IT'S NOT JUST ACCEPTABLE, IT'S EXEMPLARY!!! A SUCCESSFUL AND WIPP-CERTIFIED ACCEPTABLE KNOWLEDGE PROGRAM AT ROCKY FLATS

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ABSTRACT

A successful Acceptable Knowledge (AK) program has been developed and implemented at the Rocky Flats Environmental Technology Site (RFETS) by Rocky Mountain Remediation Services, the waste management subcontractor at Rocky Flats. During 1998, the RFETS AK program was audited by the Department of Energy (DOE) Carlsbad Area Office and the Environmental Protection Agency (EPA), and the program received two Exemplary Practice citations and was certified for waste disposal at the Waste Isolation Pilot Plant (WIPP). The AK program at Rocky Flats is also accepted by the Nevada Test Site (NTS), allowing the Site to ship a large volume of low level waste for disposal at NTS, and it meets the requirements of the Resource Conservation and Recovery Act (RCRA) for the documentation of process knowledge characterization.

The AK program is actually a combination of the following four systems which work together to document the historical knowledge and characterization information for all waste generated at RFETS:

1. Waste Stream and Residue Identification and Characterization (WSRIC) system - the primary AK system used to describe and characterize thousands of waste outputs since 1992.
2. Non-Routine Waste Origination Logs (NRWOLs) - used to document unique, one-time-only generated wastes.
3. Backlog Waste Reassessment Baseline Book (BWRBB) and Waste Reassessments – used to characterize waste packages in storage at RFETS that were generated before the WSRIC and NRWOL programs came into existence, and to update or change AK when confirmatory measurements provide information which is in conflict with existing AK documentation.
4. Supplemental AK Documentation - a document which contains AK information specifically required by WIPP for transuranic (TRU) and transuranic mixed with hazardous (TRM) waste which is not documented elsewhere, including radionuclide and defense waste determinations.

The AK program includes all waste types generated at RFETS (radioactive, nonradioactive, hazardous, mixed and sanitary) from all types of processes (operations, maintenance, environmental restoration, and decommissioning). The WSRIC, NRWOL, and Waste Reassessment elements of the AK program have been in place for several years at RFETS and are being used successfully in day-to-day waste generation operations. The AK program relies heavily on waste generation process knowledge provided by the waste generator, thereby minimizing costly sampling and analysis for waste characterization purposes.

The systems within the Rocky Flats AK program are continually updated with new information about currently and previously generated waste. The AK program is maintained on a relatively slim annual budget of less than $1 million, and efforts are underway to further streamline the AK program in FY99.

BACKGROUND

RFETS is in a decommissioning and environmental restoration mode after over 40 years of nuclear weapons production for the Department of Energy (DOE). RFETS is storing over 1800 cubic meters of TRU and TRM waste and estimates the future generation of an additional 13,000 cubic meters of TRU and TRM during site decommissioning, estimated to be complete by 2006. This waste is destined for disposal at the WIPP facility in New Mexico.

The RCRA and Colorado Hazardous Waste Regulations authorize waste generators and treatment, storage, and disposal facilities to use AK, in appropriate circumstances, to make hazardous waste determinations. AK includes information relating to site history, process operations, and waste management, in addition to waste-specific data generated prior to the effective date of the RCRA regulations. AK, as an alternative to sampling and analysis, can be used to meet all or part of the RCRA waste characterization requirements. Sites must compile all process information and data that support the AK used for waste stream characterization.

Since TRU waste poses health and safety risks to waste characterization personnel, excessive handling and manipulation of the waste must be minimized. In addition, TRU waste often consists of non-homogeneous debris that is very difficult to sample. The collection of representative samples of TRU waste is extremely costly, increases the potential of human exposure to radiation, and under most circumstances, is not feasible. TRU waste can be characterized using AK in conjunction with visual examination, headspace gas analysis, and solidified waste analysis, while limiting exposure to personnel and the risk of an environmental release.

The WIPP Transuranic Waste Characterization Quality Assurance Program Plan requires generators of TRU waste to create a consistent, defensible, and auditable record of the information used to characterize waste. This AK record must contain sufficient information of the waste generating operations and waste composition to assign EPA hazardous waste numbers, matrix waste parameters, and identify radionuclides in each stream.

Several process knowledge based programs for waste characterization have been in existence at RFETS since the early 1990's. These systems were implemented to meet the Colorado Hazardous Waste Regulations and RCRA requirements to document hazardous waste determinations and waste characterization based on process knowledge. These systems were also used as the basis for the RFETS Waste Generator Program that was implemented in the early 1990's to obtain approval to resume low level waste (LLW) shipments to the Nevada Test Site. These existing programs were reviewed in context of the WIPP AK requirements and found to be providing the bulk of the information required. The existing programs have been expanded and supplemented to meet the WIPP AK requirements.

ACCEPTABLE KNOWLEDGE PROGRAM FOR RFETS WASTE GENERATED SINCE 1992

In 1992, the Waste Stream and Residue Identification and Characterization (WSRIC) program was initiated as the result of agreements and compliance orders related to the implementation of the Colorado Hazardous Waste Regulations. WSRIC is a series of several hundred "Building Books", which describe all waste generating processes currently occurring in each building at RFETS and characterizes over 4000 waste outputs generated from these processes. The WSRIC Building Books include waste generating process descriptions, chemical inputs, process flow diagrams, waste outputs, waste characterization information, and characterization rationale. All waste outputs are described and characterized, including radioactive, nonradioactive, hazardous, mixed, and sanitary waste outputs. Characterization information provided in the WSRIC Building Books includes radiological and hazardous waste determinations, EPA Hazardous Waste Numbers, identification of Land Disposal Restriction information, chemical constituent identification, and compatibility codes. Characterization information is supported primarily by process knowledge but includes a discussion of analytical data, where available. Figure 1 is an example of a Characterization Rationale page from a WSRIC Building Book.

The WSRIC Building Books are constantly updated to reflect the waste generation processes occurring in each building, and each WSRIC Building Book is reviewed at least annually to ensure it is current. In the years since the inception of WSRIC, many waste generating processes have ceased, and some buildings have been demolished. As this occurs, the waste processes and building books are "archived" in the WSRIC program. All records of these previous waste processes and waste outputs are maintained in the WSRIC history files for future reference.

A much smaller system was introduced in 1992 to address waste outputs not easily included in the WSRIC Program. This system is called the Non-Routine Waste Origination Log (NRWOL). A NRWOL is used to collect and document the characterization of waste generated from a non-routine, one-time only process, such as waste resulting from a spill clean up. The NRWOL collects the same type of characterization information as would be included in a WSRIC building book. Figure 2 is a sample of a completed NRWOL.

The characterization information provided by the WSRIC and NRWOL systems is prepared on a waste output basis, and each waste output is assigned a WSRIC or NRWOL "process number". As waste is generated, it is placed in individual waste packages (such as drums and crates) for storage and eventual shipment to various waste disposal facilities. The WSRIC or NRWOL process number and associated waste output characterization information for each waste package is stored in a computer database (the Waste and Environmental Management System - WEMS). The WSRIC or NRWOL process number is also hand-written on a paper form called a Waste/Residue Traveler which stays with the waste package. This procedure provides both an electronic and paper system for documenting the AK of each waste package generated at RFETS.

ACCPETABLE KNOWLEDGE PROGRAM FOR BACKLOG WASTE AND WASTE REASSESSMENTS

A number of waste packages generated prior to the implementation of the WSRIC and NRWOL programs and the use of the Waste/Residue Traveler are still in storage at RFETS; this waste is called "backlog" waste. Historically, the characterization of this backlog waste has been inconsistent and poorly documented. RFETS initiated the Backlog Waste Reassessment (BWR) Project in 1994 to assess the characterization of over 45,000 packages of backlog waste in storage at RFETS. The BWR Project assessed existing waste package information and paperwork, interviewed waste generating personnel, reviewed operating procedures, gathered and reviewed existing analytical data, and consulted waste characterization experts.

The BWR Project developed a consistent and documented characterization program for the stored inventory of RFETS backlog waste. The documentation is contained in a controlled document entitled the Backlog Waste Reassessment Baseline Book (BWRBB). The BWRBB is divided into approximately 60 different chapters describing the various waste forms of backlog waste (filters, glass, combustibles, metal, etc.). Each chapter provides a description of the processes that generated that waste form, chemical inputs, summary of analytical data, and waste characterization information and rationale. Waste forms are typically subdivided into smaller subpopulations of waste packages which share a common waste characterization.

After the 1994 BWR Project was completed, the waste package paperwork (if any existed) was updated to reflect the new reassessed characterization information and a characterization subpopulation number was assigned. The WEMS database was also updated to include the new characterization information and subpopulation number.

Though the initial BWR Project is over, RFETS still uses the process to review new data and update the characterization of containerized waste whenever new data is identified. The process of reviewing and evaluating new data, determining a new waste characterization, and updating the waste package paperwork, WEMS database, and AK documentation is known as Waste Reassessment. Waste Reassessment, a controlled and proceduralized process, is the only acceptable way to update the characterization on an already generated, containerized waste.

SUPPLEMENTAL ACCEPTABLE KNOWLEDGE INFORMATION

The information provided by the WSRIC, NRWOL, and BWR programs provide an excellent base for meeting the AK requirements of WIPP for TRU and TRM waste. However, seven areas unique to the WIPP requirements are inadequately addressed by these programs. RFETS decided to provide an additional document to meet these requirements rather than incorporate the requirements into the existing WSRIC, NRWOL, and BWR programs.

For WIPP requirements only applicable to TRU and TRM waste, the RFETS TRU Waste Acceptable Knowledge Supplemental Information document was developed to address the following seven areas of AK:

Radionuclides: This section identifies the radionuclides used at RFETS that may be present in TRU and TRM waste. This information provides the basis for meeting the WIPP radionuclide characterization requirements by nondestructive assay.

Defense Waste: This section references documentation that shows RFETS TRU and TRM waste resulted from defense programs, thus meeting a WIPP waste acceptance criterion.

Matrix Parameter Categories: WIPP requires RFETS to identify wastes with similar physical and chemical properties and to group these wastes by similar properties. These groupings of RFETS TRU and TRM wastes are the matrix parameter categories that are listed as part of the supplemental AK.

Non-Solvent Volatile Organic Compounds: This section documents that the presence of toluene in headspace gas samples is due to the off gassing of waste packaging material, rather than from its use as a solvent. This provides justification for not adding an EPA hazardous waste number to the containers having toluene in the headspace gas above the WIPP Program Required Quantitation Limit.

Pyrophorics: WIPP prohibits the presence of pyrophoric material in TRU and TRM waste. Tests performed on the most potentially reactive waste forms confirm that no pyrophorics are present in RFETS waste.

Underlying Hazardous Constituents: WIPP requires all containers of characteristically hazardous TRU waste be assigned an EPA hazardous waste numbers for each underlying hazardous constituent. This section identifies which waste outputs have underlying hazardous constituents.

RCRA Metals in Plutonium: This section documents an assessment of analytical data showing concentrations of toxicity characteristic metals in plutonium metal at low ppm levels. This assessment was performed in response to a WIPP audit observation.

The Supplemental document is prepared, maintained, and controlled per rigorous procedures and is supported by auditable records. It has become a useful document to address unique WIPP concerns about particular areas of AK.

CONFIRMATION AND UPDATING OF ACCEPTABLE KNOWLEDGE

WIPP requires certain sampling and analysis processes for TRU and TRM waste, such as real-time radiography, headspace gas analysis, solid waste sampling, non-destructive assay, and visual examination. In addition to providing WIPP-required data, these events are also used to confirm the AK already available for the waste packages.

In the case where the sampling and analysis results conflict with the AK package, a Waste Reassessment is performed and the characterization of the waste is updated. For example, if a TRU drum of nonhazardous combustibles is radiographed and a leaded glove is found to have been inadvertently placed in the drum, the operator generates a non-conformance report. This non-conformance report is forwarded to Waste Reassessment personnel who follow a controlled process for reviewing and evaluating the new data. The Waste Reassessor adds a new subpopulation to the BWRBB for "combustibles with a leaded glove" and recharacterizes the drum from TRU to TRM with the EPA Hazardous Waste Number of D008 for lead. The drum paperwork is updated to include the new characterization, and the WEMS database is also updated. This controlled procedure ensures that all supporting AK information is consistent and supports the new characterization data on the drum.

PREPARATION OF WASTE STREAM SUMMARIES AND WASTE PROFILES

The final steps in preparing a waste stream to go to WIPP are the preparation of Waste Stream Summaries and Waste Profiles.

Waste streams are distinguished based upon physical form, chemical composition (including RCRA EPA hazardous waste codes), and the waste generating process. Waste generated from the same or similar processes and having similar physical form, chemical composition, and RCRA characterization may be classified into the same waste stream.

Once a waste stream has been identified and defined, two additional documents are prepared: 1) an Acceptable Knowledge Waste Stream Summary and 2) a WIPP Waste Stream Profile Form.

As the title suggests, an Acceptable Knowledge Waste Stream Summary summarizes all the significant AK associated with a given waste stream and includes information pertaining to the following topics:

- Generic waste stream information such as the waste stream title, volume, generation dates and associated TRUCON content codes
- Waste stream description, including matrix parameter category designation and weight percent estimates of waste material parameters
- Associated Transuranic Waste Baseline Inventory Report Information
- Areas and processes where the waste stream was generated
- RCRA characterization summary including identification of applicable BWR subpopulations and WSRIC process numbers
- Radiological AK information including a listing of the potential radionuclides that may be present within the waste stream and require assay

A WIPP Waste Stream Profile Form is a required WIPP-specific form prepared and submitted to WIPP for approval. Completion of a WIPP Waste Stream Profile Form requires the preparer to provide information or documentation pertaining to such things as the waste stream profile number, technical

contacts, general waste stream information, summarized AK information, other supplemental documentation, sampling and analysis information and a waste stream profile form certification statement.

The profiling process requires that a representative lot of waste packages from the waste stream be selected and characterized in accordance with all applicable requirements of the Transuranic Waste Characterization Quality Assurance Program Plan (CAO-94-1010). Characterization may include such things as nondestructive assay, radiography, headspace gas sampling and analysis and solid sampling and analysis. Confirmatory sampling and analysis data collected for this waste stream lot is then used to prepare data summary reports. The applicable data summary reports along with the Acceptable Knowledge Waste Stream Summary are attached to the WIPP Waste Stream Profile Form and submitted to WIPP for approval. The characterization data associated with the lot used to profile the waste stream is also electronically transmitted into the WIPP Waste Information System (WWIS).

Once the profile is approved, waste packages falling within the parameters of the profile may be selected for shipment to WIPP. AK summary information and characterization data for each individual waste package is submitted electronically to WIPP for review and approval prior to shipment.

ADVANTAGES OF RFETS ACCEPTABLE KNOWLEDGE PROGRAM

The RFETS AK program has successfully supported the Site's waste characterization and documentation needs for several years. The advantages of the program are listed below.

- The program is centralized and applies to all waste types and all facilities at the Site. This ensures consistency in characterization and the quality of documentation.

- The program meets the requirements of many different customers (WIPP, NTS, other disposal facilities and RCRA).

- The systems provide a great deal of information about past and current operations conducted in the various Site buildings, which is useful during planning for the decommissioning of the facilities.

- The program provides waste stream specific characterization information for the on-the-floor waste generators that has been reviewed by characterization experts who are knowledgeable of the latest characterization regulations and interpretations.

- The program is relatively inexpensive to maintain, operating on a budget of less than $1M/year. A central organization maintains the various AK systems, and relies on a network of highly trained floor level Waste Characterization Subject Matter Experts to review and sign off on waste characterizations.

- The RFETS AK program was designed to be constantly updated, so that it can reflect the most current operations and waste characterization information. The start-up and shutdown of operations, decommissioning of buildings, changes to process inputs, and changes to waste output characterization can be readily input into the AK systems.

- The majority of the waste characterizations in the RFETS AK systems are based on process knowledge, thereby reducing the need for costly sampling and analysis.

PLANNED FUTURE ENHANCEMENTS

A major WSRIC database upgrade is planned for 1999. The current database is over 9 years old, uses obsolete software packages, and is accessible only by the central WSRIC maintenance staff as a tool to produce the WSRIC Building Book. The new upgraded WSRIC database will be available to waste generators "on-line" to request changes to the WSRIC Building Books, to view and print Building Books, and to generate various reports from the database. Additionally, NRWOLs will be incorporated into the new WSRIC database, thereby eliminating the NRWOL program as a separate system. The WSRIC database upgrade will reduce the large amount of paperwork currently involved in updating and distributing the WSRIC Building Books, will provide faster turnaround for the creation and modification of waste outputs, and will make available a wealth of characterization data and history via the site-wide RFETS computer network.

A new module in WEMS is under development to more efficiently conduct Waste Reassessments. The waste reassessor will use the Waste Reassessment module to query all the waste packages in WEMS based on certain parameters. Once the population of waste packages for reassessment are determined, the new characterization data for the waste packages is assigned in the Waste Reassessment module, along with information about why the characterization is being changed. Waste package custodians are then automatically notified that a Waste Reassessment has occurred and that changes to the characterization of their waste packages are pending. The custodians approve the changes with a single keystroke, and the WEMS database is automatically updated with the new characterization. The module also provides an easy way to track Waste Reassessments not yet accepted by the waste custodian. The development of this module reduces duplicated data entry, provides better recordkeeping of characterization changes, and improves efficiency for tracking reassessment completion.

CONCLUSIONS

The RFETS AK program meets the requirements of RCRA, WIPP, NTS, and other disposal sites for accurate and documented waste characterization. The RFETS AK is designed to be extremely flexible so that changes to Site operations, characterization philosophy, and mandated requirements can be easily addressed. The program is relatively inexpensive to operate and is accepted and used by all waste generators at the Site.