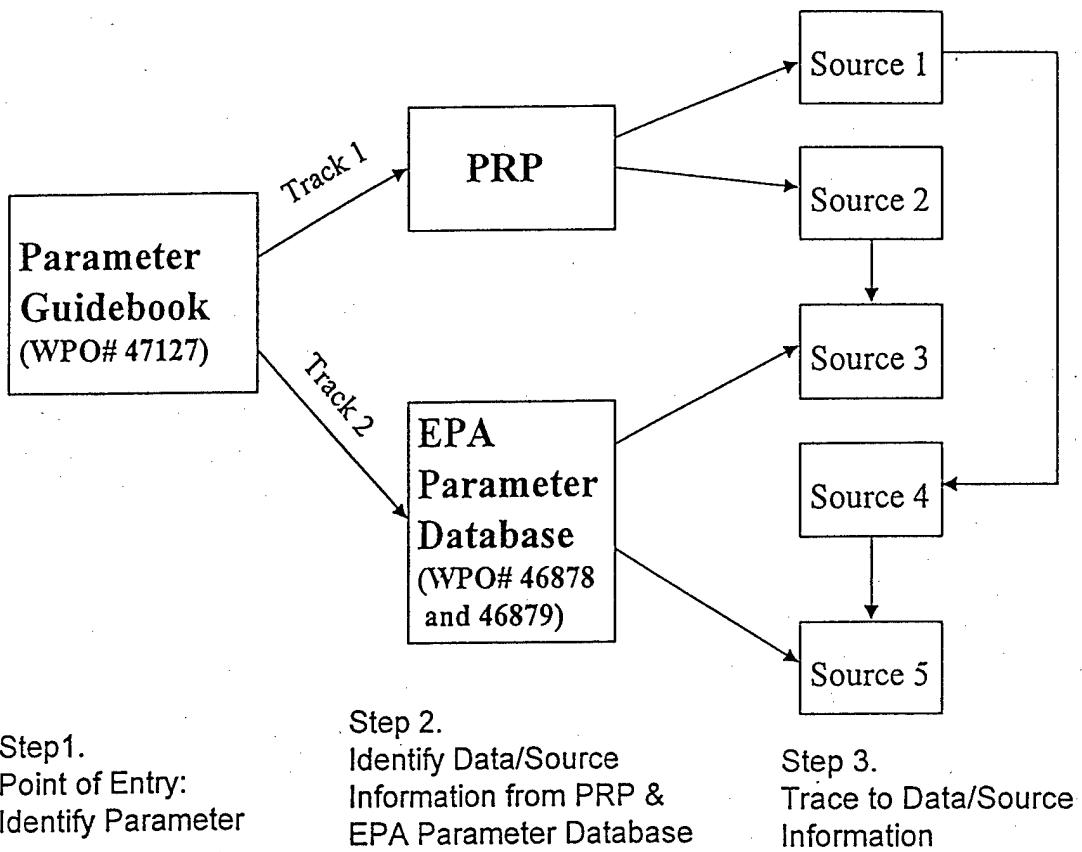


Figure 1. WIPP CCA PA Parameter tracking process.

## WIPP CCA PA Parameter Tracking System

### Point of Entry

As shown in Figure 1, the point of entry to the tracking process is the Parameter Guidebook. Each WIPP CCA PA Parameter is uniquely identified three ways: by an identification number, by the WPO# of its Form 464, or by a two-part name consisting of a material name and a parameter name. Appendices in the guidebook contain cross references of parameter and material names and parameter identification numbers. A parameter's identification number is required to use both tracking systems.

### Track 1: Parameter Trace Using the Parameter Records Package System

After a parameter identification number is known, the PRP may be obtained from the Sandia WIPP Central Files (SWCF). As described in Part 1 of this paper, the PRP for each parameter includes a Form 464, which contains parameter identification and category, distribution type and values, source references, and additional information such as concurrence

and data entry signatures. Parameter categories are assigned according to the type of source information available, as shown in Table 1. As illustrated in Figure 2, the number of tiers of supporting information depends on the category of the parameter.

Table 1. WIPP CCA PA Parameter Categories and Supporting Information

Category	Description	Primary Source of Supporting Information
1	Based on site-specific information used as initial input to a WIPP PA numerical model that specifies the physical, chemical, or hydrologic properties of the rock formations, seals, backfills, and waste form, or any other natural or engineered feature of the WIPP.	PI Parameter Packages and Data Records Packages containing laboratory, field, and/or technical literature and data.
2	Represent the inventory of the waste to be emplaced in the WIPP as defined in the WIPP Transuranic Waste Baseline Inventory Report. <sup>3</sup>	WIPP Baseline Inventory Report. <sup>3</sup>
3	Represent precisely known, tabulated physical constants (e.g., half-life of a radionuclide, gravitational constant).	Technical literature, handbooks, and textbooks.
4a	Assigned based on a similarity of properties between similar materials or features.	Category 1 parameters or other supporting information.
4b	Model configuration parameters not based on specific WIPP properties or features but needed to make PA models run (e.g., time-step limits).	PA Analysis Packages.

Category 1 parameters, those based on empirical data, are the most difficult to trace because of the sheer volume of data, supporting information, and documentation. The PI Parameter Packages (PIPPs), which are identified by WPO# on Form 464, were created to link the Data Records Packages and/or other supporting information to the parameter distributions found in the PRPs. The PIPP s provide consistent, traceable links (in summary format) between PA database parameters and data packages; provide data summaries, identify related interpretive codes and references (including reports and test plans), and, where applicable, provide a summary of experimental data collection.

In some cases a single PIPP supports a single parameter; in other cases a single PIPP may support multiple parameters; in still other cases a single parameter is supported by multiple PIPP s

(e.g., if a parameter was developed by combining laboratory and field data and separate PIPPs were assembled for the two data sets). A road map to supporting Data Records Packages is contained within the PIPP and identifies relevant supporting information by WPO# or other reference citations.

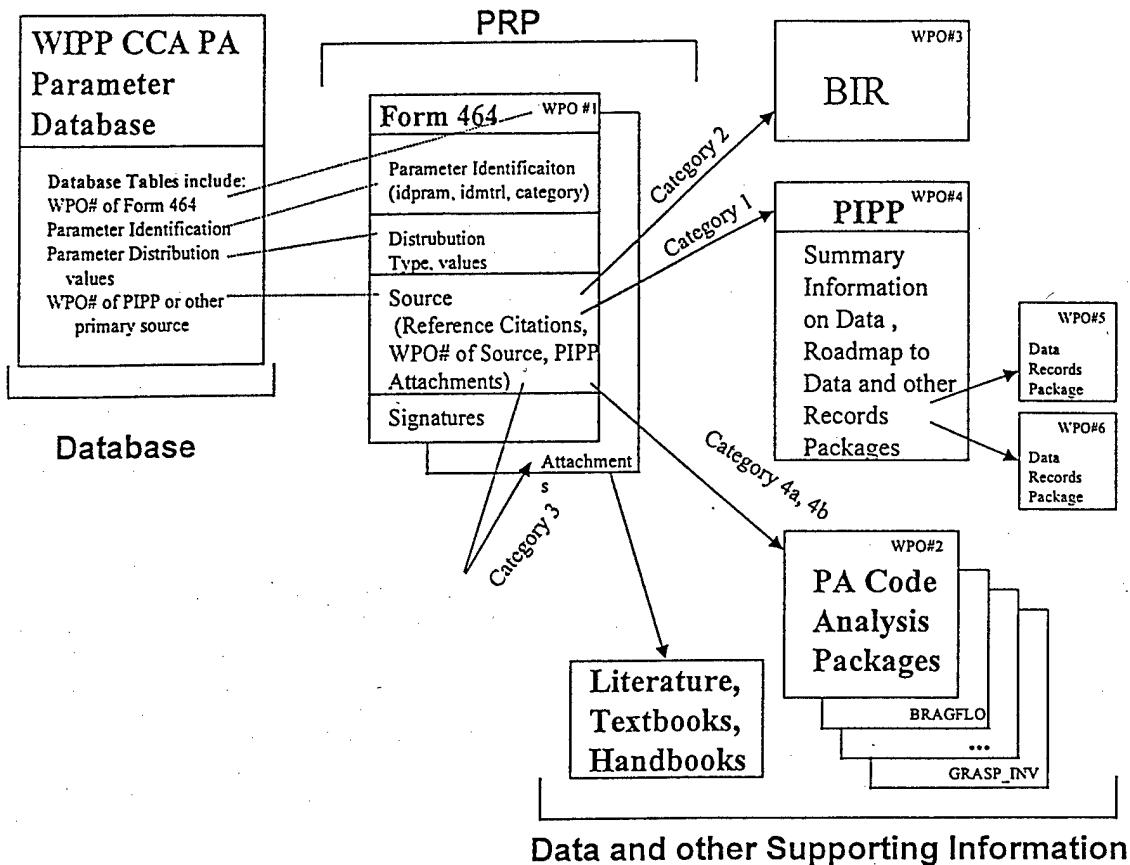


Figure 2. Parameter Records Package tracking system.

As illustrated in Figure 2, Category 2, 3, 4a, and 4b parameters trace directly to supporting information listed in the PRP, either in the “Source” block of Form 464 or within attachments or enclosed memoranda. Category 2 parameters are primarily supported by information found in the WIPP Baseline Inventory Report.<sup>3</sup> Category 3 parameters are supported by technical literature, handbooks, and textbooks. Category 4a parameters are analogues, and supporting information may be linked back to Category 1 parameters or other referenced information. Category 4b parameters are model configuration parameters and, like Category 4a parameters, are linked directly to the supporting information via Form 464 and linked indirectly

to the PA Code Analysis Packages, which contain parameter development justification and rationale.

### **Track 2: Parameter Trace Using the EPA Parameter Database**

Sandia National Laboratories constructed the EPA Parameter Database as a supplement to the WIPP CCA PA Parameter Database to support the EPA's review efforts and centralize information related to the parameters. This database, also known as the *wipp\_reference* database, provides the following:

1. quick-look information related to supporting data qualification;
2. a centralized location for general parameter information (e.g., unit conversions, parameters computed from database values, parameters whose database value were superseded, and parameters not contained in the CCA PA Parameter Database); and
3. a more direct pathway to pertinent information supporting the justification and rationale.

Data or other source information can be traced using the EPA Parameter Database. With the parameter identification number in hand (obtained from the Parameter Guidebook), one may use the EPA Parameter Database tables to identify direct ties to supporting information and clarification of rationale and justification used to develop a parameter.

## **Conclusions**

When reviewing WIPP CCA PA parameters and supporting information, EPA staff and auditors sought both the *what* and the *why* of parameter development. The WIPP CCA PA Parameter Tracking System, comprised of the Parameter Records Package tracing system and the EPA Parameter Database, provided sufficient documentation to trace chosen parameter distribution values and decision points.

## **Lessons Learned**

A PA parameter tracking system must be transparent, flexible, and inclusive. It must be sufficiently transparent and well-mapped so that a reviewer can confidently step in at the point of entry, retrieve relevant documentation, and ascertain that sufficient justification and rationale exist to support the derived parameter values. The system must be flexible and scaleable to

accommodate varying magnitudes and multiple tiers of supporting information. The system must provide the means to track or trace all pertinent information related to parameter development.

## Acknowledgment

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## References

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