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RELIABILITY AND SAFETY PROGRAM PLAN
OUTLINE FOR THE OPERATIONAL PHASE OF
A WASTE ISOLATION FACILITY

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March 28, 1977

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ABSTRACT

A Reliability and Safety Program plan outline has been prepared for the operational phase of a Waste Isolation Facility. The program includes major functions of risk assessment, technical support activities, quality assurance, operational safety, configuration monitoring, reliability analysis and support and coordination meetings. Detailed activity or task descriptions are included for each function. Activities are time-phased and presented in the PERT format for scheduling and interactions. Task descriptions include manloading, travel, and computer time estimates to provide data for future costing.

The program outlined here will be used to provide guidance from a reliability and safety standpoint to design, procurement, construction, and operation of repositories for nuclear waste. These repositories are to be constructed under the National Waste Terminal Storage program under the direction of the Office of Waste Isolation, Union Carbide Corp. - Nuclear Division.

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CHAPTER 1 PROGRAM DESCRIPTION

BACKGROUND*

The geologic disposal of radioactive waste is not a new subject; it has been under active study for over 15 years. As early as 1957, the National Academy of Sciences-National Research Council advisory committee suggested burial of solid radioactive wastes in bedded salt deposits as the best of the many methods it had considered. Shortly after that, work started at the Oak Ridge National Laboratory (ORNL) on the study of disposal in salt. This led to an underground vault test in a bedded salt mine at Lyons, Kansas, in the late 1960's in which simulated waste was placed in the geologic formation in a thoroughly instrumented test. Although further development of the Kansas test into a pilot plant was not pursued, ORNL continued to work toward identifying other rock units within the United States which would be acceptable for terminal storage of radioactive waste.

In the early 1970's, the Atomic Energy Commission (AEC) authorized the Atlantic Richfield Hanford Company to design a Retrievable Surface Storage Facility (RSSF) to receive and store high-level radioactive waste on a schedule compatible with the then-planned start-up schedule of the commercial nuclear reprocessing industry. The RSSF was considered an interim solution for storage of waste until a permanent geologic terminal storage facility, or repository, could be developed. The schedule for constructing the nuclear facilities has now

* Adapted from C. D. Zerby, "General Program Summary", NWTS Program Progress Report for 4/1/75 to 9/30/76, Y/OWI-8, Union Carbide Corp., Oak Ridge, Tenn.

changed to the extent that a final repository will not be needed for several years. Thus, there is now time to implement a full-scale geologic terminal storage program. As a result the RSSF approach has been placed in a standby status as an alternative to be used only if needed.

Because of the geologic study work by ORNL in the early 1970's, a confirmation study location has been identified in southeast New Mexico in the bedded salt of the Permian Basin. At a location about 30 miles east of Carlsbad, New Mexico, the Waste Isolation Pilot Plant (WIPP) is to be developed for terminal storage of low- and intermediate-level nuclear waste generated in the defense program. The facility is also being designed so that it is not incompatible with the disposal of high-level waste. The WIPP project, under the management of Sandia Laboratories, is currently independent of the commercial terminal storage program.

In February 1976, the Energy Research and Development Administration (ERDA) announced a greatly expanded waste management program for defense and commercial radioactive waste. In that announcement, ERDA indicated that the Oak Ridge Operations Office (ORO) of ERDA would have lead responsibility for overall coordination of the expanded commercial geologic disposal program and that an Office of Waste Isolation (OWI) would be created within Union Carbide Corporation-Nuclear Division (UCC-ND) with the responsibility for program management of that activity.

The commercial geologic disposal program was named the National Waste Terminal Storage (NWTS) program. It represents the principal programmatic effort of ERDA for ultimate and final disposal of commercial nuclear waste.

The principal objective of the NWTS program is to provide facilities in various deep geologic formations at multiple locations in the United States which will safely dispose of commercial radioactive waste, which must be delivered to a federal repository for terminal storage.

In the NWTS program, OWI will program manage the development and operation of federal repositories, from the time the search for sites begins, through facility design and construction, and continuing through the operating lifetime of the repository.

The typical facility will consist of a large number of excavated rooms located several hundred feet below the surface of the ground. On the surface will be receiving and handling facilities for containerized waste, delivered by truck or rail. Shafts connect the receiving facilities to the mine for delivery of the containerized solid waste to transporter vehicles, which move the waste to its point of disposal. In the case of waste with levels of radiation which require remote handling, the canisters are lowered into suitably prepared vertical holes in the floor of a room, and the hole plugged for radiation protection. In the case of low-level waste, the containers are stacked for disposal. The surface facilities occupy approximately 200 acres and would be the only visible evidence of the repository. The excavation for a full-scale facility might encompass an area of about 2,000 acres. Surface areas above the excavation, but outside the fence around the surface facilities, might be leased for general use. Surrounding the central excavation area would be an outer controlled area of approximately 16,000 acres in which mining operations and deep drilling would be controlled to avoid any compromise of the safe operation of the repository. Surface areas over the outer controlled area would not be restricted from normal activities.

At this time the plans of the NWTS program call for construction of six terminal storage facilities. The first two facilities will be located in salt formations, and the remaining facilities will be in other types of formations. The first two repositories will receive waste in the middle of 1985. Other repositories will follow later at periodic intervals. Licensing by the Nuclear Regulatory Commission (NRC) for initial-phase operation is expected to occur at the time the repository first goes into operation.

INTRODUCTION

The design, construction, and operation of a Waste Isolation Facility will involve substantial considerations of reliability and safety. These considerations will have substantial impact on public risk, operational safety (equipment and personnel), operating efficiency, design goals, and procurement specifications. This document provides a Reliability and Safety Program (RASP) plan outline for the operational phase of a Waste Isolation Facility (WIF). The program is complementary to the long term safety assessment being performed at the Battelle Pacific Northwest Laboratory.

The program outlined here will be used to provide guidance from a reliability and safety standpoint to design, procurement, construction, and operation of repositories for nuclear waste. These repositories are to be constructed under the National Waste Terminal Storage program under the direction of the Office of Waste Isolation, Union Carbide Corp. - Nuclear Division.

The program is presented as an outline with task description which are summaries of detailed efforts. Detailed descriptions are to be developed as part of the four primary

programs (risk assessment, reliability, operational safety, and quality assurance). Task breakdowns are provided up to the time of selection of the Facility Operating Contractor. Beyond that point less detail is presented, because the division of responsibilities is not entirely clear, and also the completion of early tasks is needed to define the detail of later tasks. In some areas, tasks are specified which are being performed elsewhere and are essential inputs to the plan. The schedule for these tasks is included, but not details of work statements and level of effort. The development of the nonhigh-level waste source term is performed under the auspices of the Los Alamos Scientific Laboratory. Similarly, container definition, borosilicate glass fragmentation, size distribution and leach rates are being determined by ERDA contractors. These data are necessary inputs to risk assessment which in turn is necessary for accident/safety analysis in the licensing documentation.

The plan outline was developed subject to assumptions and constraints inherent in the overall NWTS program. These included:

1. Waste form

- Glass was assumed for high-level waste.
- Canisters to be used for high-level and intermediate-level wastes.
- Low-level trans-uranic waste content and form not well defined.

2. Schedule items (as of 1-1-77)

- 4-1-77 Program start
- 4-1-78 Facility QA Program Plan from A-E
- 10-1-78 Site selection
- 12-1-78 Conceptual Design Report submitted, PSAR and PDES submitted (PSAR may not be necessary)

- 4-1-79 Start Title I design, select Facility
Operating Contractor.
- 10-1-80 Title I design complete.
- 4-1-82 Title II design complete, submit FSAR

3. Inputs from technical support studies, geology studies, and long term safety assessment to be shown, although schedules are not yet firm in some cases.

Naturally the dates and assumptions are subject to change, so the program could be out of date before it is published. However, the effect of schedule constraints should be apparent from task interactions, so that continued planning can be performed to accomodate changes.

Part of the purpose is the establishment of guidelines for procurement of necessary services. Thus the Task Descriptions may be used as summaries of work statements in Requests for Proposals. Grouping of tasks is suggested by the task number system (each hundred series suggests one or more contractors), although regrouping can easily be done by inspection of the PERT chart. Staffing and budgeting of subcontracts is suggested by the man-loading provided in the Task Descriptions.

The Reliability and Safety Program plan outline as presented does not encompass the entire OWI program of construction of several repository facilities. The time delay between the construction of the first and second pairs of facilities makes it attractive to apply the experience gained from the first pair of facilities to the RASP for subsequent facilities. This plan presents the activities necessary to cover the first pair of facilities and the personnel requirements reflect this level of effort.

LICENSING DOCUMENTATION REQUIREMENTS

The RASP is designed to accomodate the schedule for licensing documentation. This documentation is known to be in the areas of Environmental Impact Statements and Safety Analysis Reports. The defining regulations are as yet not promulgated, so the format and contents are not precisely defined. The basic philosophies behind the documentation are known, however, and the areas of concern identifiable.

Safety analysis involve studies and predictions of the risk to operating personnel and the general public that could result from operation of the facility. These analyses include detailed exposition of the design and operations of the facility from the standpoint of safety, the analysis of the consequences of conceivable credible accidents, and the definition of the measures taken to assure that the facility and operations described are in fact identically the ones utilized. It is this sequence of required demonstrations and their interrelationships which determine the content of the RASP.

FACILITY OPERATING CONTRACTOR

The Waste Isolation Facility will be operated by a Facility Operating Contractor (FOC). The FOC is scheduled to be selected approximately April 1979. Certain safety and quality assurance records, in all probability, must be maintained for the life of the operated facility. As many of these records will be generated prior to selection of the FOC, OWI must act as a surrogate for the FOC. The RASP reflects this requirement.

RASPP INTERACTIONS AND COORDINATION

Reliability and safety interact very closely with the facility design. Figure 1 depicts the areas of interaction of these three disciplines in the form of a Venn diagram. It

FIGURE 1. RASP INTERACTIONS.

should be noted that there are areas in which each discipline is independent, in which each discipline interacts with only one of the others, and in which all three interact. It is this area of interaction of all three disciplines which motivates the inclusion of a formal safety working group and a configuration accounting activity in the RASPP. Quality Assurance is shown as an all encompassing activity that pervades the entire program.

The name safety working group for coordination of areas common to safety, reliability and design was selected primarily because safety will be the dominant driving requirement for licensing. This group will provide active management participation in the coordination of matters related to safety. With as yet many studies and tests to be performed related to factors influencing safety and design, immediate management awareness of the impact of the results of these studies and tests was deemed highly desirable. Management is also in a position of being able to direct the actions necessary to achieve coordinated results.

The configuration accounting activity was included to provide assurance for one point of coordination. The configuration accounting activity will assure that all agencies have the latest approved data relating to the facility. A central point for configuration accounting and specified procedures for changing any data will minimize the possibility that work is wasted utilizing incorrect data.

RASP OBJECTIVES

The overall objective of the RASP is to provide for the reliable design and operation of a WIF in a manner that provides safety to operating personnel and the general public.

Specific goals are:

1. To provide for timely input of credible safety and reliability data into NWTS Program Licensing Documentation;
2. To define, time-phase, scope and budget the Reliability and Safety Program tasks;
3. To define, coordinate and schedule the data flow requirements of the Safety and Reliability Program tasks with internal and external interfaces;
4. To provide for timely reliability requirements and specifications for NWTS Program procurements;
5. To provide a substitute for the FOC prior to his selection;
6. To provide a vehicle for management coordination and review of these activities; and
7. To provide reliability budgeting support to management of the Office of Waste Isolation.

CHAPTER 2

PLAN OVERVIEW

OVERVIEW

The RASP covers six major areas of activity which have been assigned activity numbers in the groups shown below:

- 1) 1-99 OWI Management and Technical Coordination
- 2) 100-199 Risk Assessment
- 3) 200-299 Technical Support Studies
- 4) 300-399 Reliability
- 5) 400-499 Quality Assurance and Configuration
Accounting
- 6) 500-599 Safety

The numbering system supports the Program Evaluation and Review Technique (PERT). PERT charts are provided as a reduced figure in Chapter 3 and a full sized blue line chart in the jacket of the back cover for easy reference. Figure 2 illustrates the information given for each task in the task descriptions of Chapter 4. Figure 3 illustrates the agenda information provided for the coordination meetings scheduled in Chapter 5.

In PERT, activities are bounded by the Predecessor Number and the Successor Number. If the activity is entirely within a subgroup, both numbers are within the subgroup. When a transition occurs, the successor number defines the subgroups in which the activity belongs. The vertical lines on the chart are zero time lines and represent dummy activities provided to establish the critical path. The PERT chart provided has zero slack time, as activities were scheduled to be completed on time. As the program proceeds and activities are completed either early or late, positive

ACTIVITY DESCRIPTION

Title: Full Title of Activity

Number: (Pred) Beginning of act. (Suc) End of act. ORG. Organization

Start: (WAS) Weeks after start Complete: (WAS) same Duration of activity

Short Title: Title used on PERT charts.

Description:

Description of work which must be performed to complete the activity.

Inputs: Sources of input data to the activity

Product: Output and destination of product of activity

Resource Requirements:

Pers:	MM	Skill	Level
(number of personnel)x man months		Required	for costing

Computer Hours: necessary to task -3rd generation computer

Travel (Trips, Destination, No. Pers., Stay)

travel required to perform task.

FIGURE 2. CONTENT OF ACTIVITY DESCRIPTION.

C O O R D I N A T I O N M E E T I N G (Successor Number of Activity)

D A T E : Approximate Date of Meeting

REPORTS DUE/

ACTIVITIES COMPLETED: Generally a completed activity produces data or a report which is reported and reviewed at the meeting. Normally this report will be provided to the activity to be initiated as input. The activities and reports are listed here.

ACTIVITIES TO BE
INITIATED:

Activities which are to be initiated are listed here.

COORDINATION/
DISCUSSION:

Specific points for coordination are listed here. If a report is due and the activity to be initiated requires the report as input, the content of the report will be reviewed for adequacy and any shortfall identified and remedial action assigned.

FIGURE 3. AGENDA INFORMATION.

or negative slack-times will appear respectively. When negative slack times appear they will indicate critical activities that are behind schedule.

Each major group, except the OWI activities and the Technical Support Studies, has been assumed to start with a single subcontractor. The Quality Assurance (400's) and Safety (500's) groups of activities are turned over to the Facility Operating Contractor (FOC) after selection and a transition phase of one quarter is provided for the QA activities. The safety activities need not be continuous as ample time is available for the FOC to assume these activities.

In time, the RASP is phased by major NWTs program milestones.

1. Site selection at approximately 10/1/78 permits previous generic data to be made site specific.
2. Submission of the PSAR and PDES at about 12/1/78 drives the generation of the preliminary Safety and Quality Assurance Programs as well as the updating of the Generic Risk Assessment to Conceptual Design Data.
3. Selection of the Facility Operating Contractor at about 4/1/79 permits turnover of QA and Safety activities to the FOC.
4. Completion of the turnover terminates the applicable dates given on the PERT chart axis. Dates beyond this time are included on the activity line.

It should be noted that the beginning date of 4/1/77 was arbitrarily selected as the earliest possible date to initiate the activities in the RASP.

Several stages of modelling are envisioned as parts of the major programs. At first, a generic model, based on functions rather than hardware, is developed for the Generic Risk Assessment. As hardware design proceeds, a reliability and system model is generated from design data and the initial generic model. The system model is then fed back to later risk analysis to provide design specific results. Finally, system simulation, incorporating both safety and reliability requirements, is used to develop system operating and test procedures. Models for specific items may be produced from time to time by the architect-engineer. These should be incorporated in the system model as they become available.

CHAPTER 3 PERT CHART

ORGANIZATION

The PERT chart is an evolution of the Gantt Bar Chart. In the Gantt Chart a task is displayed as a bar, the length of which is displayed on a time axis. Typically, a task would have a milestone at the end, i.e., the completion of the task. If a second milestone is introduced, specifically the initiation of the task, then the task itself is the activity between the milestones, i.e., between the initiation and completion of the task. By replacing the bar with an arrow between the milestones and representing the milestones as circles (numbered for identification) the PERT basic format is achieved.

PERT extends this basic concept one step further by showing the interdependence between tasks. For example, when the initiation of two tasks is dependent upon the completion of a single task, two arrows project from the completion milestone to reflect the two tasks to be initiated (using the single completion milestone for initial task - as a double initiation milestone for two succeeding tasks). An alternative way to indicate the same interdependence is to utilize a dummy arrow (task) from the terminating milestone to either one or both of the initiating milestones for the new tasks. This latter course has been adapted for the PERT chart presented where it is feasible primarily to provide a rectilinear pattern for the chart. Thus the horizontal lines are tasks and the vertical dashed lines are interactions or nodes. In some cases interactions would confuse the chart so they are shown as arrows or outputs in the task descriptions.

From the planning standpoint, it is desirable initially (except in cases of planning hardware production of assembled piece parts produced by constrained facilities) to form plans based upon zero slack time with a nearly uniform level of effort. As the program accomplishes various tasks and schedules are violated, a critical path will then become apparent and assets can be reallocated to maintain scheduled accomplishment of the plan. At that time it is also feasible to incorporate PERT/Cost principles to accommodate increased costs of speeding up activities. No effort has been made to utilize the weighted time estimates for time necessary to complete tasks, but all calculation were performed on the basis of the expected time.

The PERT chart is a time phased network showing the sequence of tasks associated with the RASP. The top line of squares, 1C through 10C, represents the coordination meetings scheduled at the major data exchange points. These activity lines are blank as the meetings are events.

The bottom line of squares is introduced simply to provide an easy reference to NWTs program milestones. The legend preceding the event supplies the information. The legend preceding event 6 indicates this event is the selection of the facility operating contractor. Through 7/19/79 the time scale is uniform. Thereafter the time scale is compressed, with dates given for significant events.

The time scale at the bottom is presented in weeks after start and dates at a scale of four weeks per inch for the full sized chart in the jacket. The start date is assumed to be 4/1/77.

The major activities are grouped as follows:

- 1-98 NWTS milestones
- 1C-99C Coordination meetings
- 100-199 Risk assessment
- 200-299 Technical support
- 300-399 Reliability
 - 300-319 Reliability activities in support of procurement of reliable equipments.
 - 320-339 Reliability activities in support of reliable operations of the facility.
- 400-499 Quality Assurance
 - 400-419 Those activities determining regulatory QA requirements, and generating and executing the derived QA program.
 - 420-439 Those activities defining and executing QA Design Control and Procurement Document Control in support of ongoing activities.
 - 440-459 Those activities defining special controls, processes, test equipment and tools; preparing procedures for their use; identifying the associated skill requirements; and, after staffing, determining and fulfilling training requirements.
 - 460-479 Those activities which identify and control the facility design bases/specifications; identify the initial facility details and interfaces; determine the procedures utilized to control, change, and disseminate the approved facility configurations; and configuration accounting to implement the above procedures.

500-599 Safety

- 500-519 All safety activities supplied by OWI as surrogate for the operating contractor.
- 520-539 FOC Design Safety
- 540-559 FOC Industrial Safety
- 560-579 FOC Radiological Safety
- 580-599 FOC Cold Test Activities

From the appearance of the PERT chart the program seems heavily front loaded. This appearance is simply a reflection of the increase of uncertainty of planning as the plan extends further into the future. The program is reasonably detailed until the transition to the operating contractor about July 1979. After that time the division of responsibility is unclear. It is certain that activities corresponding to further risk assessment will take place until submittal of the FSAR. These activities are shown on a single line (119-120-121-122). A network similar to the network from 100 to 113 could have been repeated several times in the 119 to 122 interval, which would make the chart appear more balanced but would contribute nothing to the value of the plan. This approach corresponds to the "rolling wave" concept of planning and will require future updating and expansion of the RASP.

TASK LISTING

100-104 Select Accident Initiators
101-105 Characterize Release Barriers
102-106 Model Facility
103-110 Data Acquisition
104-107 Determine Accident Sequences and Consequences
105-108 Select Risk Criteria
106-109 Define and Model Consequence Limiting System
107-112 Risk Quantification
107-206 Define Technical Support Requirements
110-111 Define Non-Safety-Related Items
111-114 Update Risk Assessment
112-113 Generic Risk Assessment Final Report
113-115 Site Selection
114-117 Preliminary Consequence Analysis
115-116 Acquire Site Data
116-119 Risk Assessment Applied to Conceptual Design
117-118 Select Site Operator
119-120 Prepare FSAR Input
120-121 Update Draft FSAR
121-122 Prepare Final FSAR Input
122-123 FSAR Amendments
106-207 Technical Support Projects Defined by Generic Risk
Assessment
130-131 Define Geological Characteristics
131-132 Geological Analysis
132-133 Site Geology

200-203 Define Containers for Waste
201-204 Source Term for High Level Waste
202-205 Source Term for Nonhigh Level Waste
203-210 Tests of Glass Fragmentation and Leaching
204-209 Prove Canister Retrievalability

TASK LISTING (Continued)

205-208 Analysis and Characterization of Low Level Transuranic Waste

300-301 Procure Reliability Contractor

301-320 Plan Facility Model

302-303 Review Prior Procurements

303-325 Waste Flow Model

304-360 Reliability Specifications

305-306 Reliability Analyses as Required

320-323 Acquire Mining Equipment Reliability Data

321-322 Define Mining Flow

322-324 Mine Flow Model

323-327 MTBF MTTR

324-328 Facility Operational Simulation Model

325-326 Prepare Source Model

326-305 Evaluate Reliability Allocation

327-329 Facility Operational Simulation

329-331 Facility Sensitivity Report

330-332 Logistics Strategy

340-341 Reliability Allocation

360-307 Procurement Reliability Support

400-401 Identify Structures, Systems and Components

401-402 Identify Major Organizations Participation

402-403 Identify QA Functions of Major Organizations

403-404 Define QA Structure

404-405 Preliminary QA Program

405-7000 Prepare QA PSAR Inputs

406-407 Translate 10CFR50 to NWTs Context

407-408 Translate Appendix B of 10CFR50 to NWTs Context

408-409 Define QA Requirements

410-411 Facility Operator Procurement

411-412 Final QA Plan

TASK LISTING (Continued)

412-413 Design QA
413-414 Construction QA
414-415 Facility Operations QA
420-421 Identify QA Design Control and Design Documentation Requirements
421-422 Identify QA Audit Requirements for Design Procurement
422-425 Interim QA Design, Procurement and Audit Activities
423-424 Identify QA Procurement Documentation Requirements
425-425 Transition from Interim QA Activities
440-445 Identify Special Control Requirements
441-444 Identify Special Process Requirements
442-443 Identify Special Test Equipment and Tools Requirements
443-448 Prepare Special Test Equipment and Tools Procedures
444-449 Prepare Procedures for Special Processes
445-450 Prepare Special Control Procedures
446-447 Identify QA Skill Requirements
451-454 QA Training/Certification
452-455 FOC QA Training Requirements
453-456 QA Audit
460-461 Facility Design Bases Data Acquisition
461-462 Facility Configuration Identification
462-465 Configuration Accounting
463-464 Configuration Control, Change and Approval Procedures
465-466 Configuration Control Transition

500-501 Procure Safety Contractor
501-502 Determine Safety Standards
502-506 Design Safety Monitoring
503-507 Industrial Safety PSAR Input
504-508 Radiological Safety PSAR Input
505-509 Safety Related Cold Test Planning and PSAR Input
506-510 Review Site Specific Design Safety

TASK LISTING (Continued)

507-511 Review Site Specific Industrial Safety
508-512 Review Site Specific Radiological Safety
509-513 Review Site Specific Cold Test Plan
510-520 Facility Operating Contractor Procurement
520-521 Design and Construction Safety Monitoring
540-541 Industrial Safety Operations
560-561 Radiological Safety Operations
580-581 Cold Test Plans, Procedures, Execution and Report

CHAPTER 4

TASK DESCRIPTIONS

ORGANIZATION

The task descriptions are grouped in accordance with the task numbers assigned in order:

100's	Risk Assessment
200's	Technical Support
300's	Reliability
400's	Quality Assurance
500's	Safety

Preceding the actual task descriptions of each group is a narrative summary of contents of the entire group and the subgroup numbering system, if used. These preliminary pages are printed on blue paper for easy identification.

RISK ASSESSMENT ACTIVITIES (100 - 199)

Evaluation of risk to the public from plant operation will be a continuing effort throughout the program. Several phases of risk assessment are included, determined by stages of facility design and needs for licensing documentation.

The general methodology of risk assessment can be applied at any project stage from program concept to full operation. The level of detail, cost, and confidence in the results increase as the project matures. The purpose also changes, from identification of higher-risk functions and reliability allocation at the generic level for conceptual design, to accident sequence quantization for licensing and reliability predictions and trade-offs in the design phase, to the very expensive and detailed assessments (similar to WASH-1400) sometimes needed after facilities are operating and data is becoming available.

The initial phase is called a Generic Risk Assessment (GRA), which is based on the initial facility description. Since little design information is available at this stage, the analysis is primarily based on the functions to be performed. Data is estimated from similar functions and accident rates in nuclear and nonnuclear facilities. A preliminary list of functions is given in Table I.

Many simplifications are made at this stage since systems are not detailed and the site is not selected. It may be necessary to treat complex subsystems as single "functions", with data estimated by comparison with similar functions rather than computed from detailed hardware models and data. Meteorology, demography, and biological effects are not treated since they depend so strongly on the sites finally selected for evaluation. Thus the results are expressed in terms of amounts or fractions of isotopes released instead of human morbidity and property damage.

TABLE 1. GENERIC FUNCTION STREAM ASSOCIATED WITH WASTE
 CANISTERS

1. Receive shipment (truck or rail)
 Potential - hold cask in receiving area aboard
 transport means
2. Inspect/Monitor casks in shipment
 Potential - decontaminate, repair, prepare cask for
 unloading
3. Unload cask
 Potential - transport cask to temporary storage; tem-
 porary store and monitor cask
4. Transport cask to disassembly area
5. Mount cask in disassembly fixture
6. Remove waste canister from cask
 (Separate cask flow: inspect, clean, repair, store,
 transport, return or hold for refill)
7. Inspect canister
 Potential - decontaminate, repair
8. Transport canister to storage queue
 (Queue may be zero long, which skips this step. Hoist
 inoperability would require queue.)
9. Transport canister to hoist
10. Attach canister to hoist
11. Lower canister to storage level
12. Receive canister at storage level, detach from hoist
13. Attach canister to transporter
 (Separate flow line for transporter operations ter-
 minating in positioning transporter to receive canister)
14. Transport canister to hole
 (Separate flow line for hole preparation terminating
 in inspection and approval of hole(s) for storage of
 canister)
15. Lower canister into hole
16. Detach canister from transporter

TABLE 1. GENERIC FUNCTION STREAM ASSOCIATED WITH WASTE
 CANISTERS (Continued)

17. Lower plug on canister
- *18. Remove plug from atop canister
- *19. Attach retriwer to canister
- *20. Hoist canister from hole
- *21. Transport canister to repackaging facility
- *22. Inspect, repair, decontaminate, repackage canister as
 necessary.
- *23. Attach and hoist packaged canister to surface
- *24. Detach repackaged canister from hoist and attach to
 transporter.
- *25. Transport canister to holding facility
- *26. Transport canister to shipping facility
- *27. Load canister on off-site transportation means

* Indicates activities associated with the retrieval, repackaging and shipment of canister to another site. Repackaging is assumed to occur at the storage level, otherwise Steps 1-17 could be performed in reverse order with the appropriate word changes, e.g., lower → raise, attach → detach, etc.

The overall flow of tasks and information is given in Figure 1. The lower line indicates the progress of design and shows the incorporation of results from risk assessment into the design process. Early output is needed to provide reliability requirements to procurement activities, the Facility Quality Assurance Program Plan, and the architect/engineer's environmental assessment. Two activities have been added to the customary risk assessment function. These are Definition of Technical Support Requirements and Reliability Allocation (actually included in the Reliability series). These functions provide maximum utility of the results to the parallel development and test program and to the design engineers. Such interactions have been rare in past risk assessment application because the work came too late for maximum impact. However, the current program provides an opportunity for early incorporation of risk ranking into the overall program plan. The Generic Risk Assessment concludes with the Final Report Task (112-113) on 4/1/78.

The next logical stage involves the inclusion of conceptual design information and data from the selected site. This phase is called a Risk Assessment for Conceptual Design and provide preliminary information to the PSAR on 12/1/78 and final data to the Operating Contractor on 4/1/79.

Planning is less detailed after 4/1/79, but the licensing schedule indicates a need for continued analysis for the FSAR and amendments as questions arise during review. Also availability of design and construction information will allow resolution of uncertainties and improvement of predictions as the program proceeds.

FIGURE 5. RISK ASSESSMENT.

ACTIVITY DESCRIPTION

Title: Select Accident Initiators

Number: (Pred) 100

(Suc) 104

ORG. GRA Con

Start: (WAS) 0

Complete: (WAS) 12.6

Duration 12.6

Short Title: Select Accident Initiators

Description:

As the initial task of a Generic Risk Assessment, define those events which could lead to a release of radiation including:

- 1) man-caused events (human error, sabotage)
- 2) equipment failure
- 3) natural events (flood, earthquake, meteor strikes)
- 4) other external events (airplane crash, dam failure)

Sources of energy that could release and/or disperse radiation or breach containment features will be identified (canister heat, fuel stored onsite or brought in by transport means, free fall, vehicle motion, chemical reactions).

Credibility of events and initiators will be examined to provide a list of initiators to be used in accident sequence analysis. Accidents considered in GESMO, other risk assessments and FSAR's for reactor and fuel cycle facilities will be examined for applicability.

Inputs: Waste Isolation Facility Description
Other risk assessments (WASH-1400, etc.)
FSAR's, GESMO

Product: Evaluated list of initiators to 104-107

Resource Requirements:

Pers:	MM	Skill	Level
	2	Nuc. Eng.	Ave.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Characterize Release Barriers

Number: (Pred) 101

(Suc) 105

ORG. GRA Con.

Start: (WAS) 0

Complete: (WAS) 12.6

Duration 12.6

Short Title: Release Barriers

Description:

Identify and characterize barriers to release of radiation, including inherent design, natural barriers, engineered safety features, and consequence limiting systems. These might include such items as low leach rates, stable chemical form, containment building(s), filters, spray cooling, etc. Effectiveness of barriers and failure mechanisms will be defined and described. A list of barriers and estimated effectiveness will be generated for use in release sequences. Other environmental and safety reports will be examined to assure completeness

Inputs: Facility description, waste and container description, GESMO, NUREG-0116, WASH-1400

Product: Evaluated list of barriers to 104-107.

Resource Requirements:

Pers:

MM

3

Skill

Nuc. Eng.

Level

Sr.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Model Facility
Number: (Pred) 102
Start: (WAS) 0
Short Title: Model Facility
Description:

(Suc) 106
Complete: (WAS) 12.6
ORG. GRA Con. 12.6
Duration 12.6

Plant equipment, facilities, and functions will be modelled for probabilistic analysis. The analysis will be at the generic level, so emphasis will be placed on functions and equipment classes rather than detailed piece-parts modelling. Guidance from the initiators and barriers tasks (100-104, 101-105) running concurrently will aid in determining emphasis needed on various functions. Modelling techniques will be consistent with those used in the Reactor Safety Study and their successors.

Inputs: Facility description, operating functions, probabilistic methodology

Product: Plant model to 106-109, 105-108, 104-107, 301-320, 303-325

Resource Requirements:

Pers:	MM	Skill	Level
	3	System Eng.	Ave.

Computer Hours: 2

Travel (Trips, Destination, No. Pers., Stay)

2 trips to OWI, 2 men, 2 days each

1 trip to Denver and Oakland, 2 men, 3 days each

ACTIVITY DESCRIPTION

Title: Data Acquisition

Number: (Pred) 103

(Suc) 110

ORG. GRA CON

Start: (WAS) 0

Complete: (WAS) 25.4 Duration 25.4

Short Title: Data Acquisition

Description:

Define failure probabilities and other data needed for accident sequence analysis. Scan standard data banks, past risk assessments, OSHA and MESA records, US Bureau of Mines records, military records, and contact equipment vendors to estimate data for generic functions (crane drop, hoist jam, filter failures, etc.) needed in accident sequences. Take guidance from 100-104 and 101-105 to determine functions most in need of data. Trace data to reliable sources whenever possible. Estimate error ranges for more important functions.

Inputs: Facility and functional descriptions. Data handbooks. Government and private records.

Product: Set of data input to 107-112, 320-323, 304-307

Resource Requirements:

Pers:	MM	Skill	Level
	3	Rel. Eng.	Sr.
	3	System Eng.	Jr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

2 to Wash, D.C. and other East Coast, 2 men, 5 days
2 to San Francisco, Los Angeles, Denver, 2 men, 5 days
1 to Houston, 1 man, 3 days

ACTIVITY DESCRIPTION

Title: Determine Accident Sequences and Consequences
Number: (Pred) 104 (Suc) 107 ORG. GRA CON
Start: (WAS) 12.6 Complete: (WAS) 25.4 Duration 12.8
Short Title: Accident Sequences
Description:

Determine and model accident sequences to be quantified, based on initiators, release barriers and plant model. Select modelling technique similar to those used in the Reactor Safety Study and their successors. Model accident sequences for quantification. Review past studies for completeness and emphasis.

Determine consequences of sequences and select simple models for dispersion and biological effects for "nominal" site.

Inputs: Initiators from 100-104, barriers from 101-105, model from 102-106, WASH-1400, GESMO, NUREG 0116, ORNL-TM-4639, GEIS from ERDA.

Product: Sequences to 107-112, 408-409, 304-360

Resource Requirements:

Pers:	MM	Skill	Level
	1-1/2	Rel. anal.	Ave.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

1 to Wash, D.C., and OWI, 2 men, 4 days

ACTIVITY DESCRIPTION

Title: Select Risk Criteria

Number: (Pred) 105 (Suc) 108

Start: (WAS) 12.6 Complete: (WAS) 25.4 ^{ORG. GRA CON} Duration 12.8

Short Title: Select Risk Criteria

Description:

Select criteria to be used for risk quantification and ranking, as well as for guidance to later reliability allocation. Emphasis is to be placed on impact on short-term, operational consequences, rather than long term stability. Thus consideration should be given to on-site effects on operating personnel, dose to individuals near the boundary, and effects on the general population.

Propose criteria to OWI for review and approval.

Inputs: Release barriers (101-105) and accident initiators (100-104).
NRC and EPA regulations.

Product: Criteria to risk quantification (107-112)

Resource Requirements:

Pers:	MM	Skill	Level
	1	Safety Eng.	Sr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

1 to OWI, 1 man, 2 days

ACTIVITY DESCRIPTION

Title: Define and Model Consequence Limiting Systems
Number: (Pred) 106 (Suc)109 ORG. GRA CON
Start: (WAS) 12.6 Complete: (WAS) 25.4 Duration 12.8
Short Title: Define Cons. Lim. Systems
Description:

Define and model those systems determined to be safety-related which serve to limit the consequences of an accident.

Inputs: Plant model (102-106), initiators (100-104), barriers (101-105), plant description, structures identification (400-401).

Product: CLS model to risk quantification (107-112)

Resource Requirements:

Pers:	MM	Skill	Level
	3	Rel. Anal.	Ave.

Computer Hours: 2
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Risk Quantification

Number: (Pred) 107

(Suc) 112

ORG. GRA CON

Start: (WAS) 25.4

Complete: (WAS) 37.6

Duration 12.2

Short Title: Risk Quantification

Description:

Evaluate the model of the plant, consequence limiting systems, and accident sequences to determine release probabilities and associated risks for the selected accident sequences. Run sensitivity studies to determine those functions and equipments having most impact on risk. Rank equipments according to risk for use in reliability allocation.

Inputs: Accident sequences (104-107), data (103-110), CLS (106-109), and risk criteria (105-108).

Product: Risk ranking to final report (112-113) and reliability allocation (340-341).

Resource Requirements:

Pers:	MM	Skill	Level
	3	Statistician	Sr.
	3	Nuc. Eng.	Sr.
	3	Rel. Anal.	Ave.
	2	Systems Anal.	Jr.

Computer Hours: 6

Travel (Trips, Destination, No. Pers., Stay)

2 to OWI, 2 people, 3 days

ACTIVITY DESCRIPTION

Title: Define Technical Support Requirements

Number: (Pred) 107

(Suc) 206

ORG. GRA CON

Start: (WAS) 25.4

Complete: (WAS) 37.6

Duration 12.2

Short Title: Define Tech. Support

Description:

Define supporting studies and data needed to provide safety analysis inputs to PSAR and FSAR.

Inputs: Accident sequences (104-107).

Product: Requirements to technical support group (206-207).

Resource Requirements:

Pers:	MM	Skill	Level
	3	Nuc. Eng.	Sr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Define Non-Safety-Related Items

Number: (Pred) 110

(Suc) 111

ORG. GRA CON

Start: (WAS) 25.4

Complete: (WAS) 37.6

Duration 12.2

Short Title: Define Insens. Items

Description:

Define those items which are not safety-related or have little impact on safety. Provide a list to the architect-engineer for his Environmental Assessment and Facility QA Program Plan, and to procurement for reliability specification.

Inputs: Accident sequences (104-107)

Product: List to A-E and procurement, 304-360

Resource Requirements:

Pers:

MM

2

Skill

Rel. Anal.

Level

Ave.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Update Risk Assessment
Number: (Pred) 111 (Suc) 114 ORG. GRA CON
Start: (WAS) 37.6 Complete: (WAS) 75.4 Duration 37.8
Short Title: Update Risk Assessment
Description:

The risk assessment will be updated and refined with information from conceptual design and actual site data as it becomes available. Results to be provided for PSAR and PDES inputs.

Inputs: Risk Quantification (107-112)

Product: Report to PSAR and PDES.

Resource Requirements:

Pers:	MM	Skill	Level
	3	Nuc. Eng.	Sr.
	3	Rel. Eng.	Ave.

Computer Hours: 2
Travel (Trips, Destination, No. Pers., Stay)

2 to OWI, 2 people, 3 days
2 to Denver and Oakland, 2 people, 3 days

ACTIVITY DESCRIPTION

Title: Generic Risk Assessment Final Report
Number: (Pred) 112 (Suc) 113 ORG. GRA CON
Start: (WAS) 37.6 Complete: (WAS) 50.0 Duration 12.4
Short Title: Generic Risk Assessment Report
Description:

Write the final report for the Generic Risk Assessment program.

Inputs: Risk Quantification (107-112)

Product: Report

Resource Requirements:

Pers:	MM	Skill	Level
	1-1/2	Nuc. Eng.	3r.
	1-1/2	Sys. Analyst	Jr.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)
1 to OWI, 2 people, 3 days

ACTIVITY DESCRIPTION

Title: Preliminary Consequence Analysis
Number: (Pred) 114 (Suc) 117 ORG. RA CON
Start: (WAS) 75.4 Complete: (WAS) 83.8 Duration 8.4
Short Title: Prelim. Cons. Analysis
Description:

Refine the consequence analysis with preliminary site - specific data to include meteorology, dispersion, and demography.

Provide preliminary consequence analysis to PSAR and PDES.
(Time after site selection is too short for complete consequence analyses - only preliminary analysis can be provided).

Inputs: Updated risk assessment (111-114) and preliminary site data (113-115)

Product: Input to PSAR and PDES, 116-119

Resource Requirements:

Pers:	MM	Skill	Level
	2	Nuc. Eng.	Sr.
	2	Systems Anal.	Ave.

Computer Hours: 1
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Acquire Site Data

Number: (Pred) 115

(Suc) 116

ORG. RA CON

Start: (WAS) 75.4

Complete: (WAS) 83.8 Duration 8.4

Short Title: Acquire Site Data

Description:

Obtain site data from environmental contractor and/or architect - engineer and analyze items needed for continuing consequence analysis.

Inputs: Site selection (113-115) and data from contractor

Product: Analyzed data to continuing risk assessment (116-119)

Resource Requirements:

Pers:	MM	Skill	Level
2		systems anal.	Ave.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

1 to environmental contractor

ACTIVITY DESCRIPTION

Title: Risk Assessment Applied to Conceptual Design
Number: (Pred) 116 (Suc) 119 ORG. RA CON
Start: (WAS) 83.8 Complete: (WAS) 100.2 Duration 16.4
Short Title: RA for Conceptual Design
Description:

Incorporate conceptual design and additional site data into risk assessment.

Provide report to facility operator.

Inputs: Conceptual design report and site data (115-116)

Product: Report to operator, 119-120, 411-412, 360-307, 520-521

Resource Requirements:

Pers:	MM	Skill	Level
	4	Nuc. Eng.	Sr.
	4	Systems Anal.	Ave.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Prepare FSAR Input

Number: (Pred) 119

(Suc) 120

Start: (WAS) 100.2

Complete: (WAS) 176

ORG. RA CON

Short Title: Prepare FSAR Input

Description:

Duration 75.8

Modify risk assessment as Title I design proceeds and prepare inputs for the FSAR.

Inputs:

Product:

Resource Requirements:

Pers:

MM

Skill

Level

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Update Draft FSAR

Number: (Pred) 120

(Suc) 121

ORG.

RA CON

Start: (WAS) 176.0

Complete: (WAS) 226.2

Duration 50.2

Short Title: Update Draft FSAR

Description:

Provide additional results from design to update the draft FSAR with Title II design information.

Inputs:

Product: Results to FSAR, A-E, and FOC

Resource Requirements:

Pers:

MM

Skill

Level

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Prepare Final FSAR Input

Number: (Pred) 121 (Suc) 122

Start: (WAS) 226.2

ORG. RA CON
Complete: (WAS) 251.0 Duration 24.8

Short Title: Final FSAR Input

Description:

Prepare final revision to accident analysis for FSAR
submission

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: FSAR Amendments

Number: (Pred) 122

(Suc) 123

ORG. RA CON

Start: (WAS) 251.0

Complete: (WAS) 276.0 Duration 25

Short Title: FSAR Amendments

Description:

Prepare safety-related responses to licensing questions
as required

Inputs:

Product:

Resource Requirements:

Pers: MM

Skill

Level

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Define Geological Characteristics

Number: (Pred) 130 (Suc) 131 .ORG. RA CON

Start: (WAS) 0 Complete: (WAS) 25.4 Duration 25.4

Short Title: Define Geology

Description:

This task requires the investigation of geologic characteristics and properties for the first repository rock-type to identify those features of a mechanical, thermal, chemical or hydrologic nature which might impede the safe operation of the facility. This task includes specifically those rock properties that respond to pressure-relief, dehydration, load redistribution, heating and vibration of the host rock envelope, and which might disrupt safe operation of the underground facility.

Inputs:

Product: The product of this investigation will be a report which identifies each of the involved properties, effective response parameters and predicted results of these responses to 107-112

Resource Requirements:

Pers:	MM	Skill	Level
	1	Geol. Eng.	Sr.
	1	Geologist	Sr.
	1	Mining Eng.	Er.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

1 to geology contractor, 2 men, 3 days.

ACTIVITY DESCRIPTION

Title: Geological Analysis

Number: (Pred) 131

(Suc) 132

ORG. RA CON

Start: (WAS) 25.4

Complete: (WAS) 75.4 Duration 50.0

Short Title: Geological Analysis

Description:

Review long-term geology studies in terms of impact on facility operation for mine accidents, hole shrinkage, etc.

Inputs: Long term geology studies from contractor and Geological Program Manager where available.

Product: Report to PSAR

Resource Requirements:

Pers:	MM	Skill	Level
	3	Geo. Eng.	Sr.
	1-1/2	Geologist	Sr.
	1-1/2	Mining Eng.	Sr.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title:

Number: (Pred) 132

(Suc) 133

ORG. RA CON

Start: (WAS) 75.4

Complete: (WAS) 100.2 Duration 24.8

Short Title: Site Geology

Description:

Incorporate site-specific information from geology contractors into conceptual design risk assessment for PSAR. Interpret site characteristics in terms of short-term stability affecting facility operation.

Inputs: Site data, generic risk assessment, geological analysis (131-132)

Product: Site geology to FSAR

Resource Requirements:

Pers:	MM	Skill	Level
	3	Geo. Eng.	Sr.
	3	Geologist	Sr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

TECHNICAL SUPPORT ACTIVITIES (200-299)

As the program proceeds, some activities and results will be needed which are not included in the primary programmatic tasks. Generally, these technical support studies provide inputs to risk assessment, reliability and quality assurance programs. Some of the activities have been anticipated, defined and assigned to contractors. However, the timing of these contracted studies is not necessarily consistent with the requirements of the RASP so they have been rescheduled here to achieve consistency. Included in this group are:

1. Container definition
2. HLW Source Term
3. Other Source Terms (intermediate, cladding)
4. Borosilicate Glass Fragmentation and leach rate studies.

The requirement for other technical support studies was discerned during the preparation of the RASPP. These studies are:

1. Canister Retrievability Study and,
2. Low level transuranic waste analysis.

The requirement for the first study arises because canister retrievability must be demonstrated to be a valid concept for the retrievable operating period. The second is required because the LLTRU waste at this point in time is poorly defined, but receipt of this waste is anticipated in sizeable shipments of 48 containers each. It is anticipated that this waste will be of low density and not in canisters, thus it may be subject to dispersal by mechanisms not contemplated for the canisters.

Many other studies, related primarily to design tradeoffs, are easily identifiable as having safety impact but are not included in the RASP. The results of these studies will be input into the RASP through monitoring of design in the safety program.

The Generic Risk Assessment is expected to define additional needs for data and systems definition which may not be satisfied elsewhere in the program. Such tasks are grouped as technical Support Projects (206-207) with the level of effort undefined. Sensitivity results should define the scope and size of these studies for future contracting (or redirection of existing contracts).

Review of program plans from other sites will be needed to define the Technical Support Activities more clearly. These plans are not yet finalized, but an early effort should be made in the RASP to obtain and review these plans. Although not specifically defined as a task, this work would be included in the first task of each major activity. Revisions of schedule and content would then be requested to meet the RASP and licensing requirements.

ACTIVITY DESCRIPTION

Title: Define Containers for Waste
Number: (Pred) 200 (Suc) 203 ORG. TEC SUP
Start: (WAS) 0 Complete: (WAS) 25.4 Duration 25.4
Short Title: Define Containers
Description:

Determine physical and other parameters of containers for high level waste, intermediate level waste, cladding hulls, and low level transuranic waste.

Inputs:

Product: Characteristics to risk quantification

Resource Requirements:

Pers:	MM	Skill	Level
	OWI		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Source Term for High Level Waste
Number: (Pred) 201 (Suc) 204 ORG. TECH SUP
Start: (WAS) 0 Complete: (WAS) 25.4 Duration 25.4
Short Title: Source Term for HLW
Description:

Determine source characteristics for high level waste -
total activity, specific activity, isotope distribution, glass
form and characteristics, physical and chemical parameters, etc.

Inputs:

Product: Source characteristics to risk quantification (107-112)

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Source Term for Nonhigh Level Waste
Number: (Pred) 202 (Suc) 205 ORG. TECH SUP
Start: (WAS) 0 Complete: (WAS) 25.4 Duration 25.4
Short Title: Source Term for Non-HLW
Description:

Determine source characteristics for nonhigh level waste - total activity, specific activity, isotope distribution, form and character of dispersion medium, physical and chemical parameters, etc.

Inputs:

Product: Source characteristics to risk quantification (107-112)

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Tests of Glass Fragmentation and Leaching
Number: (Pred) 203 (Suc) 210 ORG. PNL
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Test Glass Frag. and Leach
Description:

Prepare HLW canister waste samples and test for fragmentation and leaching characteristics.

Results to be used in dispersion and resuspension calculations and hydrologic analyses.

Inputs: HLW source term (201-204), canister definition (200-203)

Product: Report of fragment sizes and distribution and leach rates versus size to preliminary consequence calculations (114-117)

Resource Requirements:

PCRS:	MM	Skill	Level
	PNL		

Computer Hour. _____

Travel (Trips Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Canister Retrievability Analysis
Number: (Pred) 204 (Suc) 209 ORG. TECH SUP
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Canister Retrievability Analysis
Description:

Provide program and tests of waste container and formation to show that waste container can actually be retrieved if necessary.

Develop logistics of retrieval.

Develop instrumentation requirements and plan to warn of events threatening retrievability.

Develop emergency plans to counter threats (protective sleeve failure, mine cave-in, leaky canister, etc.).

Inputs: Waste definition, facility description, geological parameters.

Product: Analyses of retrievability and emergency plans to PSAR.

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Analysis and Characterization of Low Level Transuranic Waste

Number: (Pred) 205 (Suc) 208 ORG. TECH SUP

Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0

Short Title: Characteristics of LLTRUW

Description:

Define, characterize, and analyze the form and content of low-level transuranic wastes to be received by the waste isolation facility. Isotopes, physical and chemical form, variability, and container characteristics are to be defined to allow dispersion and safety analysis.

Inputs: Non-HLW source term

Product: Report to preliminary consequence evaluation (114-117) and PSAR

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Technical Support Projects Defined by Generic Risk Assessment
Number: (Pred) 206 (Suc) 207 ORG. OWI
Start: (WAS) 37.6 Complete: (WAS) 100.2 Duration 62.6
Short Title: Tech Support Proj Defined by GRA
Description:

Contract for technical support needs defined by risk assessment.

Inputs: Define requirements (107-206)

Product: Project reports to FSAR input (119-120)

Resource Requirements:

Pers:	MM	Skill	Level
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Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

RELIABILITY PROGRAM
ACTIVITIES 300-399

The reliability program has two major divisions. The first effort is directed at determining reliability requirements and assisting in the procurement of equipments of the appropriate reliabilities. The parallel effort analyses and establishes the requirements for continuous reliable operation of the facility in its intended function.

Determining reliability requirements and assisting in procurements is fairly straightforward. An initial effort is required to review existing procurement documentation, identifying those equipments which will require additional reliability specifications and preparing these specifications when reliability requirement data become available. The remainder of the effort is devoted to monitoring these tasks which will produce reliability requirements which will include the Risk Assessment, Quality Assurance Program and the Safety Program. As requirements are identified and procurements initiated, the appropriate reliability specifications must be prepared for the procurement documentation. For major critical items, the process of the procurement will be monitored and any reliability shortfalls identified and evaluated for impact. This will be a long term operation spanning the duration of procurement.

Establishing the requirements for long term reliable facility operation is more complex. The facility must be modeled in detail and the sensitivity of reliable operation to the reliabilities of the major equipments established. Equipment spares and parts stocking levels must be determined and reorder levels determined. The impact of Mean Time to

Repair (MTTR) and the Mean Time Between Failures (MTBF) of the various equipments will be used to determine the requirements for maintenance and repair personnel. From the above factors a logistic strategy may be determined to maximize the probability of reliable operation of the facility.

One additional factor is considered in the reliability program, which is the interaction of designed facilities with equipment reliabilities. For example, the capacity of the poor rock surge bin underground interacts with the materials hoist reliability. At the extremes either no hoist or only a minimal surge bin is required for the cases of an infinite bin capacity or a perfect hoist. The capacity of the surge bin should be sized at the desired confidence level that mining will only be stopped at a given low probability because of a full surge bin due to hoist malfunction. These sensitivities will be established by use of the facility simulation model. The product will be a sensitivity report issued for design consideration.

The Reliability Program reflects these two major divisions as follows:

- (1) 300-319 Reliability activities in support of procurement of reliable equipments and,
- (2) 320-339 Reliability activities in support of reliable operations of the facility.

ACTIVITY DESCRIPTION

Title: Procure Reliability Contractor

Number: (Pred) 300

(Suc) 301

ORG. OWI

Start: (WAS) 0

Complete: (WAS) 12.6 Duration 12.6

Short Title: PROC. REL. CON

Description:

This task is included to provide the lead time for OWI to perform the administrative actions to obtain a reliability contractor for support in this area.

Inputs:

Product:

Resource Requirements:

Pers:

MM

Skill

Level

OWI

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Review Prior Procurements

Number: (Pred) 302

(Suc) 303

ORG. Rel. Con.

Start: (WAS) 12.6

Complete: (WAS) 25.4 Duration 12.8

Short Title: Rev. Prior Proc.

Description:

This task reviews the prior procurements for design and/or equipment by OWI from the viewpoint of reliability requirements. As the reliability allocation is not yet known, only potential (as opposed to actual) problem areas will be identified and management alerted. A list of potential problem procurements will be prepared with the reason for the potential problem.

Inputs: Facility Description

Accident initiators report from Task 100-104

Procurement documentation

Product: List of potential problem procurements

Resource Requirements:

Pers:	MM	Skill	Level
	3	Rel. Spec.	

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Reliability Specifications

Number: (Pred) 304 (Suc) 360

ORG. Rel Con

Start: (WAS) 25.4 Complete: (WAS) 49.8 Duration 24.4

Short Title: Procurement Reliability Support

Description:

This task will assist OWI procurement by providing the necessary reliability specifications. Tasks 110-111 (Identify Insensitive Items) and 340-341 (Reliability Allocation) will be monitored and reports received as they become available. Reliability requirements will be estimated from engineering judgement and design requirements and refined as more definitive results become available from the Generic Risk Assessment.

Inputs: Reports from Tasks 110-111, 340-341. Configuration changes from task 462-465. Design data.

Product: Reliability input and specifications to procurements.

Resource Requirements:

Pers:	MM	Skill	Level
	12	Rel. Eng.	

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

5 trips to vendors of major equipment items.

ACTIVITY DESCRIPTION

Title: Procurement Reliability Support

Number: (Pred) 360 (Suc) 307

Start: (WAS) 49.8

Complete: (WAS) 238.6 ^{ORG.} Rel. Con. Duration 188.8

Short Title:

Description:

This task continues 304-360, but the emphasis shifts as information becomes available from the Generic Risk Assessment. Reliability allocation from 340-341 will be used to provide specifications for those equipments that need high reliability as well as those that can be less stringent due to smaller impact on safety. Tasks 326-305 (Evaluate Reliability Allocation) and 305-306 (Reliability Analysis) will be monitored and reports received as they become available. The results of these tasks will be incorporated in reliability specifications. As data become available, the list of potential problem procurements will be screened and if problems exist, remedial action recommended to OWI management. As the facility design matures and configuration changes are received from Task 462-465 (Configuration Accounting), changes will be reviewed for reliability impact on procurements and appropriate action taken.

Inputs: Conceptual Design Report, 304-360, reports from 340-341, 326-305, 305-306, 462-465, 408-409, 323-327.

Product: Reliability input and specifications to procurement.

Resource Requirements:

Pers:	MM	Skill	Level
	39	Rel. Enq.	

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

1 trip per 2 or 3 months to vendors.

PRELIMINARY LIST OF
EQUIPMENTS TO BE PROCURED

Gasket Sealed Doors
Cask Crane (100 T)
Cask Cooling Pad
Transfer Station Access Hatch
Canister Cranes (25 T), (4 T)
Canister Shield
Canister Storage Feed Conveyor
Canistered Waste Hoist, Head Frame, & Cage
HLW Canister Transporter
Hole Driller
Overpack Canister Units
Mechanical Manipulators (Transfer Cell)
Fork Lift Trucks (5 T)
Low Level Waste Hoist, Head Frame, & Cage
Self-Generated Waste Solidifier & Packager
Cask Transfer Lift Tables (100 T)
Overpack Unit Lift Table (4 T)
Railroad Car Puller (HLW)
Low Level Cargo Transfer Cab (25 T)
Low Level Weigh Scale (5 T)
Standby Power Generators
Communication Equipment/System
Radiation Monitoring Equipment/System
Men & Materials Ship Hoist, Head Frame, & Cage
Mined Materials Surge Hopper
NM Belt Conveyor System
Railroad Car Loading Hopper
Storage Yard Stocking Conveyor System
MM Transfer Switch Engines
Clam Shell Reloading Crane
Reclaim Conveyor System
Continuous Mining Machines
Mining Truck (Electrical/Diesel)
Man Carrier Vehicles (Subsurface)
Vibratory Conveyor Feeders
Graders
Front End Loaders/Scoop Trams
Portable Cranes
Ventilation Fans (200 K cfm)
Mine Exhaust Fans (250 K cfm)
Exhaust Filters (HEPA)
Mobile Dust Precleaner (Centrifugal/Metrical)
Mobile Ventilation Units (HLW)
Filter Air Conditioner Units (Subsurface)
Mobile Fan Filter Unit (20 K cfm)
Motorized Overhead Doors
Fan/Coil Recirculating Units
Air Conditioners (Surface)
Motorized Air Dampers

ACTIVITY DESCRIPTION

Title: Reliability Allocation

Number: (Pred) 340 (Suc) 341 ORG. Rel. Sub.

Start: (WAS) 37.6 Complete: (WAS) 50.0 Duration 12.4

Short Title: Reliability Allocation

Description:

Use risk quantification and sensitivity results to allocate reliability required to systems, equipments, and components.

Provide requirements to procurement.

Inputs: Risk quantification (107-112)

Product: Reliability requirements to procurement, 326-305, 360-307

Resource Requirements:

Pers:	MM	Skill	Level
	3	Rel. Anal.	Sr.
	3	Program Planner	Ave.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

1 to OWI, 2 men, 3 days

ACTIVITY DESCRIPTION

Title: Evaluate Reliability Allocation
Number: (Pred) 326 (Suc) 305 ORG. Rel Con
Start: (WAS) 50.0 Complete: (WAS) 75.4 Duration 25.4
Short Title: Eval. Rel. Alloc.
Description:

Task 340-341 will allocate reliability targets for equipments/functions of the waste flow as driven by the requirements to minimize risk. These equipments or series of equipments supplying functions must be procured. The equipment reliability targets must be evaluated in the context of availability and cost and also the sensitivity of the risk to the specific equipments. Where the targets are not reasonably attainable, trade-offs must be performed to minimize cost to attain the functional reliability through redesign, redundancy or substitution.

Those equipment reliabilities reasonably attainable will be documented and passed to task 360-307 for inclusion in procurement documentation.

Those target reliabilities which must be further examined will be passed to task 305-306 for analysis.

Inputs: Reliability allocation from task 340-341

Product: Reliabilities for equipment procurement to task 360-307
Analyses to be performed to task 305-306.

Resource Requirements:

Pers:	MM	Skill	Level
	6	Rel. Eng.	Sr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Reliability Analyses as Required

Number: (Pred) 305

(Suc) 306

ORG. Rel Con

Start: (WAS) 75.4

Complete: (WAS) 238.6 Duration 163.2

Short Title: Reliability Analyses as Required

Description:

Certain reliability analysis requirements will be received from task 326-305. These analyses will be performed and documented.

From time to time, vendors will be unable to attain or possibly exceed reliability targets. Task 360-307 will require analysis support to evaluate these situations. This category of analysis will also be performed and documented.

Inputs: Reliability analysis requirements from task 326-305

Product: Analytical results documented

Resource Requirements:

Pers:	MM	Skill	Level
	6	Rel. Eng.	Mid
	13	Rel. Eng.	Sr.

Computer Hours: 1 per 2 months average ~20

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Plan Facility Model

Number: (Pred) 301

(Suc) 320

Start: (WAS) 12.6

ORG. Rel Con
Complete: (WAS) 25.4 Duration 12.8

Short Title: Plan Fac Mod

Description:

This task generates the basic structure and flow diagram of the facility simulation model. The model must be designed with sufficient modularity to permit evaluation of alternative waste handling, mining, storage and receiving schemes. Interfaces between modules must be defined. The desired variables for investigation must be defined as well as their parametric ranges. The model must be capable of simulating both retrievable and backfill operations.

Inputs: Facility description
report from task 400-401

Product: Plan and major modules of the waste facility simulator.

Resource Requirements:

Pers:	MM	Skill	Level
	3	analyst	Sr.
	3	programmer	Non-Prof.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Define Mining Flow

Number: (Pred) 321

(Suc) 322

ORG. Rel Con

Start: (WAS) 12.6

Complete: (WAS) 25.4 Duration 12.8

Short Title: Mine Flow

Description:

This task defines the sequence of mining equipments associated with the mining of the storage facilities underground and the transport and handling equipments above ground. Capabilities and requirements of each equipment must be included, e.g., conveyors must be defined in terms of capacity per unit time and power requirements as a function of capacity and transport distance. Capacities and input and output rates for storage and surge hoppers must be identified. Where unit transportations are utilized: speed ranges; load and unload times; and fuel capacity, consumption rates and refuel times must be specified. The sequence of equipments utilized in backfilling must be separately identified.

Inputs: Facility Description
report from task 400-401

Product: Sequence of equipments (with capabilities and limitations)
utilized in mining and transport of mined materials.

Resource Requirements:

Pers:	MM	Skill	Level
	3	mining eng.	Mid.
	1.5	analyst	Jr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Acquire Mining Equipment Reliability Data
Number: (Pred) 320 (Suc) 323 ORG. Rel Con
Start: (WAS) 25.4 Complete: (WAS) 37.6 Duration 12.2
Short Title: Acq. Rel. Dat.
Description:

Determine major/selected vendors of the mining equipments for the list from task 321-322. Contact vendors and obtain available reliability and design data of the equipments and a list of major users of the equipments (preferably ungaged in salt mining). Contact major users and obtain experience data. Evaluate data as to adequacy for determining MTBF and MTTR. Where inadequate data are available, arrange with vendor to get detailed design data. As the vendor's quid pro quo, the results of the reliability analysis may be promised together with protection and return of proprietary information. Segregate data by equipments.

Inputs: List of equipments in Mining Flow from task 321-322, 103-110.

Product: Reliability/Design data of mining equipments to task 323-322

Resource Requirements:

Pers:	MM	Skill	Level
	2x3	Rel. Eng.	Sr.
	2x3	Mech. Eng.	Jr.
	3	programmer	Non-Prof.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

2 US circuits (1 for vendors, 1 for users) x 2 people
x 14 days (multiple stops).

ACTIVITY DESCRIPTION

Title: MTBF MTTR
Number: (Pred) 323
Start: (WAS) 37.6
Short Title: MTBF MTTR
Description:

(Suc) 327
Complete: (WAS) 62.8

ORG.	Rel	Con
Duration	25.2	

For those mining equipments with adequate data, analyze data and establish MTBF's, MTTR's and the associated distributions. For those equipments for which only design data are available, prepare a system simulation of the components and establish the MTBF's, MTTR's and associated distributions. Prepare inputs as necessary in format defined in task 301-320.

Organize data by equipment including results of reliability simulations and preserve for task 330-332.

Inputs: Data from task 320-323
Format from task 301-320

Product: Input for facility operations simulation, task 327-329

Resource Requirements:

Pers:	MM	Skill	Level
	2x 6	Rel. Eng.	Sr.
	1x 6	Programmer/analyst	Mid.
	2x 6	asst. prog.	Jr.

Computer Hours: 1 hour/equipment with design data only
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Mine Flow Model
Number: (Pred) 322 (Suc) 324 ORG. Rel Con
Start: (WAS) 25.4 Complete: (WAS) 37.6 Duration 12.2
Short Title: Mine Flo Mod
Description:

Flow chart, program and document the mine flow sequence from task 321-322 in conformance with the plan and interfaces established in task 301-320. Prepare a driver and appropriate inputs to exercise the model over the required parametric range and all interfaces. Debug as required. Prepare an analytically verifiable test case and proof the model.

Inputs: Plan and interfaces from task 301-320
Mine flow equipment sequence from task 321-322.

Product: Computer program and documentation of mine flow to task 324-328.

Resource Requirements:

Pers:	MM	Skill	Level
	3	analyst	Mid.
	3	programmer	Non-Prof.

Computer Hours: 6
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Waste Flow Model

Number: (Pred) 303

(Suc) 325

ORG. Rel Con

Start: (WAS) 25.4

Complete: (WAS) 37.6 Duration 12.2

Short Title: WST Flo Mod

Description:

Flow chart, program and document the waste flow sequence from task 102-106 in conformance with the plan and interfaces established in task 301-320. Prepare a driver and appropriate inputs to exercise the model over the required parametric range and all interfaces. Debug as required. Prepare an analytically verifiable test case and proof the model.

Inputs: Waste flow sequence from task 102-106
plan and interfaces from task 301-320

Product: Computer program and documentation of waste flow in
task 324-328.

Resource Requirements:

Pers:	MM	Skill	Level
	3	Analyst	Mid.
	3	programmer	Non-Prof.

Computer Hours: 6
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Prepare Source Model
Number: (Pred) 325 (Suc) 326 ORG. REL CON
Start: (WAS) 25.4 Complete: (WAS) 37.6 Duration 12.2
Short Title: Source Mod.
Description:

Flow chart, program and document the waste source models from tasks 201-204 and 202-205 in conformance with the plan and interfaces established in task 301-320. Prepare a driver and appropriate inputs to exercise the model over the required parametric range and all interfaces. Debug as required. Prepare an analytically verifiable test case and proof the model.

Inputs: Plan and interfaces from task 301-320.
Source terms from tasks 201-204 and 202-205.

Product: Computer program and documentation of waste source to task 324-328.

Resource Requirements:

Pers:	MM	Skill	Level
	3	Analyst	Sr.
	3	Programmer	Mid.

Computer Hours: 6
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Facility Operational Simulation Model

Number: (Pred) 324

(Suc) 328

ORG. Rel Con

Start: (WAS) 37.6

Complete: (WAS) 62.8

Duration 25.2

Short Title: Facility Simulation

Description:

Flow chart, program and document the software necessary to integrate the mine flow, waste flow and source models from tasks 322-324, 303-325 and 325-326 respectively in conformance with the plan and interfaces from task 301-320. Prepare input and output modules. Verify that impossible conditions are appropriately alerted with error messages, e.g., mining rate exceeds conveyor capacity, etc. Debug as necessary. Prepare analytical test case, verify model.

Inputs: Computer models from tasks 322-324, 303-325 and 325-326.
Plan and interfaces from task 301-320.

Product: Functional computer program modeling the operations of the facility and documentation therefore to task 327-329.

Resource Requirements:

Pers:	MM	Skill	Level
	2x6	analyst	Mid.
	6	programmer	Non-Prof.

Computer Hours: 24

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Facility Operational Simulation

Number: (Pred) 327

(Suc) 329

ORG. Rel Con

Start: (WAS) 62.8

Complete: (WAS) 75.4

Duration 12.6

Short Title: Fac. Opn. Sim.

Description:

Prepare the parametric input as defined in task 301-320 and the reliability input data from task 107-112 (Risk Assessment). Exercise the facility simulation model over the parametric range. Perform preliminary analyses of outputs and identify critical areas. Obtain detailed parametric data in the critical ranges. Provide results to task 329-331 and to task 330-332.

Inputs: Facility Simulation model from task 324-328
Reliability input data from task 323-327
data from 107-112

Product: Parametric output from system simulations to tasks 329-331 and 330-332, provide data back to 114-117.

Resource Requirements:

Pers:	MM	Skill	Level
	3	Rel. Eng.	
	3	Analyst	
	3	Programmer	

Computer Hours: 24

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Facility Sensitivity Report
Number: (Pred) 329 (Suc) 331 ORG. Rel Con
Start: (WAS) 75.4 Complete: (WAS) 87.6 Duration 12.2
Short Title: FAC SENS RPT
Description:

For both the retrievable storage and backfill storage examine the waste and mining sequences for sensitivities of facility operations to such parameters as canister storage feed conveyor system capacity, surge hoppers and bin capacity, predrilled hole inventory, etc. Identify sensitivities which cross couple between canister flow and mining flow. For example, if mining comes to a halt and predrilled holes are all filled, the canister flow must be halted. This situation will be sensitive to both waste arrival rate and predrilled hole inventory. Another predictable sensitive situation will be simultaneous mining and backfill.

Identify situations which alert to potential flow stoppage. Document the results of the sensitivity studies and the alerting conditions.

Inputs: Parametric simulation data from task 327-329

Product: Facility sensitivity report to design A-E, procurement, operator, risk assessment (116-119), and FSAR.

Resource Requirements:

Pers:	MM	Skill	Level
	2x3	analyst	Sr.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Logistics Strategy

Number: (Pred) 330

(Suc) 332

ORG. Rel Con

Start: (WAS) 75.4

Complete: (WAS) 100.2 Duration 24.8

Short Title: Logistics Strategy

Description:

With the input reliability data and simulation results determine the logistics strategy which minimizes the probability of stoppage in either the waste or mining flows. Provide recommended equipment spares and repair parts levels and reorder levels. Provide maintenance strategies for the most sensitive major equipments. Provide maintenance and repair personnel requirements. Parameterize the above for 50, 90 and 99% confidence limits.

Prepare a logistics strategy report documenting results by equipment type.

Inputs: Data from tasks 323-327, 327-329, 329-331 and 326-305

Product: Logistics strategy report

Resource Requirements:

Pers:	MM	Skill	Level
	6	Rel. Eng.	
	6	Analyst	

Computer Hours: 12

Travel (Trips, Destination, No. Pers., Stay)

QUALITY ASSURANCE PROGRAM
ACTIVITIES 400 - 499

The purpose of the Quality Assurance Program is to assure that the Waste Isolation Facility as described in approved design documentation is in fact in accordance with this description. It comprises all those planned and systematic actions necessary to provide assurances that structures, systems, components and procedures will perform satisfactorily in service. It applies to all activities associated with doing a job correctly as well as verifying and documenting the satisfactory performance of the work.

As such, the QA Program begins with the design of the facility and associated equipments and components; continues through procurement, construction, acceptance, test and operations; and concludes only after completion of operations and conversion of the facility to an unmanned dormant repository. It is important to note that the documentation of the QA Program will be the only single source set of documentation which spans the entire history of the facility from concept to completion of operations.

Appropriate codes and standards for waste isolation have not yet been issued. However, it seems likely that they will parallel existing issues which should be examined for convertibility. Appendix B to 10CFR50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," establishes QA requirements for design, construction and operation of nuclear power plants. Almost concurrently with the promulgation of Appendix B, the responsibility for scoping, coordinating, reviewing, and developing quality assurance standards related to design, construction, maintenance, and modification of nuclear power plant structures, systems, and components was assigned by the American National Standards Institute (ANSI) to their N45 Standards Committee, "Reactor Plants and Their Maintenance."

In turn, subcommittee N45-2, "Nuclear Quality Assurance Standards" was established to accomplish the job.

The standard consists of 19 sections, the first defining scope, identifying responsibilities, and defining some of the more important/unique terms used. The remaining 18 sections correspond precisely to the 18 elements of Appendix B of 10CFR50. It should be noted that to date all sections of the ANSI N45.2 Standard have not been completed.

From the time schedule of the conversion of Appendix B into definitive standards, it is probable that standards will not be available during the design, construction and early operations phases of the repository. Title 10CFR part 50, "Licensing of Production and Utilization Facilities" could be construed as applicable to the Waste Isolation Facility (WIF). It would appear logical to expect that Appendix B, "Quality Assurance Criteria for Nuclear Power Plants" will be revised to cover a WIF or an applicable appendix codified. The NWTs program must obviously proceed with such guidance as may be inferred from the extrapolation of standards and regulatory positions and comments pertaining to standards covering reactors.

Based on this premise, the QA Program Plan for the WIF should include the following provisions based upon the 18 elements of Appendix B, 10CFR50 (or new equivalent).

1. Organization
2. Quality Assurance Program (scope)
3. Design Control
4. Procurement Document Control
5. Instructions, Procedures, and Drawings
6. Document Control
7. Control of Purchases Material, Equipment and
Services
8. Identification and Control of Materials, Parts,
and Components

9. Control of Special Processes
10. Inspection
11. Test Control
12. Control of Measuring and Test Equipment
13. Handling, Storage, and Shipping
14. Inspection, Test, and Operating Status
15. Nonconforming Materials, Parts, and Components
16. Corrective Action
17. Quality Assurance Records
18. Audits

Appendix B, Section I, "Organization" is further quoted in part, "The applicant shall be responsible for the establishment and execution of the quality assurance program." It goes on to state that all or part of the job may be delegated, but the responsibility is retained. Regulatory staff comments and supplementary guidance contained in, "Guidance on Quality Assurance Requirements During the Operations Phase of Nuclear Power Plants," dated October 26, 1973, provides specific examples of acceptable QA organizations. In the four examples, in each case a QA supervisor is onsite and an offsite manager QA operation is included. In two cases the latter reports to a vice president quality assurance. The regulatory position with respect to organization is cited as an indication that the term "applicant" must be logically construed as the Facility Operator.

With the selection of the Facility Operator occurring in 1979 and the early QA requirements established by various Regulatory Guides, a significant burden is placed upon OWI to provide the early QA activities/supervision. A brief examination of ANSI Standard N45.2.9, deemed generally acceptable and providing an adequate basis for complying with Appendix B 10CFR50, indicates that tremendous quantities of records generated in early design and procurement will be required to be maintained for the life of the facility.

The Quality Assurance Program as presented in this plan accomodates four groups of activities:

1) 400 to 419 - Those actions necessary to translate 10CFR50 and Appendix B thereto into the context of the NWTS and therefrom define the QA Program requirements; to identify the QA organization and scope of the QA program; and finally the generation and execution of the QA Program Plan.

2) 420 to 439 - Those actions necessary to define and begin the QA functions of Design Control and Procurement Document Control in support of ongoing activities.

3) 440 to 459 - Those activities necessary to identify special controls, processes, test equipment and tool requirements; to prepare the procedures to be utilized with them; to identify the skills required; and, after staffing, to determine and fulfill training requirements.

4) 460 to 479 - Those activities, often termed Configuration Management, which identify and control the design bases/specifications of the facility; identify the initial facility details and interfaces; determine the methods and procedures utilized to control, change, and disseminate the approved facility configuration; and the configuration accounting to implement the methods and procedures defined above. (Normally only the last activity is a QA function but all are included for completeness.)

ACTIVITY DESCRIPTION

Title: Identify Structures, Systems and Components
Number: (Pred) 400 (Suc) 401 ORG. QA SUB
Start: (WAS) 0 Complete: (WAS) 12.6 Duration 12.6
Short Title: ID Struct Sys Comp
Description:

This task requires the identification of structures, systems and components related to the safe operation of the waste isolation facility. The task includes specifically those features that respond to the seismic, flood, tornado and missile protection requirements; NRC General Design Criteria; release barrier design/systems; consequence limiting systems; shielding design/systems; mine safety; industrial safety, motor vehicle and traffic safety; fire protection, industrial hygiene, and water pollution control. Monitoring and alarm systems for detection and alarm of specific unsafe conditions will be identified.

The product will be a report (loose leaf for updating) providing the identity of each such structure, system or component; the requirement to which it responds; the essential feature of the response and an indication if the essential feature(s) will be accessible upon completion.

Inputs: Waste Isolation Facility Description Y/OWI/SUB-76/16506
ERDA Manual Chapters 0510, 0524, 0529, 0550, 0552 and 6301;
30CFR57; DOT reqs; NFPCA; MESA reqs; etc. liason with A-E
Product: Report as above to tasks 442-443, 441-444, 440-445, 446-447
401-402, 406-407, 420-421, 423-424, 461-462, 463-464,
301-320, and 106-109.

Resource Requirements:

Pers:	MM	Skill	Level
	3	Reactor/Nuc Eng	Sr.
	6	QA Engineer	1 Sr., 1 Mid.
	3	Analyst	1 Mid.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

2 trips Oakland via Denver 2 people 1-1/2 day each location

ACTIVITY DESCRIPTION

Title: Identify Major Organizations Participation

Number: (Pred) 401 (Suc) 402 ORG. QA SUB

Start: (WAS) 12.6 Complete: (WAS) 16.6 Duration 4.0

Short Title: Maj. Org.

Description:

For each structure, system and component of the report from task 400-401, identify the responsible contractor and the OWI supervisor and branch. Obtain from each contractor his QA organizational structure, address, point of contact, phone number and nearest airport. For each structure, system and component, prepare a single page, loose leaf addendum to the task 400-401 report providing the above details and distribute per task 400-401 report. For those elements for which the responsible contractor has not been selected, prepare report format sheets for the OWI supervisor for issue when selection is accomplished. For report augmentation, in these cases, prepare an insert sheet indicating OWI supervision and expected date of data availability.

Inputs: 400-401 report, OWI contractor hist. & structure.

Product: Single sheet augmenting reports to 400-401 report.

Resource Requirements:

Pers:	MM	Skill	Level
	1	QA Engineer	Sr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Identify Special Test Equipment and Tools Requirements
Number: (Pred) 442 (Suc) 443 ORG. QA SUB
Start: (WAS) 12.6 Complete: (WAS) 16.6 Duration 4.0
Short Title: TE TLS
Description:

For each structure, system and component identified in the Task 400-401 report; identify test equipments and/or tools required to verify that the essential features do in fact function as required. Create the envelope of test equipment and tool requirements. Identify those test equipments and tools of the envelope which require periodic calibration. The items so identified will be the list of special test equipments and tools.

For each structure, system and component; prepare a one page list of test equipment and tools required with the special test equipments and tools identified thereon. Issue to distribution of task 400-401 report.

Inputs: Report from Task 400-401

Product: Test equipment and tool list for each item of input report. Total list of test equipment and tool requirements to task 446-447.

Resource Requirements:

Pers:	MM	Skill	Level
	1	QA Eng.	Mid.
	1	QA Tech/Inspector	Non-Prof.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Identify Special Process Requirements

Number: (Pred) 441

(Suc) 444

Start: (WAS) 12.6

Complete: (WAS) 16.6

ORG. QA SUB

Duration 4.0

Short Title: SPC PRC

Description:

In conjunction with Task 440-445 (Identify Special Control Requirements) review the structures, systems and components reported in Task 400-401. Identify those for which the verification of the essential protective/safety feature depends upon verification of a manufacturing/construction process or verification depends upon a one time nondestructive test or the feature becomes inaccessible/untestable after construction is complete.

For each item so identified, prepare a one page summary indicating the nature of the special process, the requirement for verification and that the process will be subject to special controls. Issue to task 400-401 report distribution.

Inputs: Report from task 400-401

Product: One page inserts for input report.

Resource Requirements:

Pers:	MM	Skill	Level
	1	QA Eng.	Mid.
	1	QA Tech/Inspector	Non-Prof.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Identify Special Control Requirements
Number: (Pred) 440 (Suc) 445 ORG. QA SUB
Start: (WAS) 12.6 Complete: (WAS) 16.6 Duration 4.0
Short Title: SPC CON
Description:

In conjunction with Task 441-444 (Identify Special Process Requirements) review the structures, systems and components reported in Task 400-401. Identify those for which the verification of the essential protective/safety feature depends upon verification of a one-time nondestructive test or the feature becomes inaccessible/untestable after construction is complete.

Inputs: Report from Task 400-401

Product: By task 441-444

Resource Requirements:

Pers:	MM	Skill	Level
	1	QA Eng.	Jr.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Identify QA Functions of Major Organizations

Number: (Pred) 402 (Suc) 403 ORG. QA SUB

Start: (WAS) 16.6 Complete: (WAS) 25.4 Duration 8.8

Short Title: ID Maj. Org. QA Func.

Description:

For each structure, system and component identified in the report from Task 400-401 as augmented; identify the QA inspection/test/verification functions which must be performed and the responsible organization. For each item for which QA responsibility is transferred, e.g., manufacturer to construction contractor, indicate the multiple responsibility and identify the transfer point/event/time.

Prepare single page insert reports as per above to be incorporated in report. Issue to report holders.

Inputs: Report from Task 400-401 augmented by Task 401-402, 440-445, 441-444 and 442-443

Product: Single page inserts to input report

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Sr.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Identify QA Skill Requirements

Number: (Pred) 446

(Suc) 447

ORG. QA SUB

Start: (WAS) 16.6

Complete: (WAS) 25.4 Duration 8.8

Short Title: ID QA Skill

Description:

From the envelope of the test equipment and tools and the special processes to be verified; identify the specific skills required by each item. Group skills into technical personnel groups, e.g., mechanical, electro-mechanical, electronics, etc., technician. Assign the appropriate personnel skill to each item of test equipment, tools and special processes.

Prepare report of skills required for Task 403-404.

Inputs: Report from Task 400-401 augmented by task 442-443, 441-444 and 440-445. Envelope of special test equipments and tools from task 442-443

Product: Report of skill requirements for task 403-404

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Mid.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Define QA Structure

Number: (Pred) 403

(Suc) 404

Start: (WAS) 25.4

Complete: (WAS) 37.6

ORG. QA SUB

Duration 12.2

Short Title: QA Struc

Description:

From the major organization QA Functions (Task 402-403) for each structure, system and component and the skills required for special test equipments, tools and processes; define the QA structure necessary to satisfy the requirements. Include in requirements the necessary audit functions and the central QA records function. Identify separately all QA structure to be provided by OWI and/or the operating contractor. Identify on structure any time phased requirements. Review QA structure with Task 408-409 (Define QA Requirements).

Issue report of QA structure requirements.

Inputs: Report from task 400-401 as modified by tasks 401-402, 402-403, 442-443, 441-444, and 440-445. Report of skills required from task 446-447.

Product: Report of QA Structure Requirements for Task 404-405 and OWI Management review.

Resource Requirements:

Pers:	MM	Skill	Level
	3	QA Eng.	Sr.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Prepare Special Control Procedures
Number: (Pred) 445 (Suc) 450
Start: (WAS) 16.6 Complete: (WAS) 37.6
Short Title: Spec. Controls
Description:

ORG. QA SUB
Duration 21.0

For each special process identified in Task 441-444 (Identify Special Processes), prepare the detailed procedures for controls necessary to provide certified documentation of the verification that the correct (as defined by task 444-449) procedures were utilized in the process. Provide those control procedures to Task 444-449 in the agreed format.

Inputs: Report from Task 400-401 as augmented by Tasks 441-444 and 440-445 (only applicable)

Product: Procedures to task 444-449.

Resource Requirements:

Pers:	MM	Skill	Level
	5	QA Eng.	Jr.

Computer Hours: None
Travel (Trips, Destination, No. Pers., Stay)
None

ACTIVITY DESCRIPTION

Title: Prepare Procedures for Special Processes

Number: (Pred) 444

(Suc) 449

ORG. QA SUB

Start: (WAS) 16.6

Complete: (WAS) 37.6 Duration 21.0

Short Title: Process Proc.

Description:

For each special process identified in Task 441-444 (Identify Special Processes), prepare detailed procedures to implement the process for each structure, system or component to which it applies. Format procedures to incorporate procedure for the application of special controls applicable to each process (the actual control procedure to be prepared in Task 445-450).

Inputs: Report from Task 400-401 as augmented by tasks 441-444 and 440-445 (only applicable).

Product: Special Process Procedures and control thereof to be utilized in Task 404-405 (preliminary QA plan).

Resource Requirements:

Pers:	MM	Skill	Level
	5	QA Eng.	Mid
	5	QA Tech.	Non-Prof.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Prepare Special Test Equipment and Tools Procedures
Number: (Pred) 443 (Suc) 448 ORG. QA SUB
Start: (WAS) 16.6 Complete: (WAS) 27.6 Duration 21
Short Title: TE/T Proc.
Description:

For the list of special test equipment and tools identified in Task 442-443 prepare detailed procedures for the utilization of each item. Where a single item is required for more than one structure, system or component; insure that the procedure accommodates the multiple applications. It is not expected that final values (passing test criteria, etc.) will be available at this time for all procedures; consequently, procedures should be so formatted that criteria sheets may be inserted in procedures for each structure, system and component to which it applies.

Inputs: Report from task 400-401 as augmented by task 442-443
(only applicable)

Product: Procedure for utilization of Special Test Equipments and Tools. To task 404-405 (Preliminary QA Plan)

Resource Requirements:

Pers:	MM	Skill	Level
	5	QA Eng.	Mid
	5	QA Tech.	Non-Prof.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Translate 10CFR50 to NWTS Context

Number: (Pred) 406 (Suc) 407

ORG. QA SUB

Start: (WAS) 12.6

Complete: (WAS) 16.6 Duration 4.0

Short Title: CFR

Description:

Review 10CFR50 in detail. Identify those portions which are directly applicable to NWTS. Translate the remaining portions into NWTS context. Review the structures, systems and components identified in Task 400-401 in light of the translated CFR. Identify and produce any indicated additions/modifications to encompass the NWTS facilities. Prepare a double column twist format report containing 10CFR50 in the left column and either comments, e.g., no change, or amended text in the right column. Where text has been added leave space in the left column to achieve one-to-one correspondence in unmodified portions.

Inputs: 10CFR50 Task 400-401 report.

Product: Report as above to Task 407-408

Resource Requirements:

Pers:	MM	Skill	Level
	1	Nuc. Eng.	Sr.
	1	QA Eng.	Jr.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Translate Appendix B of 10CFR50 to NWTs Context
Number: (Pred) 407 (Suc) 408 ORG. QA SUB
Start: (WAS) 16.6 Complete: (WAS) 25.4 Duration 8.8
Short Title: App B
Description:

Review Appendix B of 10CFR50 in detail. Identify those portions directly applicable to NWTs. Translate the remaining portions into NWTs context. Review the 10CFR50 report from Task 406-407 and examine appendix B for completeness against the revised version. Make any necessary additions to Appendix B. Review the Task 400-401 report and identify any omissions in the revised version of App B. Prepare additions as required. Prepare report similar to that of Task 406-407 for Appendix B.

Inputs: Appendix B of 10CFR50
Task 400-401 report
Task 406-407 report

Product: Report as above to Task 408-409

Resource Requirements:

Pers:	MM	Skill	Level
	2	Nuc. Eng.	Sr.
	2	QA Eng.	Jr.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Define QA Requirements

Number: (Pred) 408

(Suc) 409

ORG. QA SUB

Start: (WAS) 25.4

Complete: (WAS) 37.6 Duration 12.2

Short Title: QA REQTS

Description:

Establish the NWTS QA Program requirements by interpreting to the structures, systems and components of the Task 400-401 the report from task 407-408 (Appendix B modified) utilizing the ANSI Standards N45.2 series for guidance. Prepare such additional quality requirements as necessary. Prepare a series of OWI quality guides to cover the NWTS structures, systems and components and the documentation deriving therefrom to cover all facility phases from design through operations.

Inputs: Task 400-401 report as augmented.
Task 406-407 report (10CFR50 modified)
Task 407-408 report (App B to 10CFR50 modified)
Product: ANSI Standards N45.2 as issued & drafts.
OWI Quality Guides (QA Requirements)

Resource Requirements:

Pers:	MM	Skill	Level
	3	Nuc. Eng.	Sr.
	3	QA Eng.	Jr.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Preliminary QA Program

Number: (Pred) 404

(Suc) 405

ORG. QA SUB

Start: (WAS) 37.6

Complete: (WAS) 50.0 Duration 12.4

Short Title: QAP

Description:

From the input QA structure, Program Requirements, Procedures and NWTS Program Schedule, prepare a preliminary QA Program Plan phased to meet the requirement on schedule. Prepare a Quality Assurance Manual documenting Quality Guides; Special Test Equipment, Tools and Procedures to be used with them; and Special processes, the procedures to be used with them, and the special controls to which these processes are subject. Where special documentation requirements are apparent, forms and/or format should be included in the manual.

Inputs: Procedures from tasks 443-448, 444-449, 445-450.

QA structure from task 403-404

QA Program Requirements from task 408-409

Product: NWTS Program Schedule

Preliminary QA Program Plan

Resource Requirements: Preliminary QA Manual

Pers:	MM	Skill	Level
	3	Nuc. Eng.	Sr.
	3	QA Eng.	Sr.
	3	QA Tech	Non-Prof.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Prepare QA PSAR Inputs
Number: (Pred) 405 (Suc) 7000 ORG. QA SUB
Start: (WAS) 50.0 Complete: (WAS) 87.6 Duration 37.6
Short Title: QA PSAR INPUT
Description:

This task translates the Preliminary QA Plan and Manual into the format required by the PSAR. While the task is scheduled to the date of PSAR submission, it is expected to conform to the PSAR production schedule.

Inputs: Preliminary QA Plan and Manual (from task 404-405)

Product: PSAR QA Content

Resource Requirements:

Pers:	MM	Skill	Level
	2x8	QA Eng.	1- Sr.
			1- Jr.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Identify QA Design Control and Design Documentation Requirements
Number: (Pred) 420 (Suc) 421 ORG. QA SUB
Start: (WAS) 12.6 Complete: (WAS) 21.2 Duration 8.6
Short Title: QA DES
Description:

Identify those structures, systems and components from the report of Task 400-401 for which design activities will be initiated prior to July 1979. Using the Grey Book as guidance, prepare interim procedures for QA Design Control and QA Design Documentation Requirements by translating to NWTS context. Document the interim procedures.

Inputs: Report from Task 400-401
NWTS program schedule
Guidance on Quality Assurance Requirements During Design and Procurement Phase of Nuclear Power Plants.
Product: Interim procedures for QA Design control and Design Documentation.

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Mid.

Computer Hours: None
Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Identify QA Design Control and Design Documentation Requirements
Number: (Pred) 420 (Suc) 421 ORG. QA SUB
Start: (WAS) 12.6 Complete: (WAS) 21.2 Duration 8.6
Short Title: QA DES
Description:

Identify those structures, systems and components from the report of Task 400-401 for which design activities will be initiated prior to July 1979. Using the Grey Book as guidance, prepare interim procedures for QA Design Control and QA Design Documentation Requirements by translating to NWTs context. Document the interim procedures.

Inputs: Report from Task 400-401
NWTs program schedule
The "Grey Book" Guidance and Quality Assurance Requirements
Product: During Design and Procurement Phase of Nuclear Power Plants
Interim procedures for QA Design control and Design Documentation.

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Mid.

Computer Hours: None
Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Identify QA Procurement Documentation Requirements
Number: (Pred) 423 (Suc) 424 ORG. QA SUB
Start: (WAS) 12.6 Complete: (WAS) 21.2 Duration 8.6
Short Title: QA PROC
Description:

Identify those structures, systems and components from the report of Task 400-401 for which procurement will be initiated prior to July 1979. Using the Grey Book as guidance, prepare interim procedures for acquisition and review of procurement documentation. Document the interim procedures.

Inputs: Report from task 400-401. NWTS Program Schedule The Grey Book, "Guidance on the Quality Assurance Requirements During Design and Procurement Phase of Nuclear Power Plants".
Product: Interim procedures for acquisition and Review of Procurement Documentation

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Mid.

Computer Hours: None
Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Identify QA Audit Requirements for Design and Procurement
Number: (Pred) 421 (Suc) 422 ORG. QA SUB
Start: (WAS) 21.2 Complete: (WAS) 25.4 Duration 4.2
Short Title: QA Aud
Description:

Utilizing the Interim Procedures developed in Tasks 420-421 and 423-424 and the Grey Book for Guidance, develop the interim audit procedures for the design and procurement activities. Document these procedures.

Inputs: Interim Procedures from Tasks 420-421 and 423-424. The Grey Book, "Guidance on the Quality Assurance Requirements During Design and Procurement Phase of Nuclear Power Plants.

Product: Interim QA Audit Procedures for Design and Procurement Activities

Resource Requirements:

Pers:	MM	Skill	Level
	2	QA Eng.	Mid.

Computer Hours: None
Travel (Trips, Destination, No. Pers., Stay)

None

ACTIVITY DESCRIPTION

Title: Interim QA Design, Procurement and Audit Activities
Number: (Pred) 422 (Suc) 425 ORG. QA SUB
Start: (WAS) 25.4 Complete: (WAS) 100.2 Duration 74.8
Short Title: INT QA
Description:

This activity implements the interim procedures developed in Tasks 420-421, 423-424 and 421-422. The purpose of this activity is to initiate those QA activities which occur prior to the operating contractor's arrival, but for which records are required for the duration of the facility life. As applicable procedures and the preliminary QA Manual are developed under other tasks, they will be substituted for equivalent interim procedures.

Inputs: Interim QA procedures from tasks 420-421, 423-424, 421-422
Preliminary QA Manual and Program when ready

Product: Interim QA Activities anticipating the operating contractors arrival and all permanent QA documentation generated before his arrival.

Resource Requirements:

Pers:	MM	Skill	Level
	18	QA Eng.	2-Mid.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

18 trips (one per month) to each design and major item procurement contractor. Details to be determined.

ACTIVITY DESCRIPTION

Title: Transition from Interim QA Activities

Number: (Pred) 425

(Suc) 426

ORG. QA SUB

Start: (WAS) 100.2

Complete: (WAS) 112.8 Duration 12.6

Short Title: QA TRANS

Description:

This activity is scheduled to provide for the orderly transition of the interim QA activities and documentation to personnel from the operating contractors QA organization.

Inputs: Documentation and activities from task 422-425

Product: Turn over of records and activities to permanent QA organization

Resource Requirements:

Pers:	MM	Skill	Level
QA Sub only 2x3		QA Engrs.	2-Mid.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

One trip per month to each design and major procurement item contractor. (Does not include provision for operating contractor personnel who should accompany).

ACTIVITY DESCRIPTION

Title: Facility Design Bases Data Acquisition
Number: (Pred) 460 (Suc) 461 ORG. QA SUB
Start: (WAS) 0 Complete: (WAS) 8.2 Duration 8.2
Short Title: FAC BAS
Description:

This task is to identify and acquire the regulatory and functional requirements which will drive the design of the Waste Isolation Facility. Where requirements are too broad for direct application, refining studies will be performed and/or recommended. For example, 40CFR190, EPA Radioactive Emissions Standards Encompasses the entire LWR uranium fuel cycle from mining on. Some standards are expressed in terms of "any part" of the cycle, which could imply direct applicability. Other standards are stated in terms of total curies/gigawatt year for the cycle. In this case the entire cycle must be analyzed and the emissions allocated and the NWTS portion determined. The objective of this task is to produce a design bases data book (loose leaf) which will be controlled to assure that all design considerations utilize the same bases. Included will be source terms, regulations, safety code requirements, etc. Broad areas for which the bases must be determined include: General design and construction criteria (includes seismic, flood, etc.); radiation control of monitoring, Mine and tunnel safety, Industrial safety and hygiene, motor vehicle and traffic safety, transportation of radioactive materials, fire protection, air and water standards. National standards must be augmented by state standards after site selection.

Inputs: Waste Isolation Facility Description, Sept. 1976
Y/OWI/SUB-76/16506

Product: Design Bases Data Book

Resource Requirements:

Pers:	MM	Skill	Level
	2	Nuc. Eng.	Sr.
	2	QA Eng.	Mid.
	2	Mining Eng.	Jr.

Computer Hours: -
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Facility Configuration Identification
Number: (Pred) 461 (Suc) 462 ORG. QA SUB
Start: (WAS) 8.2 Complete: (WAS) 21.2 Duration 13
Short Title: Config.
Description:

The design bases from Task 460-461 will ultimately be applied to specific designs for elements of the facility. As this occurs, the identifying documentation must be procured and the most recent approved version maintained on file and the identification recorded to provide a central record of the approved current facility configuration. As all designs will not be completed during the task, those structures, systems and components related to safety as identified in Task 400-401, must be annotated with the applicable bases and used as an interim configuration identification (these data will also be valuable for QA design control and audit, tasks 422-425). The product of this task will be the list of documents; appropriately identified by number, date of issue, and revision; of the up to date, approved facility configuration and a file of those documents.

Inputs: Design Bases Data Book (Task 460-461)
Report from Task 400-401 when completed

Product:
Documentation of approved facility configuration

Resource Requirements:

Pers:	MM	Skill	Level
	3	Nuc. Eng.	Sr.
	3	Mining Eng.	Jr.

Computer Hours: none
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Configuration Control, Change and Approval Procedures
Number: (Pred) 463 (Suc) 464 ORG. QA SUB
Start: (WAS) 8.2 Complete: (WAS) 21.2 Duration 13
Short Title: Config. Pro
Description:

This task will devise, document and disseminate the procedures to be employed in controlling, changing and approving the current configuration of the facility. Additional procedures will be developed to verify that the appropriate contractors and OWI branches possess the current approved version of documentation defining the facility configuration. As these procedures will constrain the activities of all contractors and OWI management, the final documentation must be approved and issued by OWI management. Consequently close liaison is indicated. Distribution requirements will evolve from this task 401-402 (Major Organizations Participating) augmentation to the task 400-401 report.

Inputs:

Product:

Configuration control manual

Resource Requirements:

Pers:	MM	Skill	Level
	3	QA Eng.	Mid.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Configuration Accounting

Number: (Pred) 462 (Suc) 465 ORG. QA SUB

Start: (WAS) 21.2 Complete: (WAS) 100.2 Duration 79.0

Short Title: Config. Acc.

Description:

This task implements the procedures of the Configuration Control Manual. It will maintain the current configuration, updates it as approved changes are received, disseminate approved changes, verify that appropriate organizations hold the approved configuration documentation and, incorporate additions as the design of the facility matures.

Inputs: Configuration Control Manual (Task 463-464)

Product:

Configuration Control Services

Resource Requirements:

Pers:	MM	Skill	Level
	2x19	QA Eng.	1-Mid.
			1-Jr.

Computer Hours: None

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Configuration Control Transition
Number: (Pred) 465 (Suc) 466 ORG. QA SUB
Start: (WAS) 100.2 Complete: (WAS) 112.8 Duration 12.6
Short Title: Config. Trans.
Description:

This activity provides for the orderly transition of the Configuration Control activities and documentation to the operating contractor personnel.

Inputs: Documents and activities from task 462-465

Product: Operating contractor configuration control

Resource Requirements:

Pers:	MM	Skill	Level
	2x3	QA Eng.	1-Mid.
	Operating contractor personnel		1-Jr.

Computer Hours: -
Travel (Trips, Destination, No. Pers., Stay)
none

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ACTIVITY DESCRIPTION

Title: Final QA Plan
Number: (Pred) 411
Start: (WAS) 100.2
Short Title: FOC QAP
Description:

(Suc) 412 ORG. FOC*
Complete: (WAS) 112.8 Duration 12.6

This is the period when the Facility Operating Contractor (FOC) starts activities. The first QA related activity should be to review the Preliminary QA Program and bring it up to date and update the Quality Assurance Manual. At the same time FOC personnel will take over the ongoing QA and Configuration Control activities, tasks 425-426 and 465-466.

Inputs: Preliminary QAP from task 404-405

Product:

Resource Requirements:

Pers:	MM	Skill	Level
	FOC personnel		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

* Facility operating contractor

ACTIVITY DESCRIPTION

Title: QA Audit
Number: (Pred) 453 (Suc) 456
Start: (WAS) 100.2 Complete: (WAS) - ORG. FOC
Short Title: FOC QA AUDIT Duration 20 yrs +
Description:

This activity covers the audit function of the FOC QA Organization.

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
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FOC Personnel

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

TBD

ACTIVITY DESCRIPTION

Title: FOC QA Training Req'ts
Number: (Pred) 452 (Suc) 455 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration 20+ yrs
Short Title: FOC QA TR REQTS
Description:

As the QA activities of the FOC progress, certain certified QA personnel training requirements will occur. This activity detects and alerts to these requirements.

Inputs:

Product:

Training Requirements for QA personnel

Resource Requirements:

Pers:	MM	Skill	Level
	FOC personnel		

Computer Hours: -
Travel (Trips, Destination, No. Pers., Stay)

TBD

ACTIVITY DESCRIPTION

Title: QA Training/Certification
Number: (Pred) 451 (Suc) 454 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration 20+ yrs
Short Title: QA CERT
Description:

As training requirements are uncovered in task 452-455, personnel must be trained and certified. This activity covers the requirement.

Inputs: Requirements from task 452-455

Product:
Certified personnel

Resource Requirements:

Pers:	MM	Skill	Level
	FOC personnel		

Computer Hours: -
Travel (Trips, Destination, No. Pers., Stay)
TBD

ACTIVITY DESCRIPTION

Title: Design QA
Number: (Pred) 412 (Suc) 413 ORG. FOC
Start: (WAS) 112.8 Complete: (WAS) - Duration to 4/1/82
Short Title: DES QA 4/1/82
Description:

This task covers FOC QA activities related to Design of the Facility.

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
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FOC personnel

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Construction QA
Number: (Pred) 413 (Suc) 414 ORG. FOC
Start: (WAS) - Complete: (WAS) - Duration Construction
Short Title: Const. QA 10/85 Phase
Description:

This activity covers the FOC construction QA tasks (TBD).

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
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FOC personnel

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Facility Operations QA
Number: (Pred) 414 (Suc) 415 ORG. FOC
Start: (WAS) - Complete: (WAS) - Duration -
Short Title: OP QA 2005
Description:

This activity covers the FOC operations QA tasks.

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
		FOC personnel	

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

OPERATIONAL SAFETY PROGRAM ACTIVITIES (SERIES 500)

The Safety Program Plan is formulated based upon the following assumptions:

- 1) The Architect Engineer contractors participating in the design phases of the facility are aware of and accustomed to designing facilities complying with the governing regulations.
- 2) The construction and/or mining contractors are practiced and competent in operating under the appropriate Federal and State regulations.
- 3) The operating contractor will be responsible for the Operational Safety Program.
- 4) Safety as interpreted for the Operational Safety Program refers to the safety of the operating personnel and does not refer to the safety of the facility as a repository of waste, which is implemented through the design and the operational concept.

Within the context of the assumptions, OWI must provide the activity related to safety prior to the time of selection of the operating contractor. Monitoring of the design features is required as an audit for compliance with ERDA, OSHA, MESA and State regulations.

Until the arrival of the operating contractor upon the scene, presumably in April 1979, OWI must provide for the radiological and industrial safety inputs into the PSAR.

The general areas to be covered for inclusion in the PSAR include:

- safety review of engineered safety features;
- industrial safety;
- radiological safety; and
- safety aspects of the cold test.

When the sites are selected about two months before the PSAR is due to be submitted, all the safety inputs above must be reviewed and updated to reflect compliance with state standards.

As Title II design and construction proceed and operating details become specified, the operating contractor will then be in a position to definitize details of the Operational Safety Program. The most complex portion of the Operational Safety Program will be the requirement to coordinate the continuing mining operating and all of the associated MESA encumbrments with the storage operation. This will become particularly onerous when and if backfilling is begun.

For example, 30CFR57.1153 makes mandatory specific escape and evacuation plans which include mine maps or diagrams showing, among other things, direction of principal air flow, escape routes, telephone locations, fire doors, ventillation doors and refuge chambers. These plans must be maintained current and reviewed with MESA personnel at least once every six months. In the dynamic mining and disposal environment, maintaining such plans will be no small chore.

It is also apparent that detailed plans must be generated and MESA/OSHA variances obtained to permit almost any concept of a retrieval operation with personnel below ground. With the changes of ventilation flows for cooling prior to retrival, a whole series of escape and evacuation plans may be necessary to account for changes in retrieval area.

Routinely, arrangements must be scheduled for maintaining of the mine atmosphere, sound levels, hazardous materials containment and radiation among other items. Records must be maintained for personnel underground. Safety inspections of equipments must be scheduled and verified. Indoctrination of personnel in the safety plans must be scheduled. Procedures must be specified for the safe operation of equipments, fueling of vehicles, changing of batteries, etc. Compliance with these procedures by concerned personnel must be verified.

Radiation safety requirements are also delayed as the facility is not expected to receive radioactive materials until 1985. Both the PSAR and FSAR will require exposition of radiological safety plans. As a minimum a radiation protection (safety) officer must be assigned by the operating contractor early in the program to provide technical assistance in operational planning and reviewing operations procedures. Personnel monitoring must be prepared for and appropriate records established. Sensor and alarm systems must be appropriately configured, emplaced and routinely tested. Provisions for routine and emergency decontamination must be prepared and implemented.

The Operational Safety Program as presented in this plan includes four groups of activities:

500-519 - The OWI provided (safety contractor assumed) safety, safety planning, and test planning activities prior to the arrival of the operating contractor.

520-539 - The activities of the operating contractor in monitoring the safety aspects of design and any modifications of design during construction.

540-559 - Industrial safety planning activities of the operating contractor.

560-579 - Radiological safety planning activities of the operating contractor.

580-599 - The activities of the operating contractor in detailed planning for and executing of safety related functions during the facility cold test.

ACTIVITY DESCRIPTION

Title: Procure Safety Contractor
Number: (Pred) 500 (Suc) 501 ORG. OWI
Start: (WAS) 0 Complete: (WAS) 12.6 Duration 12.6
Short Title: PROC Saf
Description:

This activity is an OWI procurement action to provide a contractor to fill the safety gap until the Facility Operating Contractor is hired, presumably in April 1979. Task is included for completeness only.

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
	OWI		

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Determine Safety Standards
Number: (Pred) 501 (Suc) 502 ORG. SAF SUB
Start: (WAS) 12.6 Complete: (WAS) 25.4 Duration 12.8
Short Title: SAF STD
Description:

For each of the structures, systems and components identified in the report from task 400-401, determine the applicable safety standards. For structures and large systems it will be necessary to obtain layouts or schematics as different standards will apply in different portions. For each item, provide classification under industrial or radiological safety or both. Prepare minimum length reports to be inserted after each item quoting the applicable standard. Where layouts or schematics were used, include drawing identification and prepare a file of these drawings for retention. Split the report into the two classifications. Identify items under both categories which can be tested feasibly during the Cold Test.

Inputs: Report from task 400-401, applicable CFR's
30 USC 725 Federal Metal and Nonmetallic Mine Safety Act and amendments, etc. Occupational Safety and Health Reporter Reference File, BNA, Inc., recommended.

Product: Augmented report identifying and citing applicable standards for each item. To be used in tasks 502-506, 503-507, 504-508 and 505-509.

Resource Requirements:

Pers:	MM	Skill	Level
	2x3	Saf. Eng.	1-Sr., 1-Jr.
	3	Rad. Saf. Off.	1-Mid.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Design Safety Monitoring
Number: (Pred) 502 (Suc) 506 ORG. SAF SUB
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Monitor DES SAF
Description:

This task maintains close liaison with the design A-E's and reviews the designs as they mature and verifies that they comply with the appropriate standards as identified by Task 501-502. Independent verification of the engineered safety features (as designated by the PSAR format & content) function is required. This task also maintains a current file of applicable new standards as promulgated and identifies the structures, systems and components to which they apply. The report from task 501-502 will be updated as changes occur. This task will also prepare and/or review the appropriate portions of the PSAR.

Inputs: Report from task 501-502
PSAR Format & Content Definition from Regulatory Affair Br. OWI

Product: Up to date file of design safety status.
PSAR input if required.

Resource Requirements:

Pers:	MM	Skill	Level
	2x12	Saf. Eng.	1-Sr. 1-Jr.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

12 liaison trips to design A-E's
2 people 2 days at each.

ACTIVITY DESCRIPTION

Title: Review Site Specific Design Safety
Number: (Pred) 506 (Suc) 510 ORG. SAF SUB
Start: (WAS) 75.4 Complete: (WAS) 83.8 Duration 8.4
Short Title: Site Saf.
Description:

When the sites are selected, about October 78, it will be necessary to review all the safety features of the sites in light of specific state regulations. Appropriate text must be prepared/reviewed for inclusion in the PSAR. Files must be updated to include state standards where applicable.

Inputs: Files from task 502-506
Appropriate state regulations.

Product: Site specific updated design safety files
appropriate state oriented text for PSAR.

Resource Requirements:

Pers:	MM	Skill	Level
	2x2	Saf. Eng.	1-Sr. 1-Jr.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

1 trip to Design A-Es
2 people 5 days at each.

ACTIVITY DESCRIPTION

Title: Industrial Safety PSAR Input
Number: (Pred) 503 (Suc) 507 ORG. SAF SUB
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Ind. Saf PSAR
Description:

This task prepares and/or verifies the industrial safety input into the PSAR and acquires the preliminary data upon which the Industrial Safety Plan will be based. As designs mature and operational procedures are defined, the procedures must be reviewed for compliance with the appropriate standards. When applicable, safety equipment will be identified. The procedures for use of special test equipment and tools (task 443-448) and special processes (task 444-449) will be reviewed for safety and to identify any potentially hazardous equipments and materials. Markings and isolation requirements will be identified for hazardous areas, equipments and materials. A permanent file of these data will be maintained. Finally the PSAR input will be prepared and/or reviewed as required.

Inputs: Reports from tasks 501-502, 443-448 and 444-449.
PSAR format and content from OWI.

Product: Permanent file of Industrial Safety Data.
PSAR input if required.

Resource Requirements:

Pers:	MM	Skill	Level
	12	Saf. Eng.	Mid.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Review Site Specific Industrial Safety
Number: (Pred) 507 (Suc) 511 ORG. SAF SUB
Start: (WAS) 75.4 Complete: (WAS) 83.8 Duration 8.4
Short Title: ST IND
Description:

After sites are selected, this task reviews the industrial safety data and PSAR input for compliance with state regulations. Appropriate text must be prepared/reviewed for inclusion in the PSAR. Files must be updated to include state standards.

Inputs: Files and Product from task 503-507.

Product: Site specific updated Industrial Safety Files.
Appropriate state oriented text for PSAR.

Resource Requirements:

Pers:	MM	Skill	Level
	2	Saf. Eng.	Mid.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Radiological Safety PSAR Input
Number: (Pred) 504 (Suc) 508 ORG. SAF SUB
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Rad. Saf. PSAR
Description:

This task prepares and/or reviews the radiological safety input into the PSAR and acquires preliminary data upon which the radiological safety plan will be based. As designs of radiological safety features mature and operating procedures are defined, radiologically hazardous and potentially hazardous areas must be identified and procedures reviewed for rad. safety. Radiation protection design features must be evaluated. A Health Physics Program Plan must be developed to a high degree of maturity for inclusion in the PSAR. The organization of the plan must be included among the staffing requirements for the Facility Operations Contractor (FOC) procurement. Permanent files must be started and maintained for the radiological safety data accumulated. Finally, the PSAR input must be prepared and/or reviewed.

Inputs: Report from Task 501-502.
29CFR1910.96 as amended, "Occupational Safety & Health Standards
Ionizing Radiation"

Product: Appropriate ERDA, OSHA, MESA standards
Permanent file of radiological safety data
PSAR input if required.

Resource Requirements:

Pers:	MM	Skill	Level
	12	Health Physicist	Mid.
	12	Physicist	Mid.

Computer Hours: _____

Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Review Site Specific Radiological Safety
Number: (Pred) 508 (Suc) 512 ORG. SAF SUB
Start: (WAS) 75.4 Complete: (WAS) 83.8 Duration 8.4
Short Title: St. Rad.
Description:

After sites are selected, this task reviews the radiological safety data and PSAR input for compliance with state regulations. Appropriate text must be prepared/reviewed for inclusion in the PSAR. Files must be updated to include state standards.

Inputs: Files and product from task 504-508

Product: Site specific updated Rad. Safety files
Appropriate state oriented text from PSAR

Resource Requirements:

Pers:	MM	Skill	Level
	2	Health Physicist	Mid.
	2	Physicist	Mid.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Safety Related Cold Test Planning and PSAR Input
Number: (Pred) 505 (Suc) 509 ORG. SAF SUB
Start: (WAS) 25.4 Complete: (WAS) 75.4 Duration 50.0
Short Title: Cold Test Plan PSAR
Description:

While the performance of the Cold Test remains many years in the future, undoubtedly the PSAR will require the inclusion of test plans. This task provides for the review of operating procedures and identifies those elements of the facility and its operations for which the Cold Test can serve to demonstrate compliance with safety standards. The task includes generation of the permanent files on this subject. Finally, the PSAR input is prepared and/or reviewed.

Inputs: Reports from tasks 501-502, 443-448, and 444-449.

Product: Permanent files of Cold Test data.
PSAR Input is required.

Resource Requirements:

Pers:	MM	Skill	Level
	12	Saf. Eng.	Mid.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Review Site Specific Cold Test Plan

Number: (Pred) 509

(Suc) 513

ORG. SAF SUB

Start: (WAS) 75.4

Complete: (WAS) 83.8 Duration 8.4

Short Title: St. Rev.

Description:

While the probability is small that state requirements will exceed the scope of demonstration envisioned in the Cold Test Plan as included in the PSAR, nevertheless, site specific state requirements must be reviewed and the plan updated if required. Files must also be updated to include state standards.

Inputs: Files and product of task 505-509.

Product: Site specific updated Cold Test files
Appropriate state oriented text for PSAR

Resource Requirements:

Pers:	MM	Skill	Level
	2	Saf. Eng.	Mid.

Computer Hours:

Travel (Trips, Destination, No. Pers., Stay)

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ACTIVITY DESCRIPTION

Title: Facility Operating Contractor Procurement
Number: (Pred) 510 (Suc) 520 ORG. OWI
Start: (WAS) 83.8 Complete: (WAS) 100.2 Duration 16.4
Short Title: PRO FOC
Description:

This task is an OWI task and is included only for completeness with task initiation time arbitrary. Outputs from Tasks 503-507, 507-511, 504-508 and 508-512 will be useful in determining skills required in the FOC staffing.

Inputs:

Product:

Resource Requirements:

Pers:	MM	Skill	Level
	OWI		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Design and Construction Safety Monitoring
Number: (Pred) 520 (Suc) 521 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration 20+ yrs
Short Title: Des. Constr. Saf.
Description:

This task covers the FOC's activities related to design and construction safety monitoring, maintenance of the associated permanent files, preparation of the engineered safety features portion of the FSAR, preparation of related FSAR amendments and ultimately will phase into a safety related maintenance monitoring function.

NOTE: At this time the schedules, facility designs and operational concepts are too imprecise to merit an attempt at detailing sub-tasks. About the beginning of FY/9 would be appropriate for such detailing.

Inputs: Files from task 506-510

Product: Design, Construction and Maintenance Safety Monitoring
FSAR inputs and related amendments.

Resource Requirements:

Pers:	MM	Skill	Level
	FOC		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Industrial Safety Operations
Number: (Pred) 540 (Suc) 541 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration 20+ yrs
Short Title: Ind. Saf
Description:

This task covers the FOC's Industrial Safety activities including preparation of plans, maintenance of files, staffing the organization, preparation of FSAR inputs and amendments thereto, and ultimately preparation of industrial safety portion of phase out plans.

NOTE: At this time the schedules, facility designs and operational concepts are too imprecise to merit an attempt at detailing subtasks. About the beginning of FY79 would be appropriate for such detailing.

Inputs: Files from task 507-511

Product: Industrial Safety Operations
FSAR inputs and related amendments

Resource Requirements:

Pers:	MM	Skill	Level
	FOC		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Radiological Safety Operations
Number: (Pred) 560 (Suc) 561 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration 20+ yrs
Short Title: Rad. Saf.
Description:

This task covers the FOC's Radiological Safety activities including preparation and execution of a Health Physics Safety Program Plan; maintenance of files, staffing the organization, preparation of FSAR inputs and amendments thereto and finally disposition of personnel exposure records.

NOTE: At this time the schedules, facility designs and operational concepts are too imprecise to merit an attempt at detailing sub-tasks. About the beginning of FY79 would be appropriate for such detailing.

Inputs: Files from task 508-512

Product: Radiological Safety Operations
FSAR inputs and related amendments

Resource Requirements:

Pers:	MM	Skill	Level
	FOC		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

ACTIVITY DESCRIPTION

Title: Cold Test Plans, Procedures, Execution and Report
Number: (Pred) 580 (Suc) 581 ORG. FOC
Start: (WAS) 100.2 Complete: (WAS) - Duration ~6 yrs
Short Title: Cold Test Proced.
Description:

This task covers the FOC's activities in completing the safety related portions of the Cold Test Plan, preparing detailed test procedures, executing the test procedures, acquiring and analyzing data and preparation of appropriate portions of the test report. The task includes preparation of FSAR inputs and amendments as required. This task phases out upon acceptance of the test report by NRC.

NOTE: At this time the schedules, facility designs and operational concepts are too imprecise to merit an attempt at detailing sub-tasks. About the beginning of FY79 would be appropriate for such detailing.

Inputs: Files from task 509-513

Product: Cold Test Plan, procedures and report (applicable portions)
FSAR inputs and amendments

Resource Requirements:

Pers:	MM	Skill	Level
	FOC		

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)

CHAPTER 5

COORDINATION MEETINGS

RATIONALE

Coordination meetings are useful in maintaining management awareness of the progress of complex programs and in minimizing the time required for corrective action when things go awry. When one activity depends upon another activity's input, it behooves management to be aware of the timely transfer of the data and to assure that it meets the receiving activity's needs. If the data are inadequate, corrective action can be taken on the spot.

Similarly, it is advantageous to discuss problem areas in the multidisciplinary environment of the coordination meeting. A new unprejudiced look at a problem often results in definition and resolution of the cause. Complex programs should be given every opportunity to succeed.

TIMING

Coordination meetings are scheduled at the initiation of major activities, upon conclusion of major activities when the results will be utilized by others, and for major events such as site selection. The dates shown for meetings are generally at the first day of the month or quarter and are given as guides for firm scheduling as the time of meeting nears.

Foreseeable meeting requirements are scheduled on the PERT chart as events 1C through 10C, depicted by squares on the top line. As safety, Quality Assurance and Risk Assessment activities progress, it is inevitable the problem areas will be discovered.

Almost inevitably these problem areas will have some design impact. Unscheduled coordination meetings can be arranged as necessary to address such problems with the attendance list tailored to fit the requirement.

IMPLEMENTATION

A management support task (secretariat) is suggested to support the meeting schedule. This task will provide notice of the meeting to attendees, arrange the meeting place, and prepare and distribute the minutes of the meetings; relieving OWI management of these duties. The support has been recommended at a one man level, however, if OWI management finds these meetings of great utility and extends the scope beyond the RASP and increases the frequency; this level may prove inadequate.

C O O R D I N A T I O N M E E T I N G 1C

D A T E : 4/1/77

REPORTS DUE/
ACTIVITIES COMPLETED: None

ACTIVITIES TO BE
INITIATED:

1. Generic Risk Assessment tasks 100-104 (Accident Initiators), 101-105 (Release Barriers), 102-106 (Model Facility), and 103-110 Data Acquisition).
2. Quality Assurance tasks 400-401 (Identify Structures, systems components related to safety) and 460-461 (Identify Facility Design Bases)

COORDINATION/
DISCUSSION:

1. Instruct: Coordination between tasks 102-106 (Model Facility), 400-401 (Identify Structures, systems and components related to safety) and 460-461 (Identify Facility Design Bases).
2. As the report from task 460-461 (Identify Facility Design Bases) will be ready one month before the other tasks are completed, instruct: distribution of report to the coordination tasks from 1 above.

COORDINATION MEETING 2C

DATE : 7/1/77

REPORTS DUE/

ACTIVITIES COMPLETED:

1. Facility Model task 102-106
2. Release Barriers from task 101-105
3. Accident Initiators from task 100-104
4. Structures, systems and components relating to safety from task 400-401
5. Facility Design Bases from task 450-461 due on 6/1/77.

ACTIVITIES TO BE
INITIATED:

1. Generic Risk Assessment tasks 106-109 (define consequence limiting systems), 105-108 (Risk Criteria) and 104-107 (Accident Sequences).
2. Quality Assurance tasks 442-443 (Identify Special Test Equipment and tools), 441-444 (Identify Special Processes), 440-445 (Identify Special Controls), 401-402 (Identify Major Organizations), 406-407 (Translate 10CFR50 into NWS context), 420-421 (Identify QA Design Control and Design Documentation Requirements) and 423-424 (Identify QA Procurement Documentation Requirements)
3. Safety task 501-502 (Determine Safety Standards)
4. Reliability tasks 301-320 (Plan Facility Model), 321-322 (Define Mining Flow), and 302-303 (Review Prior Procurements).

COORDINATION/
DISCUSSION:

1. Coordinate: assure that all reports are consistent with the A&E conceptual design and with each other.
2. Instruct: The approved facility configuration and design bases will be published 9/1/77 and the procedures for configuration control instituted at that time.

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C O O R D I N A T I O N M E E T I N G 3C

D A T E : 8/1/77

REPORTS DUE/
ACTIVITIES COMPLETED:

1. Special Test Equipment and Tools Requirements from task 442-443
2. Special Process Requirements from task 441-444
3. List of major organizations from task 401-402
4. 10CFR50 translated to NWTs context from task 406-407

ACTIVITIES TO BE
INITIATED:

Quality Assurance tasks 443-448 (Prepare Special Test Equipment and Tools Procedures), 444-449 (Prepare Procedures for Special Processes), 445-450 (Prepare Special Control Procedures), 446-447 (Identify QA Skill Requirements), 407-408 (Translate Appendix B of 10CFR50 into NWTs Context), and 402-403 (Identify QA Functions of Major Organizations).

COORDINATION/
DISCUSSION:

1. As all major organizations (vendors) have not been selected, discuss: handling of the data voids which will be encountered in task 402-403.
2. Discuss: adequacy of special process controls.

C O O R D I N A T I O N M E E T I N G 4C

D A T E : 9/1/77

REPORTS DUE/
ACTIVITIES COMPLETED:

1. Interim procedures for QA Design Control and Design Documentation from task 420-421.
2. Interim procedures for acquisition and review of procurement documentation from task 423-424.
3. List of documents defining the approved facility configuration from task 461-462
4. Configuration control, change and approval procedures from task 453-464.

ACTIVITIES TO BE
INITIATED:

Quality assurance tasks 421-422 (Identify QA Audit Requirements for Design and Procurement) and 462-465 (Configuration Accounting).

COORDINATION/
DISCUSSION:

Approve: reports 1-4
Determine: Distribution of reports 3 and 4

COORDINATION MEETING

5C

DATE : 10/1/77

- REPORTS DUE/
- ACTIVITIES COMPLETED:
1. Consequence limiting systems from task 106-109.
 2. Risk criteria from task 105-108
 3. Accident sequences from task 103-107
 4. QA skill requirements from task 446-447
 5. Major organizations QA functions from task 402-403
 6. Appendix B to 10CFR50 in NWTS context from task 407-408
 7. Interim QA Audit procedures for Design and procurement from task 421-422
 8. Safety standards from task 501-502
 9. Facility model plan from task 301-320
 10. Mining flow from task 321-322.

- ACTIVITIES TO BE INITIATED:
1. Generic Risk Assessment tasks 107-112 (Risk Quantization), 107-206 (definition of additional technical support requirements), and 110-111 (define insensitive items).
 2. Quality Assurance tasks 403-404 (define QA structure), 408-409 (Define QA requirements), and 422-425 (Interim QA Design, Procurement and Audit Activities)
 3. Safety tasks 502-506 (Design safety monitoring), 503-507 (Industrial safety PSAR Input), 504-508 (Radiological safety PSAR Input), and 505-509 (Safety related cold test planning and PSAR Input).
 4. Reliability tasks 320-323 (Acquire Mining equipment reliability data), 322-324 (Mining flow model), 303-325 (Waste flow model), and 304-360 (Reliability Specifications)

- COORDINATION/ DISCUSSION:
1. Approve: reports 7 and 8
 2. Review: adequacy of reports 1, 2, and 3 as input to task 107-112
 3. Review: adequacy of report 9.

C O O R D I N A T I O N M E E T I N G 6C

D A T E : 1/1/78

REPORTS DUE/ 1. Additional technical support requirements from task 107-206
ACTIVITIES COMPLETED: 2. Risk quantization from task 107-112
 3. List of insensitive items from task 110-111.
4. Procedures for special test equipment and 7. QA requirements from task 408-409
 tools from task 443-448 8. Mining equipment reliability data
5. Special process procedures and controls from task 320-323
 from task 444-449 9. Mining flow model from task 322-324
6. Recommended QA structure from task 403-404. 10. Waste flow model from task 303-325

ACTIVITIES TO BE 1. Generic risk assessment tasks 112-113 (prepare report) and 340-341
INITIATED: (Reliability Allocation)
 2. Quality Assurance task 404-405 (Preliminary QA Program)
 3. Reliability tasks 323-327 (MTBF-MTTR), 324-328 (Facility Simulation)
 and 325-326 (Source Model)

COORDINATION/ 1. Discuss/approve/implement: requirements from report 1.
DISCUSSION: 2. Discuss: design impact of reports 2 and 3.
 3. Review: adequacy of report 8.

C O O R D I N A T I O N M E E T I N G 7C

D A T E : 4/1/78

REPORTS DUE/
ACTIVITIES COMPLETED:

1. Generic Risk Assessment report from task 107-112
2. Reliability allocation from task 340-341
3. Preliminary QA program and manual from task 404-405
4. Source model from task 325-326

ACTIVITIES TO BE
INITIATED:

1. Quality assurance task 405-7000 (QA PSAR Input)
2. Reliability task 326-305 (Review Reliability Allocation)

COORDINATION/
DISCUSSION:

1. Review/approve: Report 1.
2. Review: Report 2.
3. Review/approve: Report 3.

C O O R D I N A T I O N M E E T I N G

8C

D A T E : 10/1/78

REPORTS DUE/
ACTIVITIES COMPLETED:

First sites have been selected by OWI. This selection will require that generic input be made site specific. As only two months remain prior to PSAR and DER submittal, a coordination meeting is required to assure prompt initiation of site specific activities.

ACTIVITIES TO BE
INITIATED:

1. Risk assessment tasks 115-116 (Acquire Site Specific Data) and 114-117 (Prepare Accident Consequence estimates).
2. Safety tasks 506-510 (Review Site Specific Design Safety), 507-511 (Review Site Specific Industrial Safety), 508-512 (Review Site Specific Radiological Safety), and 509-513 (Review Site Specific Cold Test Plans).

COORDINATION/
DISCUSSION:

Discuss: any unforeseen problems raised by site selection.

C O O R D I N A T I O N M E E T I N G 9C

D A T E : 12/1/78

REPORTS DUE/
ACTIVITIES COMPLETED:

1. Accident consequences from task 114-117
2. PSAR Input Design Safety from task 506-510
3. PSAR Input Industrial Safety from task 507-511
4. PSAR Input Radiological Safety from task 508-512
5. PSAR Input Cold Test Plans from task 509-513

ACTIVITIES TO BE
INITIATED:

None

COORDINATION/
DISCUSSION:

Review: Reports 1-5 for adequacy

COORDINATION MEETING 10C

DATE : 4/1/79

REPORTS DUE/
ACTIVITIES COMPLETED: Facility Operating contractor selected

ACTIVITIES TO BE
INITIATED: Quality Assurance tasks 425-426 (QA Transition) and
465-466 (Configuration Accounting Transition)

COORDINATION/
DISCUSSION: None

ACTIVITY DESCRIPTION

Title: Coordination Meeting Management Support
Number: (Pred) 1C through (Suc) 10C ORG. Man Sup
Start: (WAS) 0 Complete: (WAS) 100.2 Duration 100.2
Short Title: None used
Description:

This task is defined in the coordination meetings agendas 1C through 10C. It is separately tasked to relieve OWI management of the administrivia required to notify meeting participants, collect presentation materials and prepare and issue meeting minutes. The performance of these functions is the task scope.

Inputs: Coordination meeting agendas

Product: Minutes of meetings

Resource Requirements:

Pers:	MM	Skill	Level
	24	Admin/Management	Sr.

Computer Hours: _____
Travel (Trips, Destination, No. Pers., Stay)
As per meeting locations.

GLOSSARY

A-E	Architect - Engineer
AEC	Atomic Energy Commission
ANSI	American National Standards Institute
BNA	Bureau of National Affairs
CDR	Conceptual Design Report
CFR	Code of Federal Regulations
CLS	Consequence Limiting Systems
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
FOC	Facility Operating Contractor
FQAPP	Facility Quality Assurance Program Plan
FSAR	Final Safety Analysis Report
GEIS	Generic Environmental Impact Statement
GESMO	Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors
GRA	Generic Risk Assessment
HLW	High Level Waste
LLTRUW	Low Level Trans-Uranic Waste
MESA	Mining Enforcement and Safety Administration
MM	Man Months
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NFPCA	National Fire Prevention and Control Administration
NRC	Nuclear Regulatory Commission
NWTS	National Waste Terminal Storage
ORO	Oak Ridge Operations Office
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OWI	office of Waste Isolation
PDES	Preliminary Draft Environmental Statement
PERT	Program Evaluation and Review Technique

GLOSSARY (Continued)

PSAR	Preliminary Safety Analysis Report
QA	Quality Assurance
RA	Risk Assessment
RASP	Reliability and Safety Program
RFP	Request for Proposal
RSSF	Retrievable Surface Storage Facility
UCC-ND	Union Carbide Corporation - Nuclear Division
USC	United States Code
WAS	Weeks After Start
WIF	Waste Isolation Facility
WIPP	Waste Isolation Pilot Plant