APPENDIX S
FACTOR SPECIFIC QUALITY ASSURANCE

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FACTOR SPECIFIC QUALITY ASSURANCE

1.0 INTRODUCTION

Within the eight factors there were specific quality assurance measure taken. Some factors used computer codes while many used manual calculation and estimates to analyze the Engineered Alternatives (EAs). The following section describes Quality Assurance (QA) measure used within most of the factors.

1.1 TRANSPORTATION FACTOR

1.1.1 *Computer Codes*

All codes used for the transportation risk were developed under applicable QA standards. Previous verification has been performed on all models used in this analysis.

- RADTRAN—RADTRAN was developed by Sandia National Laboratories (SNL). The code has been continuously updated and subjected to SNL's QA procedures and standards. The code is accepted by the U.S. Department of Energy (DOE) for transportation use in estimating radiological risks.

- HIGHWAY—HIGHWAY was developed by Oak Ridge National Laboratory (ORNL). The code is continuously updated and subjected to ORNL's QA procedures and standards. The code is accepted by DOE for use in estimating routes, mileage, and fraction of travel in population zones.

- MICROSHIELD—MICROSHIELD was developed by Grove Engineering. The code meets American National Standards Institute standards and QA requirements.

1.1.2 Reporting

All transportation analysis results presented in the transportation risk section were double checked by independent review. The text was technically edited and subjected to a peer review.

1.2 IMPACT ON UNCERTAINTY IN COMPLIANCE ASSESSMENT

During the performance of the technical analysis, control of quality was maintained by verification and review of the work in progress. These reviews were performed at various stages of the work to assure that all aspects of the work affecting project quality requirements have been properly considered. Calculations, input data, report sections, and drawings were checked and verified during these reviews.

The computer codes developed for this factor were documented and validated in accordance with a defined QA procedure and includes the specification requirements, design and development information flowcharts, source code and sample data, and verification records documenting the test plan and results.

1.3 COST AND SCHEDULE FACTOR

1.3.1 Mass and Volumes

This section describes the quality assurance procedures used for the calculation of transuranic (TRU) waste preprocessed masses and volumes and final postprocessed masses and volumes.

1.3.2 Calculation of Initial Masses and Volumes

An electronic copy of the Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report (WTWBIR), which is a reference DOE document, was used as the basis for determining the preprocessing masses and volumes. The WTWBIR data were imported into spreadsheets and manipulated to calculate the masses and volumes. These spreadsheets are subject to the following peer review:

- Transcription checkpoints were performed for data entered manually.
- Data sorts were spot-checked to ensure no loss of data during the sorting operation.
- Manual calculations were performed on random samples of data to verify spreadsheet calculations.

Records were generated that show the spreadsheet was verified, the date of the review, the reviewer, results, and corrective action (if required). The text of the Waste Inventory Appendix (Appendix O) was subject to peer reviews and technical editing.

1.3.3 Calculation of Final masses and Volumes

Computer programs were developed to determine final masses and volumes for the baseline and each alternative in each configuration, based on scaled initial masses and volumes. The computer code was reviewed against process flow diagrams to ensure proper logic. Manual calculations were performed to demonstrate the capability of the computer program to produce valid results. Manual calculations were used to test the overall computer program results additionally, tests were performed at several intermediate stages to verify proper working of individual modules. Tests were not performed to verify 100% of the results, but rather for each program. At least one result was tested for each logic branch in the program.

The computer programs were not installed on any other computer nor were significant hardware or operational systems configuration changes made. Therefore, no in-use tests were performed.

Records were generated that show the program tested, the date of the test, the tester, testing results, and corrective actions (if required).

1.3.4 Cost Calculations

This section describes the quality assurance procedures for calculation of process, transportation and backfill costs.

Information regarding the current DOE-TRU waste process capability was gathered from the Environmental Management Programmatic Environmental Impact Statement, Preliminary Draft Site Treatment Plan Database and the Preliminary Draft National TRU Program TRU Waste Management Program and consolidated in a single matrix. The resulting matrix was compared to the initial sources and checked for transcription errors, incorrect information, or missing information.

Costing data were gathered from an electronic copy of the Waste Management Facility Cost Information for Transuranic Waste. Cost data were charted and curve fitted into a spreadsheet. The trendlines were specified as either linear or polynomial, dependent on the resulting R^2 value. The trendline was qualified when R^2 rounded to 0.999 for the curve. These trendlines and their resulting equations were spot checked for their precision using visual observation and manual calculations.

These equations were used to develop programs that determine cost on the basis of mass or volume throughput. The computer code was reviewed against the equations obtained from the curve fitting and the processing schemes of the decentralized, regionalized, and centralized configurations to ensure proper logic was used. Manual calculations were performed to demonstrate the capability of the computer program to produce valid results.

The resulting costs for this study were spot checked to assure the appropriate cost programs were run for the appropriate masses or volume throughput. Spreadsheet links were checked to assure the correct costs were displayed in tables placed in this report.

The computer programs were not installed on any other computer nor were significant hardware or operating system configuration changes made; therefore no in-use tests were performed.

Records were generated that show the program tested, the date of the test, the tester, testing results, and corrective action (if required). All of the resulting tables, figures, and text for processing costing were subjected to peer review and technical editing.

1.3.5 Calculation of Transportation Costs

Costing information for transportation was obtained from the Waste Management Facility Cost Information for Transportation of Radioactive and Hazardous Materials. The primary information gathered, specific to the calculations, was the cost per loaded mile and the fixed cost equation. Mileage between the sites was obtained using HIGHWAY 3.3. This mileage was peer reviewed and checked for accuracy and is consistent with the mileage used in the transportation risk section of this report. The number of shipments was calculated based on the calculated waste output masses and volumes. Both the fixed costs and the variable costs were based on round trips in shipping. Manual calculations were performed to assure the performance of the spreadsheet calculations at each intermediate calculation step, up to and including, the final costs.

These manual calculations were archived as quality records.

1.3.6 Schedule Calculations

This section describes the quality assurance procedures for ensuring accurate schedule.

A preliminary baseline schedule scenario logic diagram was generated and subjected to a peer review to ensure that the flow of activities was accurate. Following this review, a Project Evaluation and Review Technique analysis was performed to verify the durations used were within acceptable limits. The start and finish dates were calculated using computer scheduling software then verified with manual calculations. All changes to the schedule were tracked using schedule-generated revision control and maintaining a computer backup of all schedule information. Upon completion, the schedules were peer reviewed again.

1.4 IMPACT ON OTHER DISPOSAL SYSTEMS FACTOR

Calculations based in Rocky Flats secondary waste data were peer reviewed, all the data summaries were checked against the original Rocky Flats Waste Stream and Residue Identification and Characterization reports, and 100% of the calculations were manually checked. The calculations for secondary waste generated for each EA were based on spreadsheets used for the cost analysis that had previously been through QA (see QA discussion for cost analysis). The new spreadsheets generated for this factor were checked for accuracy and logic. The final calculations to determine impacts on DOE low-level waste programs were based on referenceable information in the Integrated Data Base and Mixed Waste Inventory Report and 100% of these calculations were manually checked.