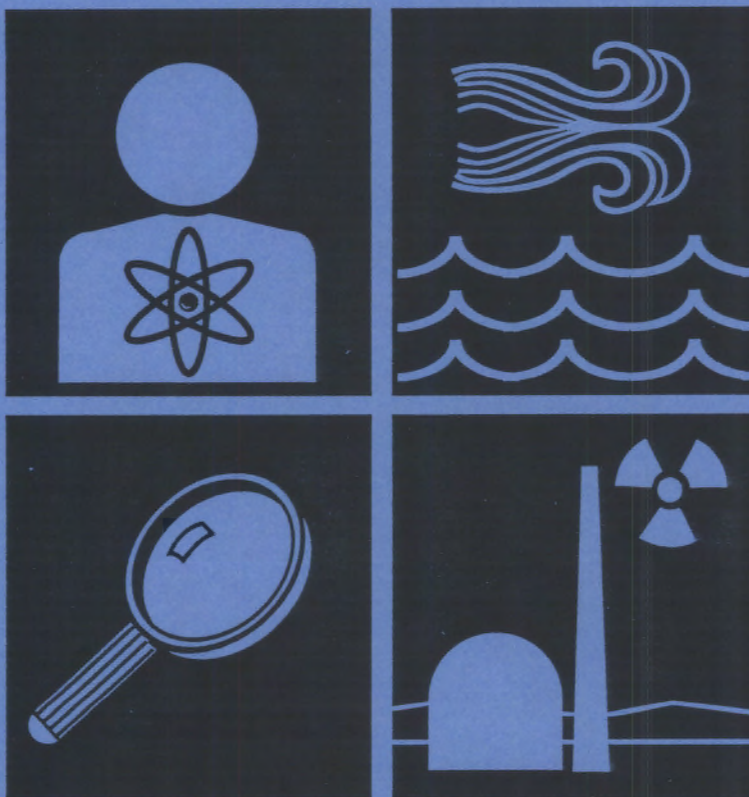


# FY 1992 Task Plans for the Hanford Environmental Dose Reconstruction Project

D. B. Shipler, Project Manager

October 1991



Prepared for the Technical Steering Panel

## **DISCLAIMER**

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FY 1992 TASK PLANS FOR THE  
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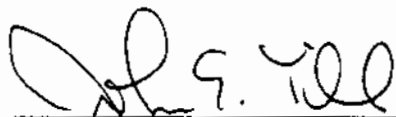
Pacific Northwest Laboratory  
Richland, Washington 99352

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This document has been reviewed and approved by the  
Technical Steering Panel.



J. E. Till, Chairman  
Technical Steering Panel  
Hanford Environmental  
Dose Reconstruction Project


October 1, 1991

Date

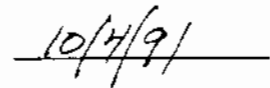
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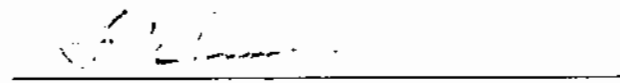
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D. B. Shipler, Project Manager  
Hanford Environmental  
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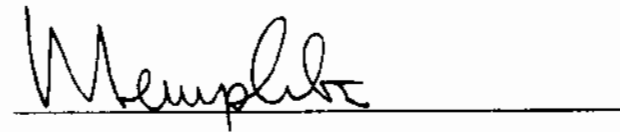


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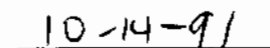


F. C. Hood, Director  
Quality Programs

Date



W. L. Templeton, Manager  
NEPA Implementation and  
Environmental Documentation,  
Office of Hanford Environment



Date

## PROJECT OVERVIEW

The purpose of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate radiation doses from Hanford Site operations since 1944 to populations and individuals. The primary objective of work to be performed in FY 1992 is to determine the appropriate scope (space, time, radionuclides, pathways and individuals/population groups) and accuracy (level of uncertainty in dose estimates) for the project. Another objective is to use a refined computer model to estimate Native American tribal doses and individual doses for the Hanford Thyroid Disease Study (HTDS). Project scope and accuracy requirements defined in FY 1992 can be translated into model and data requirements that must be satisfied during FY 1993.

The plan for FY 1992 has been prepared based on activities and budgets approved by the Technical Steering Panel (TSP) at its meeting on August 19-20, 1991. The activities can be divided into four broad categories: 1) model and data evaluation activities, 2) additional dose estimates, 3) model and data development activities, and 4) technical and communication support.

The following activities will be conducted to accomplish objectives in FY 1992:

### MODEL AND DATA EVALUATION ACTIVITIES

- complete restructuring of the dose and air codes for estimating doses and conducting analyses
- help assess the accuracy of the project computer model by comparing its output with model output generated by the International Atomic Energy Agency "Validation of Model Predictions" program
- conduct sensitivity and uncertainty analyses on the dose and air dispersion models and upgrade them for application in the expanded area
- review and evaluate environmental monitoring data for vegetation and surface water
- document radionuclide transfer and age-dependent dose factors

#### ADDITIONAL OOSE ESTIMATES

- assist Native American tribes in acquiring and evaluating food consumption, demographic and agricultural data
- estimate doses for eight Native American tribes in the vicinity of the HEDR study area

#### MODEL AND DATA DEVELOPMENT ACTIVITIES

- document the contribution of groundwater contamination to dose
- review and evaluate river and coastal radionuclide monitoring data for 1944-1991
- reevaluate and supplement milk production and processing data for the expanded area
- assess fresh fruit and vegetable pathways

#### TECHNICAL AND COMMUNICATION SUPPORT

- continue document declassification and historical information retrieval
- continue technical integration support
- continue quality assurance support
- continue statistical support to all tasks
- continue TSP communications support
- continue records management
- continue project administration

A Memorandum of Understanding between the U.S. Department of Energy (DOE) and the U.S. Department of Health and Human Services (DHHS) was signed in December of 1990 to transfer responsibility for epidemiological and dose reconstruction studies for DOE facilities. The Centers for Disease Control (CDC) of DHHS will manage the HEDR work. Beginning in February 1992, CDC will contract with Battelle Pacific Northwest Laboratories to continue the technical work of the project. The FY 1992 and 1993 task plans form the basis

of the work described in the contract. The TSP will continue to provide technical direction of the Battelle work.

Figure 1 shows project organization; Table 1 shows the FY 1992 Work Breakdown Structure (WBS) and budget; Figure 2 shows FY 1992 milestones.

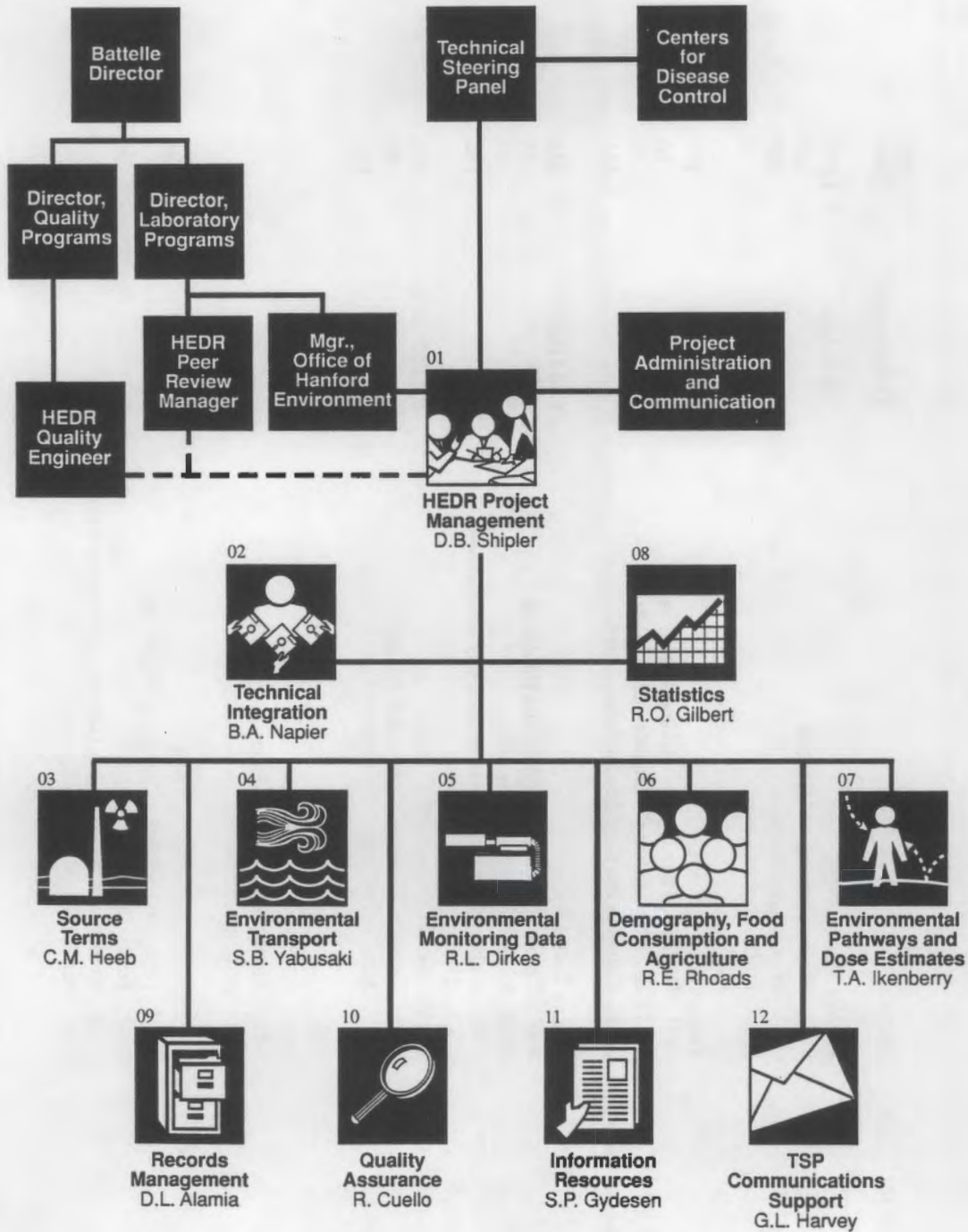


FIGURE 1. HEDR Project Organization



TABLE 1. HEDR Task Numbers, Work Breakdown Structure, and Budget for FY 1992

<u>WBS Element (a)</u>	<u>Task</u>	<u>Subtask</u>	<u>Task Manager</u>	<u>Budget (\$ in thousands)</u>	<u>Budgeted FY Labor Hours</u>
	<b>01</b>	<b>Project Management</b>	<b>DB Shipler</b>	<b>1,074</b>	
1.1, 1.2		0101 Project Planning and Control		680	
1.3, 1.4, 1.6, 1.7		0103 Project Administration		380	
1.5		0104 Project Peer Review		14	
	<b>02</b>	<b>Technical Integration</b>	<b>BA Napier</b>	<b>275</b>	
2.8		0201 Technical Planning, Control and Reporting		66	
2.1, 2.2, 2.6, 2.7		0204 Project Technical Coordination and Analysis		78	
2.3, 2.4, 2.5		0205 Pathways and Dose Model Requirements		131	
	<b>03</b>	<b>Source Terms</b>	<b>CM Heeb</b>	<b>335</b>	
3.6		0301 Technical Planning, Control and Reporting		54	
3.4		0304 Radioactive Releases to Water		99	
3.1		0307 Radioactive Release Data Availability and Review		182	
	<b>04</b>	<b>Environmental Transport</b>	<b>SB Yabusaki</b>	<b>502</b>	
4.4		0401 Technical Planning, Control and Reporting		56	
4.1.1, 4.1.2, 4.1.3, 4.1.5, 4.1.6		0402 Atmospheric Model Development and Evaluation		180	
4.2		0403 Groundwater Transport		55	
4.3		0404 Surface-Water Transport		108	
4.1.4		0405 Atmospheric Model Database		72	
4.1.7		0406 Atmospheric Model Calculations		31	
	<b>05</b>	<b>Environmental Monitoring Data</b>	<b>RL Dirkes</b>	<b>169</b>	
5.6		0501 Technical Planning, Control and Reporting		43	
5.2		0502 Terrestrial Monitoring Data		67	
5.1		0503 Environmental Monitoring Data Availability and Review		44	
5.3		0504 Surface-Water Monitoring Data		15	

(a) See appendix for WBS element titles that correspond to these numbers.

TABLE 1. HEDR Task Numbers, Work Breakdown Structure, and Budget for FY 1992

<u>WBS Element</u>	<u>Task</u>	<u>Subtask</u>	<u>Task Manager</u>	<u>Budget (\$ in thousands)</u>	<u>Budgeted FY Labor Hours</u>
	<b>06</b>	<b>Demography, Food Consumption and Agriculture</b>	<b>RE Rhoads</b>	<b>495</b>	
6.5		0601 Technical Planning, Control and Reporting		40	
6.4		0602 Food Consumption		60	
6.2		0603 Milk and Other Food Model Development		295	
6.4.2		0605 Native American Data		100	
	<b>07</b>	<b>Environmental Pathways and Dose Estimates</b>	<b>TA Ikenberry</b>	<b>306</b>	
7.4		0701 Technical Planning, Control and Reporting		56	
7.1		0702 Pathways and Dose Code Development and Documentation		170	
7.3		0703 Pathways and Dose Model Parameter Development		40	
7.2		0705 Dose Calculations		40	
	<b>08</b>	<b>Statistics</b>	<b>RO Gilbert</b>	<b>346</b>	
8.7		0801 Technical Planning, Control and Reporting		50	
8.2, 8.3, 8.4, 8.5, 8.6		0802 Statistics Support for Project Technical Task Work		130	
8.1		0803 Analysis of Model Reliability		166	
	<b>09</b>	<b>Records Management</b>	<b>DL Alamia</b>	<b>91</b>	
9.3		0901 Technical Planning, Control and Reporting		19	
9.1, 9.2		0902 Project Records Management		72	
	<b>10</b>	<b>Quality Assurance</b>	<b>R Cuello</b>	<b>61</b>	
10.5		1001 Technical Planning Control, and Reporting		31	
10.1, 10.2, 10.3		1002 Quality Assurance Program Development		18	
10.4		1003 Quality Assurance Verification		12	
	<b>11</b>	<b>Information Resources</b>	<b>SP Gydesen</b>	<b>157</b>	
11.3		1101 Technical Planning, Control and Reporting		40	
11.1		1102 Hanford Document Declassification		52	
11.2		1103 Hanford Information Resources Identification and Search		65	

TABLE 1. HEDR Task Numbers, Work Breakdown Structure, and Budget for FY 1992

<u>WBS Element</u>	<u>Task</u>	<u>Subtask</u>	<u>Task Manager</u>	<u>Budget</u> <u>(\$ in thousands)</u>	<u>Budgeted</u> <u>FY Labor</u> <u>Hours</u>
	<b>12</b>	<b>TSP Communications Support</b>	<b>GL Harvey</b>	<b>55</b>	
12.7		1201 Technical Planning, Control and Reporting		29	
12.1		1202 TSP Public Outreach Support		3	
12.2, 12.3		1203 Communications Assessment Research		9	
12.4, 12.5, 12.6		1204 TSP Meetings and Materials Support		14	
		<b>Subtotal, HEDR Project Tasks</b>		<b>3,866</b>	
		Contingency			
		<b>Subtotal, Project Tasks Plus Contingency</b>		<b>3,866</b>	
		Technical Steering Panel		880	
		Native American Research (b)		327	
		TSP Contract Administration (c)		19	
		<b>FY 1992 Budget</b>		<b>5,092</b>	
		FY 1991 Carryover Funds		70	
		<b>FY 1992 Funding Requirements</b>		<b>5,022</b>	
		(The FY 1992 budget of \$5,092K minus the FY 1991 carryover funding of \$70K equals the FY 1992 funding requirement of \$5,022K.)			

(b) Proposed budget includes \$275K for Native American Research, \$15K for Indian Health Services management costs, and \$37K for contingency.  
(c) Assumes that an agency other than Battelle will administer the TSP contracts beginning April 1, 1992.



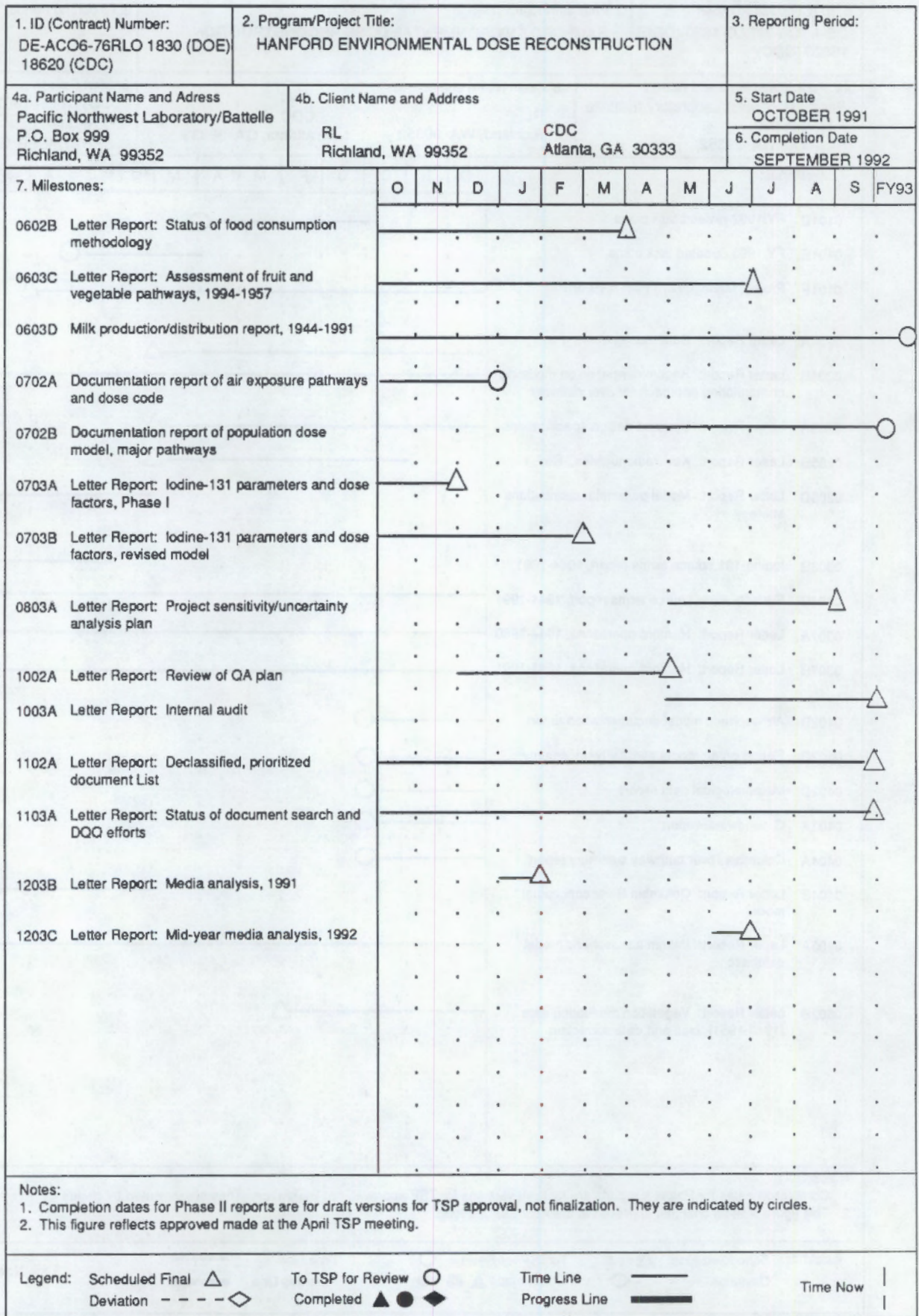


FIGURE 2. FY 1992 Milestones (contd)

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## INTRODUCTION

Phase I of the HEDR Project was designed to develop and demonstrate a method for estimating radiation doses people may have received from Hanford Site operations since 1944. The method researchers developed relied on a variety of measured and reconstructed data as input to a modular computer model that generates dose estimates and their uncertainties. As part of Phase I, researchers used the reconstructed data and computer model to calculate preliminary dose estimates for populations from limited radionuclides, in a limited geographical area and time period.

Phase I ended in FY 1990. In February 1991, the TSP decided to shift the project planning approach away from phases--which were centered around completion of major portions of technical activities--to individual fiscal years (FYs), which span October of one year through September of the next. Therefore, activities that were previously designated to occur in phases are now designated in an integrated schedule to occur in one or more of the next fiscal years into FY 1995. Task plans are updated every 6 months.

In FY 1992, scientists will continue to improve Phase I data and models to calculate more accurate and precise dose estimates.

This document began with a project overview, which included the purpose, scope, milestones, and costs for FY 1992 dose reconstruction activities. The remainder of the document consists of the 12 task plans that discuss scope, approach, and deliverable items (milestones).

**Milestones** consist of major reports and letter reports. *Major reports* are documentation to the TSP of completed, major HEDR activities. The TSP reviews and approves these reports. *Letter reports* document interim work, such as screening calculations, and show progress or provide input to TSP decisions. TSP approval of letter reports is not required.

**Project deliverables** are data or other information provided from one HEDR task to another, input to monthly reports or other HEDR documents, or presentations to the TSP or its subcommittees.

Subtask and milestone numbers are assigned to individual project work elements and follow that work through completion. New work elements and milestones are assigned new numbers. Therefore, subtask and milestone numbers in any task plan may not be consecutive or the same in different years.

## TASK 01: PROJECT MANAGEMENT

### SCOPE

Project management will provide planning, coordination, communication, information control, technical control, technical review, and administration of project work in accordance with approved task plans and directives from the TSP. The task is also responsible for producing progress reports of project technical work and for formal communications with the TSP. Work to be performed by the project is listed in the project WBS (shown in the appendix) and allocated to subtasks for scheduling and tracking. Subtasks are as follows:

- Project Planning and Control (0101)
- Project Administration (0103)
- Project Peer Review (0104).

### SUBTASK 0101: PROJECT PLANNING AND CONTROL (WBS 1.1, 1.2)

#### Scope

Project planning and control includes those activities necessary to develop and implement task plans and control the work described in the task plans. It includes defining work, developing and controlling budgets and schedules, implementing processes and procedures, reviewing products, implementing and tracking corrective actions, and reporting. It also includes management activities to ensure and enhance leadership and technical performance by HEDR task leaders and performance of technical work by project staff.

#### Approach

Project management, through this document, will implement, track, and control the work to be performed. Key to administrative and control requirements are

- the HEDR Project Management Plan
- the HEDR QA plan and implementing procedures

- records of meetings involving technical direction that may affect approved scope, cost, or schedule
- records of telephone communications involving technical direction that may affect approved scope, cost, or schedules
- monthly task reports, including status of task activities and interfaces; progress toward milestones; problems, potential problems, and solution alternatives; approved changes in scope, budget, or schedule; actual costs this period, cumulative costs this fiscal year, budget to date, and variances; other task information of interest
- task file keys and codes, including designation of quality records
- predesignated reviews and reviewers for specific deliverables, including clearance requirements
- maintenance of correspondence logs
- use of communication cover sheets on project documents
- identification, conduct, and recordkeeping of training for technical and administrative activities
- documentation of key decisions affecting technical performance, scope, cost, or schedule
- review, approval, and control of research notes, information, calculations, analyses, evaluations, and models.

Proven project management techniques, as identified in the Battelle Project Management System (PMS) manual PNL-MA-95, will be implemented. Planning will be accomplished by the development of task plans and costs estimated by fiscal year. This information will be maintained in an integrated database that will generate logic networks of activities so that potential or approved changes in planned activities (scope, cost, or schedule) can be evaluated relative to task and/or project objectives and goals. The development of the integrated project database will provide a basis for establishing a project cost/schedule based on defined objectives (end products and services) and technical work scope. Task plans will address the outline given in TSP Directive 90-1. Control of work approved in these task plans will be accomplished by applying procedures outlined in the Battelle Project Management System and reports provided through a project management software

system. The project manager and task leaders will regularly evaluate performance, analyze cost and schedule variances, report on work, and apply corrective actions as necessary.

The project management plan and task plans for FY 1992 and out years include the work of project office staff, task leaders and subtask leaders in contributing to these plans.

#### Milestones to the TSP

- 0101D - FY 1992 revised task plans (April 1992)
- 0101E - FY 1993 updated task plans (July 1992)
- 0101F - Project Management Plan revision (August 1992)
- Monthly reports

#### Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees
- Audiovisual support to the TSP at its four public meetings in FY 1992

#### SUBTASK 0103: PROJECT ADMINISTRATION (WBS 1.3, 1.4, 1.6, 1.7)

This subtask includes the following elements:

- Project Administration
- Records Control
- Subcontract Administration
- Project Communication Support.

#### Project Administration (WBS 1.3)

##### Scope

Project administration includes those activities necessary to interface with, respond to, and support the TSP, CDC and Battelle management in their understanding and oversight of HEDR work. It also includes internal project



support activities such as task management coordination, staff management and development (for HEDR-required skills) and project computer system/network maintenance and administration.

#### Approach

These activities are performed under policies, procedures and guidelines established by the TSP, CDC and Battelle for liaison and coordination of oversight functions. Staff administration and development are governed by Battelle management guidelines. Maintenance and administration of computer systems and networks are controlled by Battelle guidelines and procedures. Reviews and audits of these practices are performed by Battelle management, the project QA function and by independent Battelle audit functions.

#### Milestones to the TSP

None. Response to specific requests are documented by letter.

#### Project Deliverables

None.

#### Records Control (WBS 1.4)

##### Scope

Records control includes activities necessary to maintain accurate project records and control project documents. These activities include verification of completeness and legibility of documents, maintenance and application of sequential numbering, maintenance of a database system and project files, and transfer of records to the Battelle Records Center at regular intervals in accordance with approved procedures.

##### Approach

Battelle records management procedures and specific TSP and project requirements will be applied. The availability, accessibility, retrievability, and verifiability of project information will be maintained. In addition, the records will meet legal, regulatory, and quality requirements as established by Battelle and the project.

Records of Hanford documents reviewed by HEDR staff will be maintained as an annotated bibliography. This bibliography will become part of project records and made available in the DOE-RL Public Reading Room.

#### Milestones to the TSP

None.

#### Project Deliverables

- Transfer of project records to the Battelle Records Center at regular intervals
- Designation of project records to be transferred to the RL Public Reading Room

#### Subcontract Administration (WBS 1.6)

##### Scope

Subcontract administration includes activities necessary to identify, acquire, control, provide status of, and report progress of consultants and other contract support for the project. These activities include definition of scope; preparation of budgets and schedules; technical proposal review and selection; technical direction; scope, cost and schedule control and reporting; and milestones for evaluation. Subcontracts that Battelle manages include those of the TSP, Native American tribes, and technical consultants to HEDR Project staff.

##### Approach

Processes consistent with Battelle subcontracting procedures and TSP directives will be implemented to procure consultants and maintain subcontracts to meet CDC, TSP, project management, and technical needs. The status of contracts will be reported regularly using a project management software system. Modifications will be processed through the Battelle Contracts Department in accordance with written requests from authorized contract representatives.

#### Milestones to the TSP

None. Financial status of TSP and Native American contracts is provided on a quarterly basis to the TSP.

## Project Communication Support (WBS 1.7)

### Scope

Project communication support includes three aspects:

- providing accurate and timely information to the TSP on a regular basis about the plans, progress, and results of the project
- responding to direct requests for information from the media, the technical community, Battelle management, and other interested organizations and individuals
- planning and implementing internal project communication.

### Approach

Project milestones, TSP directives, and requests for information will be evaluated to identify appropriate communication activities necessary to support dose reconstruction goals. Communication support will be provided for preparing monthly and other project reports, preparing other print and visual materials, presenting information at TSP meetings as requested, providing speakers for other events as requested, and providing other materials or services as requested. Activities for internal project communication involve developing policy and guidelines for communicating project results; advising HEDR staff on, and reviewing, project communication products; and ensuring HEDR staff and management are kept apprised of current project issues.

The Project Office will edit and coordinate the production of project reports to the TSP. HEDR staff who generated the original reports will respond to subsequent TSP comments. Upon receiving written TSP approval, the Project Office will prepare copies of the final reports for TSP distribution to the public. Activities include the following:

- develop/update internal communication policies/procedures for HEDR project management plan
- recommend methods for effective Battelle communication/presentation of project products and activities such as the decision modeling, information search and declassification methods, collaboration with tribes, and use of the Geographic Information System (GIS) output
- develop and present training courses to improve project staff communication and task management skills

- edit, write and coordinate production of project reports and other documents, such as journal articles, from other tasks
- review Battelle presentations for public or scientific meetings, prepare visuals as necessary, and coordinate production of visuals and paper copies
- produce a quarterly bulletin to keep Battelle managers of HEDR staff aware of project issues that affect their staff
- hold annual meeting with Battelle managers of HEDR staff to discuss HEDR status/issues
- write or contribute to articles for Battelle publications to inform staff and Battelle-targeted external audiences about key HEDR activities
- respond to direct requests for project-related information, such as from members of the public, university representatives, state officials, legal representatives (for plaintiffs or defendants), and the media.

#### Milestones to the TSP

None.

#### Project Deliverables

- Monthly report input
- Guidelines to project participants for preparation of documents and presentations
- Internal project bulletins

#### SUBTASK 0104: PROJECT PEER REVIEW (WBS 1.5)

##### Scope

Peer review includes activities necessary to ensure that plans for technical work are complete, appropriate, and capable of meeting stated objectives, and that the results of technical work are sound, based on appropriate analyses, and meet stated objectives.

##### Approach

Classical peer review requirements will be applied to the review of task plans and task/project products. In addition, management review will be

performed on presentation and information materials to ensure that project, TSP, and Battelle policies and sensitivities are appropriately addressed.

#### Milestones to the TSP

None.

#### Project Deliverables

- Comments on dry runs
- Comments from peer review of documentation

#### QUALITY ASSURANCE

The HEDR QA plan will be applied to planning and achieving data quality objectives and closure on significant technical review comments by TSP and internal Battelle project reviews. Planning and tracking of corrective actions will be addressed in a project procedure and included in QA audits. Regular QA audits will be performed and closed in accordance with the HEDR QA plan and PNL-MA-70.

#### INTERACTIONS

Task plans will identify relationships between project activities so that interfaces, dependencies, and coordinations can be managed. Project management will track these interfaces and ensure that their functions are achieved. In addition, project management will network and track project activities and their dependencies to ensure that transfers of data and other information occur as planned.

## ORGANIZATION

J. E. Till, TSP Chairman  
B. Shleien, TSP Budget/Fiscal Subcommittee Chair  
M. L. Blazek, TSP Communications Subcommittee Chair

01	Project Management	D. B. Shipler, Task Leader
0101	Project Planning and Control	D. B. Shipler, Subtask Leader M. D. Freshley
0103	Project Administration	S. M. Finch, Subtask Leader A. H. McMakin J. M. Daer P. D. Richmond G. L. Harvey
0104	Project Peer Review	W. A. Glass, Subtask Leader



## TASK 02: TECHNICAL INTEGRATION

### SCOPE

This task provides technical guidance, coordination, and communication among all other tasks. This task ensures that the outputs and formats of the results of each task fit the general needs of the project on an acceptable schedule, while still maintaining scientific integrity of each product.

The scope of work for Task 02 is addressed in three subtasks:

- Technical Integration Planning, Control, and Reporting (0201)
- Project Technical Coordination and Analysis (0204)
- Pathways and Dose Model Requirements (0205).

### SUBTASK 0201: TECHNICAL INTEGRATION PLANNING, CONTROL, AND REPORTING (WBS 2.8)

#### Scope

This subtask includes preparation of advanced work plans, routine task reporting, travel requirements, preparation of technical papers on subjects of current interest, control of task schedules and costs, and the planning and reviewing of all task activities. This subtask also includes resolution of TSP and public comments on reports.

#### Approach

This is a level-of-effort task requiring the task staff to be involved daily with various other task and subtask components of the project. Task management and control will be accomplished primarily through the system of project control initiated in Task 01 (Project Management) and other Battelle accounting systems already in place. Task staff will maintain personal contact with task leaders and other HEDR staff to ensure that project milestones are defined, integrated, and met.

Activities include the following:

- prepare annual task plans, budgets, and data quality objectives (DQOs)



- prepare task monthly reports
- attend TSP/project/public meetings
- plan and prepare task/project technical papers and presentations.

#### Milestones to the TSP

None.

#### Project Deliverables

- Input to task plans
- Input to monthly reports
- Input to TSP and subcommittee meetings

#### SUBTASK 0204: PROJECT TECHNICAL COORDINATION AND ANALYSIS

(WBS 2.1, 2.2, 2.6, 2.7)

#### Scope

This subtask includes activities that provide overall technical guidance, coordination, communication, and integration among all other tasks. Activities ensure that the outputs and formats of the results of each task fit the general needs of the project on an acceptable schedule, while maintaining the scientific integrity of each product. The subtask provides technical coordination with agencies and projects associated with, but independent of, the HEDR Project, including the HTDS. The project integrator also serves as the Battelle contact with the Native American Working Group.

#### Approach

Coordination is accomplished through day-to-day communication with project staff to ensure that project requirements and milestones are defined, integrated, and met. Interfaces and constraints are identified, defined, and controlled to meet project technical requirements and milestones. Analyses are defined, planned, and coordinated at this level, while much of the work is

performed in other tasks. The project database, maintained by this subtask, is the central repository for other project databases.

Activities including the following:

- A. Hanford Thyroid Disease Study (HTDS) Coordination
  - Level-of-effort communications
  - Establish data communications specifications
  - Coordinate HTDS pilot study calculations
  - Coordinate HTDS pilot study information requests
- B. Native American Working Group Coordination
  - Level-of-effort communications/meeting attendance
  - Define research requirements beyond Phase I
  - Coordinate Native American calculations
  - Assist developing data release protocols
- C. Data Management
  - Prepare data management plan
  - Maintain project database (with Task 07)
- D. Model Reliability Analyses (Sensitivity/Uncertainty)
  - Project sensitivity/uncertainty analysis plans (with Task 08)
    - source term model
    - atmospheric dispersion models
    - terrestrial models
    - surface water models

#### Data Quality Objectives

##### New Data/Information to be Developed

Data management plan and project sensitivity/uncertainty analysis plan.

##### Final Use of Data/Information

To direct and control the storage and manipulation of data and the performance of the project sensitivity/uncertainty analyses.

##### Data Quality Objectives

- Completeness - The sensitivity analysis part should consider analysis of the sensitivity of pathways/parameters contributing more than 5% of the dose

to any individual. The uncertainty analysis part should consider analysis of all parameters contributing more than 5% of the total uncertainty at any location to any individual. The data management plan should consider the control of 100% of the input data to any calculation.

### Documentation

The results of DQO achievement and measurement will be provided in milestone reports to the TSP.

### Milestones to the TSP

- 0204A - Letter Report: Data management plan (May 1992). The plan sets data management requirements for the project database, which is the central repository for other task databases. Requirements will include those to maintain this central database and keep it current while allowing the contributing tasks continuing access. Requirements will also specify controls to ensure that appropriate inputs for the project dose model are held reasonably static.
- 0204B - Letter Report: Recommendation on whether monitoring data for the Columbia River are sufficient to estimate doses, and if not, the extent of modeling needed for dose estimation (December 1992). Provides input to the FY 1992 TSP decisions on the same subject. Recommendation is based on monitoring data from Tasks 04 and 05 and on previous work on identification of dominant radionuclides for the river pathway.

### Project Deliverables

- Data communications specifications
- Research requirements

### SUBTASK 0205: PATHWAYS AND DOSE MODEL REQUIREMENTS (WBS 2.3, 2.4, 2.5)

#### Scope

This subtask will develop requirements to enable the enhanced computer code to estimate specific individual and population group doses for defined pathways of exposure, incorporate enhanced atmospheric dispersion capabilities, and conduct sensitivity/uncertainty investigations. This subtask will be the lead for that effort, with input from the technical tasks. Techniques for computation will be investigated, selected, and documented.

Model validation activities will continue. The HEDR Project is represented at the International Atomic Energy Agency (IAEA) coordinated research program on the "Validation of Models for Radionuclide Transfer in Terrestrial, Urban, and Aquatic Environments" (VAMP) by this task. A first test scenario, devised by the IAEA with Chernobyl data, has been investigated. A similar scenario, devised with Hanford data, will be prepared and submitted to the VAMP participants to enable independent calculations to be made. A general plan for validation of additional portions of the model with Hanford data will be developed.

#### Approach

The approach is direct coordination and interaction with staff of Tasks 07 (Environmental Pathways and Dosimetry) and 08 (Statistics). The model has a fully dynamic structure that maintains model correlations through all computations. This structure requires massive data storage availability as well as speedy data retrieval capabilities. Work this fiscal year will focus on selection of appropriate temporal/spatial resolution for the surface-water calculations and selection of appropriate models. Innovative approaches will be developed, tested, and evaluated using bench-scale computer applications. Letter reports on ideas under consideration will be prepared for project files. Final selections will be documented. Initial investigations will begin toward development of user-friendly interactive mechanisms for the dose calculation modules.

Development of a Hanford VAMP validation scenario this fiscal year will ensure that it is available when the VAMP participants complete the second scenario. Analysis of the results of this scenario will depend on completion by the VAMP participants.

Activities include the following:

#### A. Project Model Design

- Update system design requirements
- Select aquatic pathways model
- Determine output requirements
- Investigate summary system (user-friendly interactions)

## B. Project model support

- Key radionuclides report
- Define population dose calculation requirements
  - coordinate definition of groups (with Task 06)
  - coordinate collective (population) dose capability (with Task 07)
  - coordinate database for collective doses
- Prepare strategy for selection of model parameter distributions (with Tasks 07 and 08)

## C. Project Code Validation

- VAMP scenario 2 participation
- VAMP scenario 3 (Hanford scenario)
  - Interaction with IAEA to define scope
  - Data search
  - Data synthesis/scenario preparation
  - International scenario analysis
  - Assistance to IAEA in publication

## Data Quality Objectives

### New Data/Information to be Developed

Updated design specifications, lists of important parameters, important exposure pathways, and important radionuclides.

### Final Use of Data/Information

To direct and control the development of the project pathways and dose-estimating computer code and to direct the collection of input data.

### Data Quality Objectives

- Accuracy - The objective is to incorporate physical phenomena as accurately as any other nationally known code for similar use. Peer reviews will be used to ensure and measure accuracy.
- Precision - The objective is to make uncertainties of code and input information integral parts of the code operation and ensure that they are expressed in the code output. Peer reviews will be used to ensure and measure precision.

- **Completeness** - The objective is for the code to calculate dose estimates for all currently identified pathways for the period 1944-1990, lifestyles of population groups and individuals, dominant airborne and waterborne radionuclides released from Hanford, for the area bounded by the Cascade Mountains on the west, the Canadian border on the north, the Bitterroot Mountains on the east, and the northern counties of Oregon on the south. Peer reviews will be used to ensure and measure completeness.
- **Representativeness** - The objective is that the code represents all known pathway phenomena, lifestyles, food habits, agricultural practices, and physical phenomena of radioactivity and dosimetry. Expert verification will be used to ensure and measure representativeness.

#### Documentation

The results of DQO achievement and measurement will be a section of each milestone to the TSP.

#### Milestones to the TSP

- **0205A - Letter Report: Updated design specifications (May 1992).** This document will set requirements for the revised computer model as its design progresses. The major addition anticipated for FY 1992 is the definition of the models and methods for the Columbia River pathway.
- **0205B - Letter Report: Key radionuclides, Rev. 1 (May 1992).** The report will document the results of an expanded investigation of Hanford-originated radionuclides that potentially resulted in the largest doses, for the entire time period under consideration, for atmospheric and surface water releases. This provides input to the TSP decision at the end of FY 1992 identifying the key radionuclides.
- **0205D - Letter Report: Model parameter distributions strategy (September 1992).** The report will describe a coherent and internally consistent process to permit appropriate and justifiable selection of input parameters. The input parameters for the project model define the ranges of uncertainties that the output will reflect. Those that are selected from the literature (as opposed to being developed by the project) must be defined and defended as distributions, not point values. This process will be coupled with the project reliability analyses, so that the effort can be tailored to the importance of the parameter.

### Project Deliverables

- Techniques for computations
- Selection of temporal and spatial resolution for surface water model
- Selection of surface water model
- Hanford VAMP validation scenario

### QUALITY ASSURANCE

Subtask 0201 requires quality assurance (QA)/data verification activities in regard to the data management activity. The specific Software Control Procedures (SCPs) include SCP-70-318, "Control of Data Bases," and SCP-70-317, "Transfer of Software, Data, and/or Documentation."

Subtask 0202 reflects a requirement for design documentation, SCP-70-312 "Determination of Software Requirements," for code review, SCP-70-313 "Final Internal Development Review of Software and Documentation," and for verification/validation, SCP-70-315 "Conversion Testing, Verification, and/or Validation of Software." The applications performed for the VAMP intercomparison will be controlled by procedures on data transfer and database management, SCP-70-317 and -318, as well as SCP-70-316, "Software Application Control."

Subtask 0203 requires no QA/data verification activities other than those routinely applied via the project QA plan. These include HEDR-specific procedures RMP-1, "HEDR Records Control," HEDR-TP-2, "HEDR Indoctrination and Training," HEDR-TP-5, "HEDR Peer Review," and HEDR-TP-6, "HEDR Review Process."

### INTERACTIONS

This task requires interactions with all other technical tasks of the HEDR Project. The Project Technical Coordination and Analysis subtask (0204) specifically deals with each task in the data management and model reliability analysis activities. The Pathways and Dose Model Requirements subtask (0205) deals with Task 07 in model support.

## ORGANIZATION

TSP Quality Assurance and Technical Integration Subcommittee  
D. Barth, Chairman

- |      |   |   |
|------|---|---|
| 02   | Technical Integration                                   | B. A. Napier, Task Manager  |
| 0201 | Technical Integration, Planning, Control, and Reporting | B. A. Napier, Subtask Manager   |
| 0204 | Project Technical Coordination and Analysis             | B. A. Napier, Subtask Manager<br>E. Liebow (Task 04)<br>J. C. Simpson (Task 08)<br>M. D. Freshley                               |
| 0205 | Pathways and Dose Model Requirements                    | B. A. Napier, Subtask Manager<br>T. A. Ikenberry (Task 07)<br>R. A. Burnett<br>J. C. Simpson (Task 08)<br>T. A. Miley (Task 08) |





## TASK 03: SOURCE TERMS

### SCOPE

Two levels of detail are forecasted for source term work:

- Level 1 - airbornes defined on daily basis, waterbornes on a weekly basis. This provides sufficient detail for input to the transport models.
- Level 2 - monthly or annual definition.

Dosimetry-related radionuclides are provided at Level 1. Radionuclides of public concern are provided at Level 2.

No groundwater source terms are provided. Battelle has access to a Westinghouse Hanford Company CERCLA database, which is sufficient.

Airborne carbon-14, tritium and fission products were added to those listed in the Project Summary Schedule (letter report from D. B. Shipler to J. E. Till, April 3, 1991).

Waterborne scandium-46, manganese-54 and cobalt-60 were added because they were used by the United States Geological Survey in its study of Columbia River system sediments. The river model development may require a more accurate reconstruction of the Hanford source, at least for their study period. Waterborne sources from reactor coolant purges and from failed fuel are addressed in other specific task activities. It may be necessary to add some releases from these sources to the appropriate radionuclide source term.

Special irradiation programs, including lithium and thorium irradiations, will be addressed under historical releases. Significant contributions from these sources will be added to the appropriate release estimates, if required.

This task includes the following elements for FY 1992:

- Source Terms Technical Planning, Control, and Reporting (0301)
- Radioactive Releases to Air (0303)
- Radioactive Releases to Water (0304)
- Radioactive Release Data Availability and Review (0307).

SUBTASK 0301: SOURCE TERMS TECHNICAL PLANNING, CONTROL, AND REPORTING  
(WBS 3.6)

Scope

This subtask provides management, control, reporting and administration of the source term subtasks. Planning, meeting attendance, documentation, reporting and publications are included. Efforts to meet QA planning, audits for accuracy, traceability and compliance are included, as well as technical integration with other HEDR tasks. The work to achieve defined scopes of work is included in each subtask plan; those activities not directly related to the work in subtask plans are included here.

Approach

HEDR management and administrative procedures in place will be applied to manage this task. These include planning for compliance with project QA practices, DQOs, project management, finance, and reporting requirements.

Activities include the following:

- project planning/task planning
- meetings (TSP, public, and project)
- documenting, reporting and publications
- project integration/interactions.

Milestones to the TSP

None.

Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees

SUBTASK 0303: RADIOACTIVE RELEASES TO AIR (WBS 3.2)

Scope

Work will begin on providing source term inputs from 1944-1991 to the atmospheric transport model for iodine-131 (1947-1991; 1944-1947 was completed in FY 1991), ruthenium-103, ruthenium-106, cobalt-60, cerium-144, and tellurium-132. This means the nominal daily values will be provided for the operating life of the reactors and separations plants. Actual output files to the atmospheric transport model will be produced by the release model code.

Monthly summary information will be provided for the following sources and radionuclides:

<u>Separations Areas</u>	<u>Reactor Areas</u>
plutonium-239	argon-41
iodine-129	carbon-14
strontium-90	tritium
cesium-137	
krypton-85 (1944-1960)	

If a decision to declassify the production data post-1960 is made, krypton-85 releases will be provided for the 1961-1972 period. If post-1960 data remain classified, krypton-85 release estimates will be made the subject of a classified report, which will be available to appropriately cleared TSP members.

The remainder of this work will be completed in FY 1993.

Milestones to the TSP

- 0303B - Iodine-131 source terms, 1944-1991 (December 1992)

Project Deliverables

- Source term estimates to Task 04
- Iodine-131 source term for 1994-1997 to the HTDS

#### SUBTASK 0304: RADIOACTIVE RELEASES TO WATER (WBS 3.4)

##### Scope

This subtask will begin work to develop source terms for radionuclides released to the Columbia River from the eight original single-pass HPRs from 1944-1991. Weekly releases will be provided for phosphorus-32, zinc-65, arsenic-786, neptunium-239, sodium-24, manganese-56, copper-64, chromium-51, iodine-131, and tellurium-132. Yearly estimates will be provided for strontium-90, tritium, and cesium-137. In addition, weekly releases will be provided during the U.S. Geological Survey study period for scandium-46, manganese-54, and cobalt-60. This work will be completed in FY 1993.

##### Milestones to the TSP

- 0304B - Source term report for releases to surface water from reactors, 1944-1991 (June 1993)

#### SUBTASK 0307: RADIOACTIVE RELEASE DATA AVAILABILITY AND REVIEW (WBS 3.1)

##### Scope

Quantitative radionuclide releases covering the operating history of Hanford facilities are required as the first step in calculating doses. An essential requirement in developing quantitative release history estimates is the reconstruction of the operating history of the production reactors and separations facilities over their lifetime. This subtask will provide the necessary plant operating information base for the reconstruction of release histories. In addition to providing the basis for release estimates, this subtask will form the starting point for the comprehensive report on the history of Hanford radioactive releases.

##### Approach

Historical documents required in source term reconstruction will be identified and entered in the source term bibliographic database.

Activities include the following:

- update source term bibliographic database and integrate with HEDR Project database

- search for 100, 200, 300, 400 Area operations data and create a quantitative facility operating history database as input for release calculations
- reconstruct reactor and separations plant operations quantitatively in terms of amounts and character of spent fuel discharged and reprocessed
- prepare operational history of emission control systems and procedures
- prepare continuous history of reactor water treatment methods that are crucial to activation products releases to the river.

#### Data Quality Objectives

##### New Data/Information to be Developed

A bibliographic database will be developed of references pertaining to the release of radionuclides from Hanford facilities with information to develop magnitudes and times of releases.

A qualitative operating history will be reconstructed for the Hanford reactors and separations facilities, which will be used to calculate airborne and surface water releases in FY 1993.

##### Final Use of Data/Information

- Input to Subtasks 0303 and 0304 (FY 1993) for generation of facility source terms to the atmosphere and to the Columbia River.
- Input to the Hanford radioactive release history.

##### Data Quality Objectives

- Completeness - The objective is that the information cover each day and each operating plant for the period 1944 through 1991. To ensure completeness, a document search tree will be developed and followed to identify and retrieve Hanford-originated documents related to radionuclide releases.
- Representativeness - The objective is that the bibliography must represent all known activities, operating variations, and accidental releases. To ensure representativeness, all searchable records will be included in the database. This will be verified by peer review.

### Documentation

The results of achievement and measurement of the DQO will be documented as a section in the milestone report to the TSP.

### Milestones to the TSP

- 0307A - Letter Report (unclassified): Hanford operations leading to radioactive releases, 1944-1960 (September 1992). Will provide the basis for airborne and waterborne release calculations. Will include amounts of material processed at separations area (for air releases) and reactor operating history (for water releases). Radionuclides studied are those listed under Subtasks 0303 and 0304 in the FY 1993 task plan.
- 0307B - Letter Report (classified): Hanford operations leading to radioactive releases, 1961-1991 (September 1992). Will include the same information as above report for post-1960 operations. The classified report will be reviewed by appropriately cleared TSP members.

### Project Deliverables

- Bibliographic database of Hanford facility references concerning operations and releases to the project files
- Bibliographic database to Subtasks 0303 and 0304
- Basic reconstruction of Hanford facility operations to Subtasks 0303 and 0304

### QUALITY ASSURANCE

Traceability of all calculations from the initial source will be maintained. Hand calculations will be performed according to Battelle procedure PAP-70-301. Battelle software control procedures SCP-70-312 through 317 will be followed where applicable.

An annotated log of all documents examined will be maintained.

### INTERACTIONS

Information from Task 02 (Technical Integration) will be used to provide an updated list of dominant radionuclides for the air and water pathways through 1957. Updated source term information will be provided to staff from

Tasks 02 and 07 for use in dose estimation. All stochastic approaches will be reviewed by the Statistics Task.

ORGANIZATION

TSP Source Term Subcommittee  
M. A. Robkin, Chairman  
B. Shleien

03	Source Terms	C. M. Heeb, Task Leader
0301	Source Terms Technical Planning, Control, and Reporting	C. M. Heeb, Subtask Leader
0303	Radioactive Releases to Air	C. M. Heeb, Subtask Leader
0304	Radioactive Releases to Water	C. M. Heeb, Subtask Leader
0307	Radioactive Release Data Availability and Review	C. M. Heeb, Subtask Leader





## TASK 04: ENVIRONMENTAL TRANSPORT

### SCOPE

In FY 1992, information will be acquired and evaluated to support continued development of models for dose estimating for the feasibility study being conducted by the HTDS and the lifestyle and food consumption studies being conducted by Native American tribes. This task consists of the following elements:

- Environmental Transport Technical Planning, Control, and Reporting (0401)
- Atmospheric Model Development and Evaluation (0402)
- Groundwater Transport (0403)
- Surface-Water Transport (0404)
- Atmospheric Model Database (0405)
- Atmospheric Model Calculations (0406).

### SUBTASK 0401: ENVIRONMENTAL TRANSPORT TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 4.4)

#### Scope

Task management activities include

- planning, scheduling, budgeting, reporting, reviewing
- responding to project management needs
- coordinating activities with other tasks
- resolving TSP and public comments on reports
- interfacing with TSP counterparts
- travel.

### Approach

The above activities will be performed in accordance with TSP directives and in cooperation with the TSP subcommittee recommendations to ensure that Task 04 milestones and deliverables are completed to the satisfaction of all parties.

### Milestones to the TSP

None.

### Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees

### SUBTASK 0402: ATMOSPHERIC MODEL DEVELOPMENT AND EVALUATION (WBS 4.1.1, 4.1.2, 4.1.3, 4.1.5, 4.1.6)

### Scope

The scope of atmospheric model development and evaluation during FY 1992 will include the following activities:

- atmospheric model documentation
- continuation of model reliability studies
- participation in model sensitivity/uncertainty workshop organized by Task 08.

### Approach

The atmospheric model will be documented in a HEDR report that will be subjected to peer and editorial review.

Model reliability studies will be planned with the assistance of project statisticians. The reliability studies will cover model sensitivity, model uncertainty, and model validation. Initial model reliability studies will be conducted to prepare for a sensitivity/uncertainty workshop to be held in the third quarter of FY 1992 (see Task 08). The results of the workshop will be

used to guide the reliability studies that follow. Ultimately, the reliability studies will examine the sensitivity of model output to uncertainty in model parameters and input data. They will also examine the sensitivity of model output to the forms selected for representing atmospheric processes. These studies will specifically address the effect of temporal integration on sensitivity. Sensitivity to input and parameter uncertainty will be evaluated by repeated model runs in which the items of interest are varied. Sensitivity to the forms of model components will be evaluated by repeated model runs replacing model components with alternative forms.

The model validation studies will address the relationship between predicted and measured time-integrated air concentrations and surface contamination for specified time periods. These studies will be undertaken jointly with project statisticians. The literature will be reviewed to identify data sets suitable for model validation. Criteria to be used in evaluation of validation data sets include number of tests, tracer characteristics, adequacy of source definition (time and amount), available meteorological data, range of atmospheric conditions, number and type of tracer samples, range of distances. No data sets used in model development will be considered for use in validation. Prior to conducting model validation tests, a validation protocol will be prepared. The protocol will address the statistical measures to be used in validation and criteria for evaluating the results of the tests. No experiments will be conducted for model validation.

The approaches and procedures used in model reliability studies will be documented in HEDR reports and in the open literature.

The modeling domain for the period December 1944 through December 1945 is an area approximately bounded by 44°N, 121.5°W, 49°N, and 116°W. As the release rates decrease, it may be appropriate to decrease the size of the model domain and reduce the complexity of the model used for atmospheric calculations. Results of calculations for the 1944-1957 period will provide a basis for recommendations to the TSP related to changes in the model and model domain.

Activities will address the following:

- A. Wind field model implementation
- B. Model documentation
- C. Model reliability studies
  - prepare for and participate in uncertainty/sensitivity workshop
  - identify and evaluate model validation data sets
- D. Evaluation of atmospheric modeling requirements for the periods when release rates decrease

#### Data Quality Objectives

##### New Data/Information to be Developed

Results of sensitivity/uncertainty analysis on the atmospheric transport and dispersion model.

##### Final Use of Data/Information

Decisions relative to scope of additional model development or modification work and need for additional or refinement of input or parametric information. Establishment of model and databases for verification and validation studies.

##### Data Quality Objectives

- Accuracy - Bias is a measure of model accuracy. It is the difference between model predictions and observed values. The objective for accuracy is that bias in monthly average air concentrations be less than a factor of three. The bias will be determined by comparing predicted and observed values for selected locations. Statistical evaluation of the stochastic realizations will be performed and compared to monitoring data for selected locations.
- Precision - The objective is that precision will be determined stochastically from the variability built into the source term model and in the meteorological data.

- **Completeness** - The objective is that the model be capable of estimating dispersion and deposition within an area approximately bounded by 49°N, 116°W, 44°N, and 121.5°W. Time-integrated air concentrations and surface contamination will be computed at intervals of no more than 10 miles. The code should handle deposition, plume depletion, and variable atmospheric pressures. Completeness will be ensured by using outside experts to identify and evaluate alternative methods and models. Peer review will be performed of the modeling techniques.
- **Representativeness** - The objective is for the model to account for physical phenomena that affect dispersion of material in the environment. These phenomena include transport, diffusion, wet and dry deposition, and radioactive decay. Outside experts will assist in identification and evaluation of methods for treating atmospheric processes in the model. The model will undergo peer review.
- **Comparability** - The objective is that the model treat phenomena that are treated in similar, nationally accepted atmospheric dispersion models.

#### Documentation

A section of the model documentation report will discuss the DQO processes, evaluations and results described above.

#### Milestones to the TSP

- 0402B - Report documenting the atmospheric model (December 1991). The report will include
  - a description of the problem being addressed
  - the technical basis for the model, including the basic equations
  - a user's guide to the model
  - a programmer's guide with flow charts and glossary of variables
  - a code listing
  - sample data sets and model output.

- 0402C - Report on air model sensitivity/uncertainty (December 1991). This completes work continued from FY 1991.
- 0402D - Meteorological data report (December 1991). This completes work continued from FY 1991.

#### Project Deliverables

None.

#### SUBTASK 0403: GROUNDWATER TRANSPORT (WBS 4.2)

##### Scope

Dose calculations will be completed for groundwater pathways and added to the groundwater pathways report. The report consists of four sections: 1) Hanford Site well data analysis, 2) riparian wells, 3) watershed deposition, and 4) offsite groundwater migration. The information contained in the document is needed for a TSP decision on whether the groundwater pathway has been adequately addressed.

##### Approach

The approach during the first quarter of FY 1992 will be to work with staff members from Task 07 (Environmental Pathways and Dose Estimates) to finalize dose calculations for the groundwater pathways. Qualified technical staff will be identified for peer review of the groundwater report and editorial and HEDR Project Office comments will be incorporated. Comments will be obtained from members of the TSP Environmental Transport subcommittee and incorporated into the document. Review comments from the TSP will be obtained and the document will be published as a Battelle report. Presentation of information at TSP meetings will accompany submittal of the document to the TSP.

#### Data Quality Objectives for Groundwater Transport Data

##### New Data/Information to be Developed

A single report presenting existing information on Hanford-originated radionuclides in wells, washoff, and offsite groundwater migration.

### Final Use of Data/Information

The information contained in the groundwater report will be used by the TSP to make a decision on whether the groundwater pathway has been adequately addressed or if additional work is needed. The question being addressed is whether groundwater represents a potential pathway by which significant radiation doses resulting from past Hanford operations could have been received.

### Data Quality Objectives

- Accuracy - The objective is that groundwater concentrations be from annual monitoring reports. Accuracy will be ensured by hand-checking the data in reports against the original sources.
- Precision - The objective is to quantify uncertainties in reported and reconstructed concentrations. This will be done by calculating the ranges (maxima, minima and best estimates) of concentrations or assessing the range of observed values. These ranges will be summarized and reported.
- Completeness - The objective is to develop a high level of confidence that discovery of additional groundwater concentration data later will not change reported values by more than an order of magnitude. If additional data change the reported values by more than an order of magnitude, the criteria for completeness will be that conclusions of the investigation do not change. To ensure completeness, a data search and inventory plan will be prepared. Completeness will be evaluated with peer review and TSP approval.
- Representativeness - The objective is that the outputs be representative of the conditions existing at and near the site over the last 45 years. Peer review of the comparisons will be made to ensure representativeness.
- Comparability - The objective is that reported results be comparable to existing environmental monitoring reports. To ensure comparability, review of existing documentation will be performed. Peer review of conclusions will be obtained to verify comparability.



### Documentation

The results of the DQO processes and evaluations described above will be documented in a section of the final report to the TSP.

### Milestone to the TSP

- 0403A - Groundwater report (December 1991). Topics to be discussed include a description of Hanford Site groundwater, Hanford Site wells used for drinking water, the offsite migration pathway, the riparian well pathway, the watershed pathway, and conclusions. Appendixes will include summaries of drinking-water systems at the Hanford Site and drinking-water limits for radionuclides, as well as available information on water sources for communities along the Columbia River downstream from the Hanford Site.

### SUBTASK 0404: SURFACE-WATER TRANSPORT (WBS 4.3)

#### Scope

Radionuclide transport in the Columbia River will be reviewed from 1944-1991 from Priest Rapids Dam to the coastal areas.

This subtask consists of the following activities:

- document the literature and database review
- participate in cooperative development of the river database with Task 05
- develop a conceptual model for the Columbia River system and adjacent coastal areas
- document the conceptual model.

#### Approach

##### Report of Literature and Database Review

From the literature and database review (conducted in FY 1991), a report will be prepared summarizing the results of previous studies containing information on radionuclide releases, activity levels, and distributions in the Columbia River system. These previous studies, which began in the late 1940s and continued intermittently through the early 1970s, were conducted by Hanford contractors and by groups external to Hanford (e.g., universities, state and federal agencies). General topics included the uptake and release

of radionuclides in stream sediments, uptake by biota, mixing processes, and behavior of specific radionuclides in river systems. Locations from Hanford downstream to the coastal areas are represented with some studies that are very site-specific and others that extend over many miles of river. An evaluation of data availability for the river locations and adjacent coastal areas will be provided. The report will provide descriptions of the governing transport processes, radionuclide accumulation areas, and key time periods of concern.

### Conceptual Model

Using the river database and information obtained from reports, journal articles, and conference proceedings, a conceptual model of the river transport processes will be developed. The model will describe the behavior of radionuclides in the river system with respect to uptake and release by sediment and biota (sink and source areas within the river channel) and seasonal river discharge effects. During the review work, simple dilution-decay routing will be conducted for specific radionuclides and seasonal or yearly time periods to evaluate and identify modeling constraints (e.g., data needs). Weekly and monthly time-steps will be compared for relative accuracy of downstream concentration prediction. Through the development of the model, significant time periods and river locations of concern will be identified.

Activities for this subtask are summarized here:

#### A. Literature and Database Review (continued from FY 1991)

- review Hanford reports and databases
- review state, federal, and university reports
- assemble Columbia River system hydraulic data
- complete identification of radionuclides

#### B. Develop Surface Water Database (with Task 05)

- develop radionuclide concentration categories
  - water
  - sediment
  - biota

- develop hydraulic data and information
  - river dispersion and flow times
  - river system hydrographs
  - river geometry
- C. Document Literature and Database Review
- D. Develop Conceptual Model of Columbia River
  - transport processes (river, estuary, coastal)
  - specific radionuclide behavior in water
    - determine transport modeling constraints
    - select radionuclides for study
  - mixing processes (Hanford reach)
  - radionuclide accumulation areas (sediment/biota)
  - identify key time periods of concern
  - identify transport modeling constraints
  - conduct simple routing calculations
    - specific radionuclides
    - specific time periods
    - evaluate results based on conceptual model
- E. Document Conceptual Model Results

#### Data Quality Objectives

##### New Data/Information to be Developed

New information will include 1) concentration of several radionuclides in Columbia River water, sediments, and biota (fish), at several locations for specified time periods, 2) estimates of doses received by representative individuals downstream of Hanford along the Columbia River, and 3) a conceptual river model.

##### Final Use of Data/Information

Input to dose calculation models, a preliminary description of river pathways and their potential impacts, and a basis for further analysis of the river pathway.

### Data Quality Objectives

- Accuracy - The objective is to develop environmental concentration estimates that are within the same range as that provided in annual monitoring reports for environmental concentrations. To ensure accuracy, data will be taken largely from these sources and hand-checked against them.
- Precision - The objective is to quantify uncertainties in reported and reconstructed concentrations. This will be done through uncertainty analyses. Distributions will be developed and reported.
- Completeness - The objective is to develop a high level of confidence that discovery of additional information later will not change calculated values by more than 5%.
- Representativeness - The objective is that the outputs be representative of the conditions existing in the Columbia River over the last 45 years. To ensure representativeness, peer review of the comparisons will be made.
- Comparability - The objective is for the results to be comparable to existing environmental monitoring reports, publicly available dose estimates, and current understanding by cognizant agencies of river hydraulics. Review of existing documentation will be performed. Peer review of conclusions will be obtained to verify comparability.

### Documentation

The results of the DQO evaluations described above will be documented in a section of the surface-water literature review report to be provided to the TSP.

### Milestones to the TSP

- 0404A - Report summarizing the Columbia River pathway findings from key documents reviewed during FY 1991 (December 1991). The results of earlier studies conducted on the river pertaining to radionuclide concentrations and transport from 1944-1991 will be summarized. Examples of data will be presented as ranges of values instead of reproducing the entire set. Typical data sets will be illustrated with graphics. The report includes dose estimates from the river pathway for representative individuals downstream of Hanford. A complete bibliography of the collected documents will be presented in the Task 05 report to avoid duplication of effort.

- 0404B - Letter Report: Description of the conceptual model of Columbia River transport processes (September 1992). The report will describe the behavior of the key radionuclides for critical time periods and locations. Included will be the results of initial routing calculations for specific radionuclides and time periods.

#### SUBTASK 0405: ATMOSPHERIC MODEL DATABASE (WBS 4.1.4)

##### Scope

Entry of additional meteorological and topographical data required for the revised atmospheric model and post-entry data checks will continue. In addition, the database will be documented.

The model domain is bounded by 44°N, 121.5°W, 49°N and 116°W. The model period is December 1944 through December 1957. As the model domain is expanded to the south, it will be necessary to acquire and enter additional meteorological data. It will also be necessary to revise the topographical data files.

##### Approach

Meteorological data for 1944 through 1947 are not generally available on magnetic media. As a result, the data must be read from microfiche or paper copies of the original observation records and manually entered into the database. As the data are entered, they are subjected to various tests to identify potential errors in the data or data entry. When the data screening is complete and errors have been corrected, the data are added to a station database. Prior to running the atmospheric model, the station databases are combined into the atmospheric model database. An additional data screening program will be developed to examine the consistency of data for all stations for each hour and the hour-to-hour consistency of the data for each station.

Topographical and land use data have been obtained from commercial sources for the entire northwestern United States. These data are on magnetic tapes and compact disks. Data for the model domain will be extracted from the original magnetic media and prepared for use by the atmospheric model.

Computer programs for extracting the data from the original media were supplied with the media. Programs will be developed to prepare the data for use by the model.

The atmospheric model database will be documented in a HEDR report that will be subjected to peer and editorial review prior to publication.

Activities include the following:

A. Atmospheric Transport Model Database Extension (time and space)

- Meteorological database
- Obtain data for southcentral and southeastern Oregon and southwestern Idaho for 1944-1947
- Enter and verify new meteorological data for 1944-1947
- Enter and verify meteorological data for 1948-1957
- Document meteorological database

B. Topographical Database

- Determine land use for extended model domain
- Determine topographic variability for extended model domain
- Document topographic database

Data Quality Objectives

New Data/Information to be Developed

Database of meteorological information from designated meteorological stations on the Hanford Site and within the Hanford region for the period 1944-1957.

Final Use of Data/Information

Will be the basis for input to the HEDR atmospheric transport and dispersion model.

### Data Quality Objectives

- Accuracy - The objective is that the database must contain the same information as recorded by the stations. Will be measured by quality control checks of files against records.
- Precision - The objective is that uncertainties in the data will be assessed based on the historical records and analysis of instrumentation and recording practices insofar as obtainable. The objective will be measured by peer review.
- Completeness - The objective is to identify and obtain sufficient meteorological data from national meteorological data archives to reconstruct dispersion of radio-nuclides released from Hanford. Completeness will be measured by professional judgment.
- Representativeness - The objective is that the database represent the known available Hanford and regional-related meteorological information.

### Documentation

The quality process, measurements and results will be a section in the report to the TSP.

### Milestone to the TSP

- 0405A - Letter report on status of interim atmospheric model database (September 1992). The report will
  - describe the model database and, where appropriate, list the data
  - describe the original data sources and data quality
  - describe the instruments used to collect the data
  - document computer codes used to process the data.

### Project Deliverables

- Input to HEDR database
- Input to HEDR document file

## SUBTASK 0406: ATMOSPHERIC MODEL CALCULATIONS (WBS 4.1.7)

### Scope

The revised atmospheric model will be used to calculate daily time-integrated air concentrations and surface contamination for the Phase I model domain for iodine-131 releases from December 1944 through December 1957. These results will be used in the calculation of doses for the HTDS pilot study and for Native Americans.

### Approach

The atmospheric model and model databases will be fully tested and documented prior to making the calculations for the HTDS pilot study and Native Americans. Source term files will be obtained from the Source Terms Task. Each file will contain a time-series of hourly releases for the period to be modeled. The set of files will represent the uncertainties in the quantities of iodine-131 released each hour and the times of the releases. The atmospheric model will be run once with each source file, using the atmospheric model database, to generate sets of files containing the daily time-integrated air concentrations and surface contamination. Each set of files produced by the atmospheric model will describe a possible sequence of daily patterns of iodine in the environment that is consistent with the release sequence and the observed meteorological data. The aggregate of all sets of atmospheric model output will represent the effect of the uncertainty in both the source term and the atmospheric model. All sets of the atmospheric model output will be transferred electronically to the environmental pathways task for use in dose calculations.

Atmospheric model output will be checked prior to being transferred to the environmental pathways task. The checks will include an examination of the model log file and visual examination of the time-integrated air concentration and surface contamination patterns.

The atmospheric model input use for each model run will be completely documented in a model log file. These files will be archived as project records. In addition, a report will be prepared that summarizes the model input and output. This report will include examples of daily model output and



monthly integrated patterns. It will also include a characterization of the variability in the output resulting from uncertainty in the atmospheric model input.

Activities to develop atmospheric transport calculations for the HTDS pilot study and Native American doses include the following:

- Establish data transfer protocol
- Run model transfer output to dose calculation task
- Analyze model output
- Document model input and results.

#### Data Quality Objectives

##### New Data/Information to be Developed

Daily time-integrated air concentrations and surface contamination for the period 1944-1957.

##### Final Use of Data/Information

Basis for 1) calculating air-pathways doses for individuals identified for the HTDS pilot study, 2) calculation population group doses for Native American tribes, and 3) analyzing the model.

##### Data Quality Objectives

- Accuracy - The objective is that bias in monthly time-integrated air concentrations and ground contaminations be within a factor of three. The approach is to use the revised model and estimating procedures. Accuracy will be verified by direct comparisons with available monitoring data.
- Precision - The objective is that precision will be determined stochastically from the variability built into the source term model and in the meteorological data.
- Completeness - The objective is that concentrations and contamination will be calculated for designated time intervals for all nodes in the model domain. Completeness will be verified by direct comparison of output data with the model domain grid.

- Representativeness - The objective is that the modeling results represent the actual distribution of radionuclides as well as results of similar models and represent the uncertainty in the distributions better than the results of similar model.

#### Documentation

A summary of the quality process, measurements, and results will be included in a report to the TSP.

#### Milestones to the TSP

None.

#### Project Deliverable

- A data file of time-integrated air concentrations and surface contamination for 1944-1957 to Task 07 for dose calculations.

#### QUALITY ASSURANCE

Within the HEDR Project, the Environmental Transport Task relies on databases managed by two other HEDR tasks: Environmental Monitoring Data (Task 05) and Source Terms (Task 03). These databases relate primarily to radionuclide source terms and distributions. The Environmental Monitoring Data and Source Term tasks are responsible for ensuring the quality of these databases.

The Environmental Transport Task also uses information from references external to the project for transport parameters (meteorologic and hydrologic) and independent radionuclide measurements. It is the responsibility of the environmental Transport Task to reference the source of internal and external data and to identify how these data are used. This includes documenting information about how data were verified or validated, and why selected data were used and any other data were not used. Data traceability and verification are reviewed periodically by the project QA officer and TSP observers.

Meteorological data used in the HEDR Project have been collected by various organizations for purposes other than the HEDR Project. In general, the data predate formal QA programs. There is no way to certify the quality of the data. However, the hourly meteorological data selected for use in the

HEDR Project came from observations made pursuant to the normal function of the organizations and were used on a routine basis when they were collected. In addition, they were collected by individuals trained in making meteorological observations using standard meteorological instruments for the period. These factors provide some assurance that the instruments were operating properly at the time of the observations and that the data are reasonable.

Meteorological data collected at Hanford have been subjected to numerous checks during and following data entry. These checks include double checks of the raw data entries, range checks, and a recent screening of all data for anomalies in distributions. Data obtained from the National Climatic Data Center are subjected to range checks before being added to the project database. Additional checks will be made prior to using the data in any model calculations that lead to dose estimates.

The atmospheric models used in the HEDR Project are drawn from the atmospheric sciences literature. The models represent the processes of transport, diffusion, deposition, depletion, and decay in a manner that is consistent with the available data and the objectives of the project. Modeling options are discussed with the TSP as they are evaluated. Prior to use of a model in calculations leading to dose estimates, the model will be described in the technical basis section of the documentation of the computer code.

Computer codes used in calculations leading to dose estimates will be developed and modified under formal QA procedures. These procedures require the following elements:

- Preparation of a software requirements specification. This document describes the purpose of the code and establishes the procedures to be followed in design, development, documentation, review, control, testing, and use of the code.
- Development of a software testing plan. The software testing plan establishes the testing documentation requirements, the testing methods, and the acceptance criteria for the code.
- Preparation of software documentation. The software documentation describes the technical basis and provides a user's guide for the code. It may also contain a listing of the code.

- Software review. Prior to formal software testing, codes undergo an independent review to ensure that they satisfy the requirements specifications.
- Software configuration management. Following the software review, codes are placed in configuration management. Once a code is in configuration management, all changes to the code are strictly controlled and must be made following written procedures.
- Software tests (code verification). The formal software tests to ensure that the code is performing as intended are made when the code enters configuration management. These tests are performed in accordance with the software testing plan.

Model calculations will be compared to measured data where suitable data are available. The magnitude of differences will be used in the quantification of the uncertainty of the model outputs and to provide, if possible, direction for changing the model to reduce uncertainties. However, it is highly unlikely that a complete model validation can be performed.

Input data for each computer run leading to dose estimates and the output from the run are permanent project records. Output of the atmospheric transport computer codes for use in dose estimates will be formally transferred to other project tasks.

For Subtask 0404 (Surface-Water Transport), a working bibliography will be maintained, which will periodically be transmitted to the project office and be made publicly available. Notations on observations, evaluations, and any other written information developed during the review will be kept in a separate file category. These will be used to prepare the report on this phase of the work. No computer codes will be developed.

#### INTERACTIONS

The Atmospheric Transport Subtask depends on information provided from the Source Terms Task (03) that characterizes the release locations, amounts, and times. This information is needed in making the air concentration and deposition projections and in assessing uncertainties in these projections. The Technical Integration Task (02) defines the products required from the

atmospheric dispersion model. The Statistics Task (08) will assist in definition of the required products and in the uncertainty and sensitivity work elements.

For Subtask 0404 (Surface Water Transport), a close working relationship will be maintained with Task 05 (Environmental Monitoring Data) to exchange document listings, obtain databases and to evaluate data quality. Also, interactions with Task 03 (Source Terms) will be necessary to obtain the records of effluent releases to the river and with Task 07 (Environmental Pathways and Dose Estimates) to identify data needs and format for dose calculations.

#### ORGANIZATION

TSP Environmental Transport Subcommittee  
P. C. Klingeman, Chairman

04	Environmental Transport Task	S. B. Yabusaki, Task Leader
0401	Environmental Transport Technical Planning, Control, and Reporting	S. B. Yabusaki, Subtask Leader
0402	Atmospheric Model Development and Evaluation	J. V. Ramsdell, Subtask Leader J. C. Simpson (Task 08)
0403	Groundwater Transport	M. D. Freshley, Subtask Leader P. D. Thorne
0404	Surface-Water Transport	W. H. Walters, Subtask Leader S. B. Yabusaki M. C. Richmond
0405	Atmospheric Model Database	J. V. Ramsdell, Subtask Leader
0406	Atmospheric Model Calculations	J. V. Ramsdell, Subtask Leader

## TASK 05: ENVIRONMENTAL MONITORING DATA

### SCOPE

Hanford historical environmental monitoring data will be assembled, evaluated, summarized, and made available to project staff and the public. These activities also provide information used by the Environmental Transport Task (04) in determining environmental transport modeling needs and by the Environmental Pathways and Dose Estimates Task (07) for model validation and the estimation of radiation doses potentially received by the public.

The radionuclides for which monitoring data will be compiled (based on availability) or reconstructed are the following:

<u>Air</u>	<u>Water</u>
iodine-131	phosphorus-32
ruthenium-103	zinc-65
ruthenium-106	arsenic-76
cobalt-60	neptunium-239
cerium-144	sodium-24
tellurium-132	manganese-56
plutonium-239	copper-64
iodine-129	chromium-51
strontium-90	iodine-131
cesium-137	tellurium-132
argon-41	strontium-90
krypton-85	tritium
	cesium-137

Time periods to be addressed for media radionuclide concentrations of concern, are the following:

- Detailed - 1944 to 1957 (includes transport modeling, and food production and distribution)
- Monitoring data corroboration - 1957 through 1972 (confirmation of consistencies with HEDR models - extrapolation and summarization of monitoring data)

- Monitoring and dose estimate integration - 1972 through 1991 (integration and summation of annual monitoring data and dose estimates with earlier time period HEDR results).

This task contains the following elements:

- Environmental Monitoring Data Technical Planning, Control, and Reporting (0501)
- Terrestrial Monitoring Data (0502)
- Environmental Monitoring Data Availability and Review (0503)
- Surface-Water Monitoring Data (0504).

#### SUBTASK 0501: ENVIRONMENTAL MONITORING DATA TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 5.6)

##### Scope

This subtask includes the activities not included in other Task 05 sub-tasks necessary to ensure that the work is carried out in accordance with approved plans. Activities include planning, scheduling, budgeting, reviewing, and reporting. Coordination and integration of task activities with other tasks and TSP members is an integral part of this subtask function. Response to Battelle project management and TSP needs and directives is also included within this subtask, as is the resolution of TSP comments on reports. Presentations of the results to project management, the TSP and/or the public and peer reviewers are also provided as appropriate.

##### Approach

Management and administrative procedures in place for the project will be applied to manage this task.

##### Milestones to the TSP

None.

##### Project Deliverables

- Task plan input
- Monthly report input

- Presentations to the TSP and its subcommittees
- Presentations to peer review groups

#### SUBTASK 0502: TERRESTRIAL MONITORING DATA (WBS 5.2)

##### Scope

This subtask consists of the following activities in FY 1992:

- Vegetation Monitoring Data Correction Factors, 1948-1951
- Vegetation Monitoring Data Availability, 1951-1991.

##### Vegetation Monitoring Data Correction Factors, 1948-1951

This activity will quantify the appropriate correction factors that are necessary to reconstruct true vegetation contamination data for the 1948-1951 time period. The 1948-1951 data were collected and entered into a database as part of FY 1991 activities. The correction factors that must be considered and applied to this data will be identified. Items that may impact the correction factors include radioactive decay for the time lag between sample collection and sample counting, measurement efficiency due to the geometry of the measurement system, sample weight and configuration, radiation absorption and scattering, and in some cases, the assumption that all beta activity on the vegetation was due to iodine-131. This effort will assist in determining whether additional accuracy can be obtained with further refinements in the data conversion method and identify those efforts needed in order to quantify these improvements.

##### Vegetation Monitoring Data Availability, 1951-1991

An inventory summarizing vegetation monitoring data available during the years 1951 through 1991 will be created. Documents containing the data will be collected, inventoried and filed in the same manner as previously used in Task 05 activities. This effort will include data from Hanford sources as well as data from other agencies such as the states of Oregon and Washington and nearby universities. The summary will include all of the vegetation monitoring information related to Hanford operations during this time period. Because of the large amount of data available and limited resources, the data



to be retrieved will be limited to reported ranges of values and reported average concentrations instead of reproducing the entire data sets, as was the case for the 1944-1951 time period. This document is intended to provide a historical account of the vegetation monitoring activities and provide a reference point to identify and facilitate future data retrieval and evaluation efforts as appropriate. This activity will also provide the information necessary for decision making relative to planning subsequent HEDR activities.

### Approach

#### Vegetation Monitoring Data Correction Factors, 1948-1951

The accuracy of the data recovered for the 1948-1951 time period and the uncertainty associated with the data will be evaluated. Correction factors that were used or were not used throughout the period of interest will be determined by examining related records and follow-up discussions with veteran Hanford employees familiar with the 1948-1951 vegetation sampling and analytical techniques. In addition, estimates of each of the applicable correction factors will be made based on current technology. Such estimates provide a mechanism for the assessment of the adequacy of historical data manipulation and allow for the application of an improved adjustment factor as appropriate. Data in the vegetation database will be adjusted using the resultant correction factors, providing a more accurate set of vegetation contamination concentrations for subsequent use.

#### Vegetation Monitoring Data Availability, 1951-1991

Vegetation monitoring data will be collected using methods developed earlier in Task 05 data review protocols. Archived historical Hanford documents and files are expected to be the primary sources of data. Literature/library searches of the Hanford Technical Library, the DOE Records Center in Richland, the Federal Records Center in Seattle and queries of the HEDR Information Resources Tracking System (HIRTS) database will identify relevant material which will be obtained for review and reference. Where available, vegetation monitoring data collected by outside agencies such as the states of Washington and Oregon and universities will augment the data obtained from the Hanford records. Titles and pertinent information contained

in the material reviewed will be documented in the Environmental Monitoring Document Database (EMDD). The data entries for those documents that have already been entered in the EMDD will be revised accordingly to reflect this review. Listings of documents entered into the EMDD will be provided to the Information Resources Task (11) to ensure uniformity and completeness within the HEDR reference tracking system.

A vegetation monitoring database will be established for the years 1951 through 1991. Data retrieval will be limited to reported ranges of radionuclide concentrations and reported average concentrations rather than the entire set of individual measurement results. Data entries will be verified through a one-on-one comparison of the hard copy entries with the corresponding data tables in the referenced reports. Calculations used in the computer-generated summaries, if any, will be verified as well. A computer disk and a hard copy of each verified database, signed and dated by the people entering and verifying the data, will be maintained as part of the QA/QC record in the Task 05 files.

A summary of the vegetation monitoring activities and results will be prepared to convey the information necessary for decision making relative to planning subsequent HEDR activities. Material to be included in the summaries includes the media sampled, sample locations, constituents measured and/or reported, sampling and/or reporting frequency, sample methods, sample results, and the references.

Factors to be considered in evaluating the data's usefulness include who collected the data, what was the intended use or purpose for the data, collection method, inherent uncertainties associated with the data collection methods, validity of data manipulation techniques, assumptions used in deriving the data, availability of data from the same location/time period collected by others for comparison, consistency of the data, and value judgments of the experts in the field.

## Data Quality Objectives

### New Data/Information to be Developed

Concentrations of radionuclides in vegetation for the period 1951-1991.

### Final Use of Data/Information

Transport and pathways model reliability studies.

### Data Quality Objectives

- Accuracy - The objective is to verify or reconstruct actual concentrations reported. This will be done by checking the processes and procedures for validity (see approach above). Accuracy will be verified by direct comparisons, extrapolations and other methods (see approach above).
- Precision - The objective is to quantify uncertainties in reported and reconstructed concentrations. This will be done through uncertainty analyses and verified by developing ranges or distribution functions.
- Completeness - The objective is that reported values be averages and ranges of concentrations for each medium and location. The goal is to achieve a high level of confidence that finding new information later will not change developed values by more than 5%. All known and discoverable sources of vegetation monitoring data will be investigated (see approach above). The approach to ensure completeness is to use an approved search and inventory plan (see approach above). Completeness will be evaluated through peer review.
- Representativeness - The objective is that concentrations developed represent the ranges of actual concentrations that could have occurred in the environmental media. Representativeness will be ensured by comparison of concentrations generated using different methods and other source analyses.

- **Comparability** - The objective is that new information be comparable (within a factor of two) to previous results or that differences be technically explainable. To achieve this, direct comparisons will be made with previous results. Evaluation of direct comparisons will be used to verify comparability.

#### Documentation

The quality process, measurements and results will be summarized in sections of milestones to the TSP.

#### Milestone to the TSP

- 0502B - Letter Report: Vegetation monitoring data (1948-1951), bias and data correction (February 1992). This report establishes and documents the new conversion/correction factors for 1948-1951 vegetation monitoring data

#### Project Deliverable

- Vegetation monitoring list of locations to Tasks 04 and 07 (March 1992 and September 1992, respectively)

### SUBTASK 0503: ENVIRONMENTAL MONITORING DATA AVAILABILITY AND REVIEW (WBS 5.1)

#### Scope

The search for and review of historical documents and files for information relative to environmental monitoring data at Hanford will be continued for the years 1944 through 1991. The data are for radionuclide concentrations in air, Columbia River water and sediment, drinking water, fish, foods, soil, waterfowl, and in other environmental media. Documents and files will be reviewed, obtained when relevant, and entered into the EMDD as appropriate to facilitate future data retrieval. In addition, the EMDD will be maintained and updated under this subtask as new documents are located and as document reviews provide additional information.

#### Approach

The search for and review of historical documents and files containing environmental monitoring data or information relative to environmental

monitoring activities at Hanford from 1944 through 1991 will continue using methods developed in Phase I. Specifically, the environmental monitoring data search and review process includes

- searching the author and subject card files of the Hanford Technical Library
- searching the Hanford Technical Library's listings of historical laboratory logbooks and notebooks
- reviewing the Hanford Technical Library's file of serial and periodic historical documents
- searching the card catalogs of the Records Holding Center in Richland for information on archived records stored in Richland and at the Federal Records Center in Seattle
- collecting, reviewing and filing potentially useful documents in Task 05 files
- obtaining and inventorying boxes of archived records from the Records Holding Center in Richland and the Federal Records Center in Seattle
- searching historical environmental surveillance project files
- discussing documents, reports and records with key former Hanford employees
- requesting, reviewing and filing documents referenced in other documents or records
- creating a computer database of potentially important documents and establishing a computer network to facilitate reviewing and tracking
- maintaining a hard copy file of all potentially useful documents and records
- performing periodic queries of the Task 11 HIRTS database to identify new documents obtained by project staff which may contain information relative to environmental monitoring task needs.

The EMDD identifies what type of information is present in the document or file being inventoried. Information included in the EMDD entries include report year, author, title, organization, publisher, report period, key words, sample location by area, environmental media, radionuclides, type of river data, an assessment of the usefulness of the document by the reviewer,

reviewer's initials, and an annotated bibliography. Actual environmental data are kept in separate database files and provided to other HEDR tasks for use in dose model validation (vegetation and air data) and dose estimation (water and fish data).

#### Data Quality Objectives

##### New Data/Information to be Developed

Inventory of environmental monitoring documentation of Hanford release of potential interest to HEDR work for the period 1944-1991.

##### Final Use of Data/Information

Basis for identification of radionuclide concentrations in environmental media and information on monitoring, analytical, and calculational processes.

#### Data Quality Objectives

- Completeness - The objective is to search all normal, identified Hanford records, Washington, Oregon, Department of Energy, Corps of Engineers, U.S. Geological Survey, and Northwest university libraries and potential document archives for titles and context related to Hanford environmental monitoring. To ensure completeness, a list will be developed of all archival sources and review catalogues of all sources (see approach above). Peer review and comparison with results of interviewees will be used to verify completeness.
- Representativeness - The objective is that the inventory represent all titles of Hanford-related environmental monitoring documents currently available and that are currently known to exist. To ensure this, peer reviews and interviews with ex-Hanford and Northwest agency employees will be conducted. For verification, expert opinion and comparison of environmental monitoring plans with inventoried monitoring results will be used.

### Documentation

Report to the TSP summarizing the quality process, measurements and results.

### Milestones to the TSP

None.

### Project Deliverables

- Periodic updates of EMDD to Tasks 02, 04, 07 and 11
- Periodic updates of EMDD to HEDR Project Office

### SUBTASK 0504: SURFACE-WATER MONITORING DATA (WBS 5.3)

#### Scope

This activity provides for the completion of the summary of the available Columbia River monitoring data initiated during FY 1991 as part of Subtask 0404, Surface-Water Transport. The primary activity remaining to be completed during FY 1992 is the generation of the summary report, which will include the following information:

- inventory of Columbia River water and biota contamination data for 1944-1991
- data from Hanford sources and other agencies such as the states of Oregon and Washington, Corps of Engineers, U.S. Geological Survey, and nearby universities
- a summary of the measurements to convey the information necessary for decision making relative to the river pathway in planning subsequent HEDR activities.

#### Approach

Data obtained through this subtask will be summarized and presented as determined by the Environmental Transport Task (04) and the Environmental Pathways and Dose Estimates Task (07), consistent with appropriate modeling input parameters.

## Data Quality Objectives

### New Data/Information to be Developed

Inventory of Columbia River monitoring data for the period 1944-1991.

### Final Use of Data/Information

Basis for 1) describing river exposure pathways, 2) estimating doses to specific individuals and populations exposed to contaminants present in the river as a result of Hanford operations, and 3) determining the need and scope of any additional river studies.

### Data Quality Objectives

- **Completeness** - The objective is that reported values be averages and ranges of concentrations for each medium and location. The goal is to achieve a high level of confidence that finding new information later will not change developed values by more than 5%. All known and discoverable sources of environmental monitoring data related to the river will be investigated (see approach above). The approach to ensure completeness is to use an approved search and inventory plan (see approach above). Completeness will be evaluated through peer review.
- **Representativeness** - The objective is that concentrations developed represent the ranges of actual concentrations that could have occurred in the environmental media. Representativeness will be ensured by comparison of concentrations generated using different methods and other source analyses.
- **Comparability** - The objective is that new information be comparable (within a factor of two) to previous results or that differences be technically explainable. To achieve this, direct comparisons will be made with previous results. Evaluation of direct comparisons will be used to verify comparability.

### Documentation

DQO process, measurements and results will be reported in the milestone reports listed below.



## Milestones to the TSP

None.

## Project Deliverable

- Input summarizing available surface-water monitoring data (December 1991). This report will summarize existing Columbia River monitoring data from 1944-1991 that were reviewed in FY 1991. The report will summarize monitoring locations, constituents, time periods, and radionuclide concentrations for monitoring done by Hanford Site and independent agencies. Averages and ranges of concentrations will be included.

## QUALITY ASSURANCE

The project QA plan will control task activities. Data extracted from reports will be identified as to the original source; data entry into databases will be verified and verification recorded. Calculation methods will be verified as correct, and results of calculations will be spot-checked.

## INTERACTIONS

The work of the task will require support by the Information Resources Task (11) through the identification of historical documents and records. Statistics Task (08) support will be required to complete the analysis of monitoring data uncertainty, in preparing data summaries and in determining the proper handling of less-than-detectable concentrations in calculating mean contaminant concentrations.

This task will provide data and information that is essential in identifying future needs and planning future activities within the Environmental Transport Task (04). The Environmental Pathways and Dose Estimates Task (07) will also use the data generated by this task in model verification and validation activities and to estimate potential doses to the public based on actual environmental measurements.

ORGANIZATION

TSP Environmental Transport Subcommittee  
P. C. Klingeman, Chairman

TSP Quality Assurance and Technical Integration Subcommittee  
D. S. Barth, Chairman

05	Environmental Monitoring Data	R. L. Dirkes, Task Leader
0501	Environmental Monitoring Data Technical Planning, Control, and Reporting	R. L. Dirkes, Subtask Leader
0502	Terrestrial Monitoring Data	R. L. Dirkes, Subtask Leader E. Mart
0503	Environmental Monitoring Data Availability and Review	R. W. Hanf, Subtask Leader
0504	Surface-Water Monitoring Data	R. L. Dirkes, Subtask Leader



## TASK 06: DEMOGRAPHY, FOOD CONSUMPTION, AND AGRICULTURE

### SCOPE

Task 06 provides demographic, lifestyle, food consumption, food production, food distribution and other agricultural information needed to estimate radiation doses from past Hanford operations. The task is developing this information for individuals, the general population, Native Americans and other special population groups included in the study.

During FY 1992, milk production and distribution information will be developed for the expanded HEDR study area (19 counties) and time period (through 1991). The counties beyond the 10 in Phase I are Douglas, Lincoln, Spokane, Whitman, Columbia, Garfield, and Asotin (in Washington) and Sherman and Gilliam (in Oregon). Initial information on the production and distribution of fresh exposed fruit and vegetables will be prepared for the 19-county area from 1944 to 1957 to support decisions on the need for more detailed models. Work to develop improved food consumption estimates for the general population will be initiated.

Collection of data to support Phase I dose estimates for Native Americans will continue, and data collection to support future dose estimates for Native Americans will be initiated. This data will be provided by the Native Americans. During FY 1992, responsibility for placing and managing contracts with the Native Americans to perform this work will transition from Battelle to CDC or their agent. Technical direction of work performed by the Native Americans will continue to be provided by the TSP's Native American Working Group. Battelle's work is limited to technical coordinations, identifying information needed to calculate dose estimates for Native Americans, developing DQOs, reviewing approaches and results, converting data supplied by the tribes for use in dose models, and estimating doses.

Work required in FY 1992 will be carried out in the following subtasks:

- Demography, Food Consumption and Agriculture, Technical Planning, Control, and Reporting (0601)
- Food Consumption (0602)

- Milk and Other Food Model Development (0603)
- Native American Data (0605).

SUBTASK 0601: DEMOGRAPHY, FOOD CONSUMPTION, AND AGRICULTURE TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 6.5)

Scope

This subtask includes the activities not included in other Task 06 Subtasks necessary to plan the work, interact with the TSP, coordinate the work with other tasks, and ensure that the work is carried out in accordance with approved plans. Routine reporting, recordkeeping and other administrative activities are also included.

Approach

Management and administrative procedures already in place for the project will be applied to manage this task.

Milestones to the TSP

None.

Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees

SUBTASK 0602: FOOD CONSUMPTION (WBS 6.4)

Scope

This subtask will develop improved estimates of food consumption for the general population. Food consumption estimation methods for the general population will build on work performed in Phase I. The time period for food consumption estimates will be expanded to include 1944 to 1991.

## Approach

The approach used in Phase I was adequate for Phase I purposes, but needs to be modified substantially to provide the basis for final dose estimates. The number of population variables for which diets were characterized in Phase I can be substantially reduced based on the analysis done during Phase I. Consumption distributions will still need to be characterized for major food groups used in the dose calculations. The exact shape of the distributions is needed for key food groups such as fresh milk, rather than just the mean and standard deviation information provided during Phase I. Correlations among food groups will be needed so that dose estimates can be based on total diets.

Based on these factors, a new approach for estimating food consumption for the general population will be developed. It is expected that the improved approach will continue to rely on existing data sources such as national surveys and special local surveys conducted during the study period. The Statistics Task (08) will assist with incorporating correlations among food groups. Limited use may be made of surveys or interviews to obtain key information that may not be well represented in the existing data sources. For example, existing data sources may not provide reasonable estimates of the amounts of locally produced fresh produce consumed by people in the study area. The improved approach will be presented to the Demography Subcommittee of the TSP for review. Data collection and analysis efforts will be initiated after agreement on the approach is reached with the TSP. Data collection and analysis will not be completed until FY 1993.

## Data Quality Objectives

### New Data to be Developed

Refined estimates of food consumption by population groupings.

### Final Use of Data/Information

Input to the dose calculations.

### Data Quality Objectives

- Accuracy - Accuracy will be assessed by comparing estimates to known consumption levels derived from independent sources.
- Precision - Food consumption frequency distributions will be developed by age and sex categories.
- Completeness - Food consumption estimates will be developed for all relevant food and age groups.
- Representativeness - Food consumption estimates will be produced for the general population for the HEDR study area.
- Comparability - The results will be comparable in detail and resolution to those prepared for the Phase I. Accuracy should be greater.

### Documentation

Results of DQO processes and evaluations will be documented as a section in milestone reports to the TSP.

### Milestone to the TSP

- 0602B - Letter Report: Status of food consumption methodology (March 1992)

### Project Deliverables

None.

## SUBTASK 0603: MILK AND OTHER FOOD MODEL DEVELOPMENT (WBS 6.2)

### Scope

During FY 1992, this subtask will initiate development of a detailed milk production and distribution model for the 19-county HEDR study area for the time period 1944-1991. This work will build on the model developed during Phase I and refined during FY 1991. This model will be completed in FY 1993. Preliminary data will be collected on the production and distribution of exposed fresh fruits and vegetables within the expanded study area. This information will be used to determine whether more detailed data collection and model development efforts are needed.

## Approach

Milk Production and Distribution - The milk model for the 19-county area and 1944-1991 time period will be developed using basically the same approach applied to develop the model for Phase I. The Phase I model and the extensions being developed during FY 1991 will be used as the starting point for this work. The work will develop detailed models for the 1944-1957 time period. Simple models based on secondary data will be developed for the remaining time periods.

Initial information will be collected and analyzed from secondary information sources such as the Census of Agriculture. Next, interviews with farmers and agricultural experts for each of the study "communities" will be conducted. This information will be summarized and then presented to expert judges, who will provide the necessary estimates for the HEDR study. At least three experts will be used to provide the expert judgment. Standard techniques will be used to solicit the judgments from the experts and reach a consensus when there is initial disagreement among them.

A major activity in FY 1992 will be collection of information on dairy cow feeding practices from dairy farmers in the geographic areas and time periods of interest to the study. It is expected that a combination of telephone and in-person surveys will be used to obtain this information. "Snowball" techniques will be used to identify and locate participants in the survey. The survey will concentrate on the 19-county HEDR study area. Information will also be obtained for other potential study areas, but fewer respondents will be surveyed, and there will be more uncertainty in the results for the outlying geographic areas. The survey will be designed and initiated in FY 1992 and completed and documented in FY 1993. It is expected that portions of the survey work will be subcontracted to Washington State University.

This activity relies extensively on information obtained from interviews with people knowledgeable about the dairy industry in the times and geographic areas of interest. Several procedures are followed to ensure the quality of the data obtained from these kinds of sources:



- Interview guides are prepared and reviewed internally before the interview is conducted. Only trained interviewers are used, which will help minimize bias introduced by the interview process.
- Accurate records are kept of interviews. A combination of tape recordings and interviewer notes are used to prepare an interview summary that presents the key results obtained. The tape recordings and notes also provide a record for future reference.
- Key results from the interview are provided to the interviewee for review. This enables the correction of any errors that may have been made in recording or interpreting the information provided. It also gives the interviewees the opportunity to clarify or change any information they provided and also may trigger memories of additional information.
- Results of the interviews are compared with other sources. These comparisons can include data obtained from written records or the results of other interviews. Any discrepancies are reconciled with the interviewee.
- Individual interviews are often used to collect basic information followed by group sessions with several knowledgeable people. Group processes can be used to trigger additional recollections and to arrive at a consensus.

An expert solicitation process will be used to estimate parameters that are not available from other sources. Mechanisms used to ensure the quality of information obtained from this kind of process include the following:

- Review of the results for internal consistency. After the session with the expert is concluded, the technical staff compare judgments made in different areas. Any inconsistencies, such as different judgments given similar available information, are noted and brought back to the expert for reconciliation.
- Review of the results by other experts. The result of this work is a model of the milk agricultural production and distribution systems. This model is reviewed with people who provided descriptive information for the model to ensure that the result is reasonable. Similar reviews may also be performed with people having general knowledge about the dairy industry during the time period under study.
- Expert judgments are obtained from more than one expert and the results are compared. Differences are reconciled between the experts through a consensus-building process.

Fresh Fruit and Vegetable Production and Distribution - The Phase I results indicated that for certain populations, areas and time periods, exposed fresh fruits and vegetables could be a potentially important exposure

pathway. No information on fruit and vegetable production and distribution systems was collected during Phase I, so it is not known if this pathway is actually important or only appears to be potentially important because of the simplistic assumption made for Phase I. During FY 1992, preliminary information on fresh fruit and vegetable production and distribution systems will be collected and used to determine if more detailed models are needed. This preliminary assessment will focus on the 1944-1957 time period when air releases were greatest.

Production information on exposed fresh fruits and vegetables will be collected from the Census of Agriculture and similar records for the 19-county extended study area. In addition to production information, preliminary information will be collected on the fraction of the production going to fresh consumption, the storage processes used for fresh produce, and the general geographic locations to which fresh produce are distributed. This information will be combined to develop a "production index" that identifies fresh fruits and vegetables that could have been consumed in significant quantities by people in the HEDR study area.

The production index will be combined with a "dose index" factor for each commodity to produce a "pathway importance" ranking. The dose index will be provided by Task 07. It will be a normalized factor representing the dose from consumption of a unit quantity of the fruit or vegetable exposed to a unit concentration of effluent from the chemical separations plant at Hanford in 1945. The pathway importance factor will be developed by multiplying the dose index by the production index of the fresh fruit or vegetable. The fruits and vegetables produced in the study area will be ranked using the pathway importance factor.

Harvest periods and storage practices will be characterized for the top group of fresh fruits and vegetables identified from this ranking process. Approximate consumption estimates will be developed from the Phase I food consumption data. This information will be used to develop "maximum" dose estimates from this pathway for representative individuals in several locations in the 19-county extended study area. The results of this assessment will be provided to the TSP in a letter report along with a recommendation on

whether or not further work is needed to develop fresh fruit and vegetable production and distribution models.

### Data Quality Objectives

#### New Data/Information to be Developed

Agricultural production and distribution information for the time period 1944-1957 for the extended HEDR study area.

#### Final Use of Data

Input to dose estimates

- Accuracy - Secondary data will be used when available. When feasible, primary data will be collected to provide information not available from secondary sources. Expert opinion will be used to provide information not available from other sources.
- Precision - The objective is that precision be reflected in the assigned distributions for market share and distribution patterns applied. These distributions will be developed based on expert opinion and available historical documentation. Peer review will be used to check the results.
- Representativeness - The objective is that data represent the state of the agricultural marketing system for the agriculture industry in the study area for the time period 1944-1957. Changes over time will be noted to the extent possible.
- Comparability - The objective is that the results be comparable in detail and resolution to those prepared for the milk model in Phase I.

### Documentation

Description of process, achievement, and measurement of objectives will be included in a section of each model report to the TSP.

### Milestones to the TSP

- 0603C - Letter Report: Potential importance to dose of exposed fresh fruit and vegetable pathways (June 1992). Nineteen-county area, 1944-1957.
- 0603D - Report on milk production/distribution, 1944-1991 (March 1993)

## SUBTASK 0605: NATIVE AMERICAN DATA (WBS 6.4.2)

### Scope

Population, lifestyle, food consumption, and food source information needed to perform Phase I dose estimates for Native Americans will be completed in FY 1992. Work to develop data needed for future estimates will begin.

### Approach

Data on population, lifestyle, food consumption, and food sources will be collected by the Native Americans under the direction of the Native American Working Group of the TSP. The existing research contracts Battelle has in place with the tribes will be used to continue work into FY 1992. It is expected that during FY 1992, responsibility for placing and administering contracts with the tribes will be transferred to CDC or its designed agent.

Data collection approaches will be developed and approved by the Native American Working Group. PNL and outside experts will support the Working Group and tribal researchers, as required, to make sure the tribal data are as complete and consistent as possible for dose estimation. This support could include activities such as providing recommended research protocols or training Native American researchers to apply the methods approved by the Working Group. PNL's other technical activities will be limited to technical liaison, specifying data quality objectives for the data, performing the technical reviews necessary to ensure that the DQOs have been met, and preparing the data submitted by the tribes for use in the dose models.

### Data Quality Objectives

#### New Data to be Developed

Refined estimates of food consumption by population groupings.

#### Final Use of Data/Information

Input to the dose calculations.

### Data Quality Objectives

- Accuracy - Accuracy will be assessed by comparing estimates to known consumption levels derived from independent sources.
- Precision - Food consumption frequency distributions will be developed by age and sex categories.
- Completeness - Food consumption estimates will be developed for all relevant food and age groups.
- Representativeness - Food consumption estimates will be produced for the general population for the HEDR study area.
- Comparability - The results will be comparable in detail and resolution to those prepared for the Phase I. Accuracy should be greater.

### Documentation

Results of DQO processes and evaluations will be documented as a section in milestone reports to the TSP.

### Milestones to the TSP

None.

### Project Deliverable

- Native American data for Phase I estimates to Task 07 (February 1992)

### QUALITY ASSURANCE

The demography, lifestyle, food production and distribution and other agricultural data being developed in this task are historical reconstructions. They rely on a variety of sources ranging from "hard" data from the U.S. Census Bureau to "soft" data from personal recollections. The data will be accepted in whatever form they exist. For these reasons, it is not possible to specify numerical goals for the acceptable level of uncertainty in the data. It is possible, however, to understand the sources of uncertainty in the data and to estimate the magnitude of these uncertainties for use in the dose calculations.

Procedures can also be implemented to reduce the likelihood that HEDR staff might make errors in recording the data, analyzing it and preparing the data for use in the dose calculation models. These procedures also ensure that the data are accurately documented for outside review and use by others in future studies. The existing project QA plan is focused on these types of procedures. Procedures that will be followed in each subtask to ensure the quality of data produced are summarized in the "Approach" sections of the subtasks.

INTERACTIONS

Task 06 staff and outside technical experts will work closely with the Native American tribes to make sure that the tribal data are as complete and consistent as possible for use in dose estimation. Task 06 staff will work with external experts in refining the estimates of milk market shares and distribution patterns in the Phase I area. Native American agricultural data will be provided to Task 07 (Environmental Pathways and Dose Estimates) for dose estimation.

ORGANIZATION

TSP Demography Subcommittee  
R. L. Morrill, Chairman

06	Demography, Food Consumption, and Agriculture	R. E. Rhoads, Task Leader
0601	Demography, Food Consumption, and Agriculture Technical Planning, Control, and Reporting	R. E. Rhoads, Subtask Leader
0602	Food Consumption	O. M. Beck, Subtask Leader
0603	Milk and Other Food Model Development	D. M. Beck, Subtask Leader
0605	Native American Data	E. B. Liebow, Subtask Leader



## TASK 07: ENVIRONMENTAL PATHWAYS AND DOSE ESTIMATES

### SCOPE

The work of this task is to estimate radiation doses to specified population groups and specific individuals. FY 1992 work includes continuing development of the air pathway exposure model, estimation of doses for Native American tribal groups, and documentation of model parameters for iodine-131.

This task consists of the following elements:

- Environmental Pathways and Dose Estimates Technical Planning, Control, and Reporting (0701)
- Pathways and Dose Code Development and Documentation (0702)
- Pathways and Dose Model Parameter Development (0703)
- Dose Calculations (0705).

### SUBTASK 0701: ENVIRONMENTAL PATHWAYS AND DOSE ESTIMATES TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 7.4)

#### Scope

This subtask includes activities not included in other subtasks necessary for overseeing completion of Task 07 work activities and integration of Task 07 activities into the project as a whole. Included are project and task planning, preparation of monthly reports, attendance at project and TSP meetings, presentations at such meetings, support for preparation of documentation, reports and publications, addressing specific TSP requests for information within the scope of the project or task plans, developing quality objectives, supporting quality assurance activities, and general project integration.

#### Approach

Planning, control, and reporting activities will be accomplished primarily through the system of project control initiated by Task 01 and other Battelle accounting systems already in place. The task manager will maintain



contact with subtask leaders and staff members from this and other tasks to ensure that task and project milestones are met.

Activities include the following:

- A. project planning, task planning
- B. monthly reports
- C. meetings (TSP and project)
- D. meeting presentations
- E. documentation, reporting, and publications
- F. responding to TSP requests
- G. QA verification
- H. project integration/interaction.

#### Milestones to the TSP

None.

#### Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees
- Project documentation

### SUBTASK 0702: PATHWAYS AND DOSE CODE DEVELOPMENT AND DOCUMENTATION (WBS 7.1)

#### Scope

This subtask will develop and implement second-generation HEDR environmental pathways and dose codes. Two such codes are planned: 1) the air exposure pathways and dose code, and 2) the river exposure pathways and dose code. Work on development on the first code was initiated in FY 1991. Initial development of the second will begin in FY 1992 with full implementation in FY 1993. Subtask activities include software engineering and coding support, development and revision of the models on which these codes are based, evaluations of hardware and software capabilities, revision of the computer code design specifications, and software documentation and quality assurance

activities. This subtask is part of a coordinated effort with Task 02 (Technical Integration) and Task 08 (Statistics).

#### Approach

Staff will complete development, implementation and documentation of the second-generation air exposure pathways and dose code. New or revised models for parameter selection, environmental pathways transport, biomass generation and senescence, animal feeding and feed transport, and commercial foods will be incorporated. This code will be developed with the capability to do individual dose calculations, in particular those in support of the initial phases of the HTDS. Dose calculation capability for population groups will be maintained throughout FY 1992, through development of the second-generation HEDR dose code or use of the existing Phase I code. Minimal work will be performed on the river pathways and dose code during FY 1992.

Activities will include the following:

- A. Continue Expansion/Refinement of Air Pathway Code
  - 1. Include population dose model
  - 2. Integrate parameter selection sub-model
  - 3. Develop individual characteristics sub-model (in support of HTDS)
  - 4. Include capability for additional radionuclides (five for air, ten for river)
  - 5. Install/incorporate revised input data sets as they become available
  - 6. Incorporate modifications specific to Native American tribes
  - 7. Provide for temporal changes in agricultural/dairy practices
- B. Initial Air Pathway Code Documentation
- C. Quality Assurance Activities
  - 1. Management/Tracking/Documentation of code changes

2. Management/Tracking/Documentation of input database updates/additions
3. Documentation of code testing, validation, and verification activities
4. Logging/documentation of model runs
  - a. Parameter values used (or equivalent information, e.g., random number seed, to enable reconstruction of parameter values)
  - b. Name(s) and description of output file(s) produced
  - c. Interactive or batch log files
5. Participate in project audits as required

#### Data Quality Objectives

##### New Data/Information to be Developed

Restructured air exposure pathways and dose code that addresses lessons learned in Phase I.

##### Final Use of Data/Information

1) Estimation of doses and their uncertainties for Native American tribes and 2) any uncertainty/sensitivity analyses of the overall air pathway code.

##### Data Quality Objectives

- Accuracy - The objective is that the code conform to code design specifications. The approach is to use Battelle software development procedures, and a verification/validation plan. QA reviews, test cases, and peer reviews will be used to measure accuracy.
- Completeness - The objective is that the code conform to code design specifications. The approach is to use Battelle software development procedures. QA reviews will be used to measure completeness.
- Representativeness - The objective is that the code conform to code design specifications. This will be done via verification studies and measured via peer reviews, test cases, and expert opinions.

- Comparability - The objective is that the code provide results that are within a factor of two of validation data. Validations studies will ensure this objective and direct comparisons of results and peer reviews will verify it.

#### Documentation

A section in the air exposure pathways and dose code documentation report summarizing the DQO process, measurements and results.

#### Milestones to the TSP

- 0702A - Report documenting air exposure pathways and dose code (December 1991). This is for the individual dose model, major pathways. This milestone includes a user manual, technical description, and initial code listing.
- 0702B - Report documenting population dose-model, major pathways (September 1992)

Note: The documentation will be revised as the code is revised before it is transferred to a receiving agency at the end of the project.

#### Project Deliverables

- Data files to project database
- Dose calculations to Tasks 05 and 06

### SUBTASK 0703: PATHWAYS AND DOSE MODEL PARAMETER DEVELOPMENT (WBS 7.3)

#### Scope

This subtask will compile, evaluate and document iodine-131 parameters used in the HEDR air exposure pathways and dose model. These parameters are primarily radionuclide-dependent, but include some radionuclide-independent parameters. This subtask includes selection of appropriate distributions for the various parameters, including soil-to-plant and feed-to-animal product transfer factors, and human intake-to-dose conversion factors. Development of fetal parameters (radionuclide transfer factors and dose factors) is not included.

## Approach

Available scientific literature will be reviewed and evaluated for applicability to the Hanford environment and potentially exposed populations. Model parameter evaluation criteria will be developed to provide a basis for consistent, scientific evaluation of parameters. ICRP Publication 56 will be the primary source of age-dependent dose factors. This will be a cooperative effort with Tasks 02 and 08.

Activities include the following:

- A. Compile, Evaluate, Document Air Exposure Pathway Iodine-131 Radionuclide-Dependent Parameters
- B. Develop Parameter Values Where Necessary for Dynamic Environmental Transport Model

## Data Quality Objectives

### New Data/Information to be Developed

A set of verified radionuclide-dependent parameters and their variabilities (uncertainties and/or distributions) used for estimating doses from iodine-131 via air exposure pathways.

### Final Use of Data/Information

Parameter values will be used in the model to estimate doses received by Native American tribes from iodine-131, plus any other dose estimates undertaken in out years.

### Data Quality Objectives

- Accuracy - The objective is to develop best estimates of parameter values that are consistent with available data, information, and expert opinion. The attainment of this objective will be assessed by peer reviews.
- Precision - The objective is to develop, for each parameter, a distribution of possible values that is consistent with available data, information, and expert opinion. The attainment of this objective will be assessed by peer reviews.

- **Completeness** - The objective is to ensure that all pertinent information on each parameter has been evaluated and incorporated as appropriate. This will be done by defining and agreeing on the parameters and literature to be searched. Completeness will be verified by expert judgment and peer review.
- **Comparability** - The objective is that the final set of parameter values and their uncertainties be within the range of values found in the literature. Direct comparison will be used to ensure comparability and it will be measured by evaluating and technically justifying the results of the comparison.

#### Documentation

Sections of the reports on iodine-131 model parameters to the TSP will summarize the DQO process measurements and results.

#### Milestones to the TSP

- 0703A - Letter Report: Iodine-131 parameters and dose factors used in Phase I (November 1991). This is a summary of a literature review of all radionuclide-dependent parameters to support the air exposure pathways and dose models. The report will include age-specific dose factors.
- 0703B - Letter Report: Iodine-131 parameters and dose factors, work beyond Phase I, revised model (February 1992). Distributions and best estimates of parameters will be given, as will the basis for their selection for the HEDR Project.

#### Project Deliverables

None.

#### SUBTASK 0705: DOSE CALCULATIONS (WBS 7.2)

##### Scope

Calculations to estimate radiation dose to individuals and population groups will be performed under this subtask. It includes dose estimates from the air, groundwater and surface water pathways, other special exposure pathways, specific radionuclides, and special release events or time periods. Included during FY 1992 are dose estimates from exposure via air pathways for

population groups of the six remaining Native American tribes (Colville, Nez Perce, Spokane, Umatilla, Warm Springs, and Yakima).

### Approach

This subtask will use data provided by other tasks and subtasks within the project to make estimates of radiation dose. Dose estimates will be made using the latest version of the HEDR Project model available at the time the calculations are to be made. In some cases it may result in the Phase I model being used; however, by mid-FY 1992 the revised air exposure pathway and dose code is expected to be used for all calculations. Timing and methodology of dose calculations during FY 1992 is dependent upon the receipt of data from the Native American tribes. Surface-water and groundwater pathway doses estimates will be performed only to the extent of assisting Task 04 in setting the scope of surface-water and groundwater modeling work.

Activities will include the following:

- A. Complete Initial Iodine-131 Air Exposure Pathway Dose Estimates for Native American Tribes
  - Yakima
  - Umatilla
  - Nez Perce
  - Colville
  - Spokane
  - Warm Springs
- B. Quality Assurance Activities
  - Run logs
  - Other

### Data Quality Objectives

#### New Data/Information to be Developed

Estimates of doses received by various population groups of the Colville, Nez Perce, Spokane, Umatilla, Warm Springs, and Yakima tribes.

#### Final Use of Data/Information

Basis for 1) scoping additional studies for the tribes, and 2) identifying pathway code and parameter needs.

### Data Quality Objectives

- Accuracy - The objective is to estimate doses using models that have been evaluated and refined using validation studies and sensitivity/uncertainty analyses. The attainment of this objective will be assessed by peer review.
- Precision - The objective is to quantify the precision of dose estimates for a specific population group (or individual) by conducting uncertainty analyses using estimated parameter uncertainties and appropriate error propagation procedures. The attainment of this objective will be assessed by peer review.
- Completeness - The objective is to estimate tribal population doses for the same categories reported for non-tribal populations reported in HEDR Phase I reports. The approach is to follow the most recent data reduction and dose estimating procedures available. Completeness will be verified by direct comparison with the Phase I reports.
- Representativeness - Tribal dose estimates will be representative of the various population groups through use of data supplied by the tribes.

### Documentation

The results of achieving and measuring the quality objectives will be included as a section in each dose report to the TSP.

### Milestones to the TSP

None.

### Project Deliverable

- Native American dose results (new model) to Task 06 and the Project Office

### QUALITY ASSURANCE

Quality assurance activities for task management consist of providing oversight to all Task 07 activities to ensure that all work is performed in accordance with QA requirements outlined in the project Quality Assurance Plan and under each subtask in these task plans.



Subtask 0702 will use Battelle Software Control Procedures (SCPs) for design documentation of computer codes. Actual coding and code maintenance will also conform to the SCP requirements. A code Final Internal Development Review (FIDR) will be performed before calculations for members of the public are released.

Dose calculations will be controlled and documented using existing Battelle SCPs for software application. Application logs will be kept of all computer-generated results.

No original data will be generated for Subtask 0703. The major quality assurance activity, therefore, is to ensure that all data (model parameter values) gathered from other sources and used in the project are the best and most appropriate available. All available radionuclide parameter data will be collected and evaluated to determine the scientific validity and applicability to the geographical area around the Hanford Site. Criteria to be considered include data source (original study or summary report), objective of the study from which the data were derived, the study methods and assumptions, nuclide chemical form, and study ecosystem. Data availability is a major concern; where sufficient data are available, a determination will be made of the number of values needed for an acceptable range (to determine the uncertainty range). It is anticipated, however, that in most cases there will be a paucity of data and all available data will need to be considered. Where data are unavailable, estimates of the values will be made using documented assumptions.

#### INTERACTIONS

All of the subtasks within this task will require interaction with Task 02 (Technical Integration). In addition, Subtasks 0702, 0703, and 0602 will require interface with Task 08 (Statistics). Tribal dose calculations (0705) require data input from Task 06 (Demography, Food Consumption and Agriculture).

## ORGANIZATION

TSP Quality Assurance and Technical Integration Subcommittee

D. Barth, Chairman

B. Shleien, TSP, Pathways Representative

G. Roessler, TSP, Dosimetry Representative

K. Kopecky, TSP, Statistics Representative

07	Environmental Pathways and Dose Estimates	T. A. Ikenberry, Task Leader
0701	Environmental Pathways and Dose Estimates Technical Planning, Control, and Reporting	T. A. Ikenberry, Subtask Leader
0702	Pathways and Dose Code Development and Documentation	R. A. Burnett, Subtask Leader
0703	Pathways and Dose Model Parameter Development	S. F. Shindle, Subtask Leader
0705	Dose Calculations	T. A. Ikenberry, Subtask Leader



## TASK 08: STATISTICS

### SCOPE

Estimates of doses individuals received from radionuclides in air and water emissions from Hanford since 1944 cannot be reconstructed with certainty. The purpose of the Statistics Task is to provide centrally managed statistical support to project technical tasks to

- assess the reliability (validity and uncertainty) of dose estimates obtained using dose models
- develop required input to dose models.

Statistical methods will be implemented in all technical aspects of the project with the overall objective of ensuring that the uncertainties of dose estimates are characterized in an accurate and useful manner. In order to ensure an efficient, consistent and integrated approach to dealing with statistical issues that arise in each of the technical areas of the project, centrally managed statistical support will be integrated into each technical task. Centrally managed statistical support will be integrated into the technical activities of the project, to participate, assist, or advise in 1) development and evaluation of data quality objectives; 2) design, analysis, and reporting of evaluations of monitoring data and validation studies; 3) development of model and database specifications; 4) conduct of screening sensitivity and uncertainty analyses to determine which pathways and model parameters are most important to accurate assessments of dose; 5) use of uncertainty analysis to estimate uncertainties in dose estimates; and 6) writing and/or review of reports documenting project procedures and results.

Task activities will be conducted in the following subtasks:

- Statistics Technical Planning, Control, and Reporting (0801)
- Statistics Support for Project Technical Task Work (0802)
- Analysis of Model Reliability (0803).

## SUBTASK 0801: STATISTICS TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 8.7)

### Scope

The scope of work includes those activities, not part of other Task 08 subtasks, necessary to do the following:

- provide specific statistical support that is integrated into the project
- prepare Task 08 work plans, budgets and monthly reports
- control schedules and cost
- maintain effective communication with the TSP, TSP subcommittees, and HEDR Project Management, including TSP meetings and travel
- plan and review all task activities.

### Approach

Task management will be accomplished through coordination with other project technical tasks and the TSP, using established project procedures.

### Milestones to the TSP

None.

### Project Deliverables

- Input to monthly reports
- Input to task plans
- Memos to project file of task accomplishments

## SUBTASK 0802: STATISTICS SUPPORT FOR PROJECT TECHNICAL TASK WORK (WBS 8.2, 8.3, 8.4, 8.5, 8.6)

### Scope

This subtask provides statistical support to HEDR Project tasks to help develop information needed to estimate doses and their uncertainties. Assistance to tasks will include, as needed, 1) developing data quality objectives (DQOs) and evaluating their attainment, 2) analyzing and evaluating environmental radionuclide data, 3) estimating missing source term and environmental

data, 4), evaluating when it may be possible to use simpler transport models, and 5) reviewing HEDR Project reports and technical papers for the appropriate use and description of statistical methods.

### Approach

The scope of work will be achieved by working closely on a regular basis with other project tasks to provide statistical expertise as needs arise. The approach used by this subtask is

- work closely with the TSP, HEDR Project management, the HEDR Technical Coordinator, and task/subtask leaders to ensure that the statistical needs of the project are recognized and are being addressed
- develop and apply statistical analyses that are appropriate for identified problems.

This subtask is closely related to Subtask 0803. Activities of the two subtasks are closely coordinated so that the total statistical needs of the project are met in a timely and defensible manner.

### Quality Objectives

#### New Data/Information to be Developed

Results and statistical analyses generally related to uncertainties of data and model outputs.

#### Final Use of Data Information

Acceptability of processes and basis for decisions of usefulness.

- Accuracy - The objective is to ensure that appropriate statistical methods are used in all cases. The attainment of this objective will be assessed by peer reviews.
- Precision - The objective is to ensure that all tasks are using the same type of statistical analyses for the same type of problem, i.e., that there is consistency across the project with regard to statistical methods. The attainment of this objective will be assessed by peer reviews.

- Completeness - The objective is to assist all technical tasks in using statistics to achieve their goals and DQOs. The attainment of this objective will be assessed by peer reviews.
- Representativeness - The objective is that statistical methods used in the HEDR Project are among the methods considered to be appropriate for the problems being addressed. The attainment of this objective will be assessed by peer reviews.
- Comparability - The objective is that the statistical support provided for the HEDR Project is at least equal to the support that could be provided by any other statistics group. The attainment of this objective will be assessed by peer reviews.

#### Documentation

Memo report to Project Office on the achievement and measurement of quality objectives for Subtask 0802.

#### Milestones to the TSP

None.

#### Project Deliverables

- Memo reports on specific task support to task leaders and the Project Office
- Memo report to Project Office on the achievement and measurement of quality objectives for Task 08

### SUBTASK 0803: ANALYSIS OF MODEL RELIABILITY (WBS 8.1)

#### Scope

This subtask supports other tasks by assessing the reliability of dose estimates for specific individuals and population groups. This support includes sensitivity and uncertainty analyses, model validation studies, and computer code verification activities. In addition, assistance will be provided to develop model parameter distributions, implement models, and develop and implement computer graphics. Emphasis is on the air pathway dose model because the surface water pathway model will not be fully developed until FY 1993.

## Approach

The air pathway dose model is a combination of a number of models developed by a number of different tasks. The Source Term Release Model is developed by Task 03. The results of this model are used by the Air Dispersion Model developed by Task 04. The results of the air dispersion model are in turn used by the environmental accumulation and dose models developed by Task 07. Within the environmental accumulation model there are submodels, such as the milk model developed by Task 06.

Uncertainties in each of these models will be quantified by running each of the codes multiple times, each time estimating a single dose using values of parameters that are randomly selected from specified probability density functions. The probability density function for a given parameter will be obtained from the scientific literature, expert opinion, and/or actual measurements of the parameter. The uncertainties in the parameters are propagated through each model and ultimately to the final dose estimates.

Sensitivity analyses, which determine the parameters and pathways that contribute the most to dose uncertainties, will be conducted separately on the different models described above. The most important parameters will be determined on the basis of their partial rank correlation coefficients with the models' output. The uncertainty and sensitivity analyses will be used to determine if additional refinements of the models will result in improved accuracy and precision of the dose estimates.

During the third quarter of FY 1992, after all the codes have been tested and initial results from preliminary uncertainty and sensitivity analyses have been obtained, an uncertainty/sensitivity workshop will be held by the TSP. This workshop will address what additional specific sensitivity analyses should be conducted. The results from the preliminary uncertainty and sensitivity analyses and this workshop will be used to develop a project sensitivity/uncertainty analysis plan that is consistent with the scope of the HEDR Project.



## Data Quality Objectives

### New Data/Information to be Developed

Results of sensitivity, uncertainty, verification and validation analyses.

### Final Use of Data/Information

Assess reliability of dose estimates. Basis for decisions on needs for further code development.

- Accuracy - The objective is to accurately quantify the uncertainties of the dose estimate. This will be achieved by accurately estimating the uncertainties of the parameters used by the model and propagating these uncertainties correctly throughout the computer models. The attainment of this objective will be assessed by peer reviews of the computer models and the parameters used within them.
- Precision - The objective is to be able to exactly replicate any dose estimate. That is, for any two identical individuals or populations, the dose estimate(s) will be exactly the same. The attainment of this objective will be verified by hand calculations and repeated trials of the model.
- Completeness - The objective is to produce accurate uncertainties for all dose estimates. Additionally, sensitivity analyses will be performed for all distinct cases. The attainment of this objective will be assessed by peer reviews.
- Representativeness - The objective is that the computer models accurately represent the conceptual models and that the conceptual models accurately represent all the pathways by which a dose may have been received. The attainment of this objective will be assessed by peer reviews.
- Comparability - The objective is that the models will be the most reliable that can be produced. The attainment of this objective will be assessed by peer review and validation studies where possible.

### Documentation

Memo report to Project Office on the achievement and measurement of quality objectives for Subtask 0803.

### Milestone to the TSP

- 0803A - Letter Report: Project sensitivity/uncertainty analysis plan (August 1992). This letter report will support a TSP decision at the end of FY 1992 on methods and extent of sensitivity and uncertainty analyses required to meet project goals.

### Project Deliverables

- Preliminary working papers for sensitivity/uncertainty workshop (March 1992)
- Memo reports on each analysis to cognizant task leaders and the Project Office
- Memo report to Project Office on the achievement and measurement of quality objectives for Subtask 0803

### QUALITY ASSURANCE

All Statistics Task work will follow PNL QA requirements as described in the HEDR Project QA Plan. In addition, the Statistics Task will maintain, in HEDR Project files, notes of meetings with other technical tasks as regards purpose, scope of discussions, recommendations and decisions, and future action items. Also, records will be kept of the purpose, methods, results and interpretations of statistical analyses.

### INTERACTIONS

The Statistics Task works with project technical tasks to coordinate and advise on statistical activities across the project. Communications with D. Barth and K. Kopecky of the TSP will be maintained to ensure compliance with statistics-related TSP direction.

## ORGANIZATION

TSP Quality Assurance and Technical Integration Subcommittee  
D. Barth, Chairman  
K. Kopecky, TSP, Statistics Representative

08	Statistics Task	R. O. Gilbert, Task Leader
0801	Statistics Technical Planning, Control, and Reporting	R. O. Gilbert, Subtask Leader J. C. Simpson
0802	Statistical Support for Project Technical Task Work	R. O. Gilbert, Subtask Leader J. C. Simpson T. B. Miley D. L. Streng
0803	Analysis of Model Reliability	J. C. Simpson, Subtask Leader T. B. Miley R. O. Gilbert

## TASK 09: RECORDS MANAGEMENT

### SCOPE

Records Management provides storage and control of completed project records, inspects the records to verify they meet QA requirements, maintains an automated inventory of project records, and provides reference service to project staff and the TSP. This task ensures that project records are organized and managed according to approved procedures to meet legal, regulatory, and QA requirements. Records Management also provides technical assistance, training, personnel, facilities, and services to ensure that these objectives are met.

This task consists of the following elements:

- Records Management Technical Planning, Control, and Reporting (0901)
- Project Records Management (0902).

### SUBTASK 0901: RECORDS MANAGEMENT TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 9.3)

#### Scope

This subtask ensures that project records are organized and managed according to approved procedures to meet legal, regulatory, and QA requirements. Records Management also provides technical assistance, training, personnel, facilities, and services to ensure that these objectives are met.

#### Approach

Direct records clerk functions, review policies and procedures for compliance, participate in audits and reviews, meet with project and client staff as necessary, and respond to records management queries. Manage task activities in accordance with CDC, HEDR, and Battelle policies and procedures.

Milestones to the TSP

None.

Project Deliverables

- Input to task plans
- Review and revise Records Inventory and Disposition Schedule (RIDS) (annual activity)
- Input to monthly reports

SUBTASK 0902: PROJECT RECORDS MANAGEMENT (WBS 9.1, 9.2)

Scope

This subtask provides storage and control of completed project records, inspects the records to verify they meet QA requirements, maintains an automated inventory of project records, and provides reference service to project staff and the TSP. This subtask also transfers processed project documents to the DOE-RL Public Reading Room.

Approach

Project records are received from the project office and verified, processed, and stored in the Battelle Records Center. A computer listing of each transfer package is returned to the project records custodian to verify receipt. Any discrepancies with records are resolved before the project records are processed.

Milestones to the TSP

None.

Project Deliverable

- Transfer processed documents to DOE-RL Public Reading Room

QUALITY ASSURANCE

The following procedure has been issued that apply to this task. No other procedures are expected to be developed.

- RMP-1, HEDR Records System

The Records Management Task maintains and controls the quality records that have been transferred to the Battelle Records Center. Quality records generated by Records Management are immediately transferred to the Project Office for inclusion in the project files.

### INTERACTIONS

Records Management deals primarily with the HEDR Project Office, the Quality Assurance Task for audits and procedure reviews, and the DOE-RL Public Reading Room for records transmittals. Records Management provides technical assistance, training, and reference service to project staff as requested.

### ORGANIZATION

09	Records Management	D. L. Alamia, Task Leader
0901	Records Management Technical Planning, Control, and Reporting	D. L. Alamia, Subtask Leader
0902	Project Records Management	D. L. Alamia, Subtask Leader D. K. Hanson D. L. Burk J. K. Hays



## TASK 10: QUALITY ASSURANCE

### SCOPE

The Quality Assurance (QA) Task ensures continuous QA support and coordination with all project tasks. It also provides QA program implementation support, including

- participating in the development of project QA planning
- guidance to project staff in developing quality objectives and meeting applicable QA requirements
- performing quality verification activities (surveillance) to ensure control of activities and compliance with QA program requirements
- maintain the project QA plan
- interfacing with the TSP QA and Technical Integration Subcommittee.

This task consists of the following elements:

- Quality Assurance Technical Planning, Control, and Reporting (1001)
- Quality Assurance Program Development (1002)
- Quality Assurance Verification (1003).

### SUBTASK 1001: QUALITY ASSURANCE TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 10.5)

#### Scope

This subtask includes preparation of task plans, routine reporting, travel requirements, and control of task schedules and costs.

#### Approach

The project QA engineers work with other tasks on a regular basis to advise on and verify quality activities. Task management and control will be accomplished through Battelle and project mechanisms already in place.

#### Milestones to the TSP

None.



### Project Deliverables

- Task plan input
- Monthly report input
- Presentations to the TSP and its subcommittees

### SUBTASK 1002: QUALITY ASSURANCE PROGRAM DEVELOPMENT (WBS 10.1, 10.2, 10.3)

#### Scope

This subtask provides QA project planning and QA guidance to project staff to assist staff in meeting applicable QA requirements.

#### Approach

The project QA plan provides the basis for this subtask. Guidance is provided to project staff in procedure implementation guidance/interpretation, resolving QA problems, QA training, document reviews (procedures, reports, and task plans), and processing deficiencies.

#### Data Quality Objectives

Included in technical task plans.

#### Milestone to the TSP

- 1002A - Letter Report: Review of project QA plan (April 1992)

### Project Deliverables

- Memo reports of program development activities to Task Leaders and Project Office
- Decision procedure
- Action tracking procedure

## SUBTASK 1003: QUALITY ASSURANCE VERIFICATION (WBS 10.4)

### Scope

This subtask performs audits, including QA verification activities (surveillance) to ensure control of activities and compliance with QA program requirements through the duration of the project.

### Approach

HEDR audits and surveillances are conducted in accordance with applicable Battelle QA and project QA procedures. An internal audit will be performed yearly on project technical and administrative QA activities. In addition, surveillances will be performed at minimum in the following areas:

- software control (code verification, database control, etc.)
- hand calculations
- project records control
- training
- data traceability of results
- compliance to established data quality objectives
- documentation of internal/external peer reviews.

### Data Quality Objectives

Not applicable.

### Milestone to the TSP

- 1003A - Letter Report: Internal audit (September 1992)

### Project Deliverable

- Memo reports of surveillance activities to Task Leaders and Project Office

## QUALITY ASSURANCE

Quality assurance activities are addressed by each technical task and requirements contained in the project QA plan and task plan.

## INTERACTIONS

The task leader will coordinate with other project staff to ensure that all staff are working to the same requirements. This is accomplished through the identification and documentation of QA requirements in a QA plan and through periodic monitoring of project activities during the life of the project.

## ORGANIZATION

TSP Quality Assurance and Technical Integration Subcommittee  
D. S. Barth, Chairman

10	Quality Assurance	R. Cuello, Task Leader
1001	Quality Assurance Technical Planning, Control, and Reporting	D. L. Stewart, Subtask Leader
1002	Quality Assurance Program Development	D. L. Stewart, Subtask Leader
1003	Quality Assurance Verification	D. L. Stewart, Subtask Leader

## TASK 11: INFORMATION RESOURCES

### SCOPE

Identify, search, retrieve, declassify (if necessary) and make available to HEDR staff and the public those documents necessary to meet project needs. Needs center around two types of information: 1) that necessary to estimate doses people may have received, and 2) that on operational and radioactive material releases to satisfy public interest. The first objective has priority within the scope, cost and schedule constraints of the project. Two types of information are needed: 1) facilities' operational information necessary to calculate amounts of radioactive materials generated and released to the environment, and 2) monitoring information indicating concentrations of radioactive materials in environmental media and how those concentrations were measured or calculated.

Evaluating, annotating and recording these documents in databases will be accomplished through work approved in other tasks. The entire process includes the following activities:

- identifying - examining (screening) author, subject, periodical and serial indices and other computer-generated lists
- searching - physically looking for documents
- retrieving - acquiring documents from their filed, stored or archived locations
- evaluating - reading documents to determine content and usefulness
- describing - developing annotated bibliographies of reviewed documents
- declassifying - reading of documents by an Authorized Derivative Declassifier to determine whether the document could be declassified as is or declassified with certain material deleted
- making available - processing and placing in the Department of Energy, Richland Field Office (RL) Public Reading Room or other publicly available locations and distributing to interested TSP and HEDR staff.

Hanford Site documents to be searched for were generated by contractors, sub-contractors, and government agencies managing and performing work at Hanford during various times [du Pont, General Electric (GE), the Atomic Energy Commission, the DOE, etc.] from 1944 through 1990. These documents included those that were classified "confidential" or "secret." There is currently no "top secret" information on Hanford Site operations.

Some documents, especially older ones, have been destroyed over the years when the storage retention dates assigned to them were reached. Titles of some of these destroyed documents are on record.

Early Hanford documents began with the prefix "HW-3-" or "HW-7-" followed by four numbers. After GE left in 1965, each of the contractors set up its own document numbering system, and no more HW document numbers were issued. There is no single central document listing for Hanford documents generated after 1965.

Documents are often indexed (cross-referenced) in many places. Sources to be checked for potentially useful indexed information include:

- titles and associated information in 25 handwritten "issue books," that contain a consecutive listing of about 100,000 document numbers issued to Hanford authors for documents produced from 1944 - 1964
- subject and author index cards for, and technical abstracts for, about 40,000 of the 100,000 Hanford-originated documents deemed to be of retrospective technical value by a Hanford Technical Abstractor (all Hanford documents were reviewed by a Technical Abstractor)
- catalogues of serial and periodic reports.

Sources and locations of actual documents include:

- 40,000 boxes of retired Hanford records in the 712 Building in Richland or the Federal Records Center in Seattle; includes all contractors, subcontractors and government agencies at Hanford from 1944 - 1991
- 40,000 HW-numbered documents, classified and unclassified, in hard copy and microfilm at the Hanford Technical Library (the 40,000 for which technical abstracts were written, as previously described)

- approximately 19,000 pages of 300 titles released by DOE in 1986 about past radionuclide releases and practices at Hanford (part of the 100,000 documents)
- approximately 21,000 pages of 418 titles released by DOE in 1987 about past radionuclide releases and practices at Hanford (part of the 100,000 documents)
- 11,000 currently classified (secret or confidential) Hanford documents generated between 1944 - 1960 (part of the 100,000 documents), including the listing of approximately 2,000 requested for declassification by the TSP and the public; however, about 550 were duplicate numbers, had already been declassified or were initiated unclassified. Of the remaining 1450 documents, 367 were identified as either of no interest (120) or as high priority and were declassified (247). (The multiple-request list of 367 was completed and is in the public domain.)
- three du Pont histories: an operations history (18 books), a design and procurement history (two volumes), and a design and construction history (four volumes).

The DOE has declared that all Hanford plutonium production- and operations-related information generated between 1944 through 1960 is declassified. Any documents found and deemed useful for meeting HEDR objectives may be declassified with or without deletions in accordance with DOE guidance by Authorized Derivative Declassifiers. Declassification is, generally, a labor-intensive process and necessary only for highly desirable documents containing information available in no other sources.

This task consists of the following elements:

- Information Resources Planning, Control, and Reporting (1101)
- Hanford Document Declassification (1102)
- Hanford Information Resources Identification and Search (1103).

SUBTASK 1101: INFORMATION RESOURCES PLANNING, CONTROL, AND REPORTING  
(WBS 11.3)

Scope

That work, not directly related to work under WBS 11.1 and 11.2, necessary to develop detailed task plans, prepare for and participate in meetings

required by TSP and Battelle management, meet requirements of the TSP and Battelle project management for project and TSP reporting for technical evaluations, management reviews and peer reviews, meet requirements of the TSP and Battelle project management for administration, records and information management, and fiscal control, and meet quality requirements of the TSP and Battelle.

#### Approach

Planning of the work to be performed on this task will be carried out in accordance with TSP Directive 90-1, the planning/budgeting process approved by the TSP at its February 1991 planning/budget workshop, Battelle project management systems, and HEDR Project Office requirements.

Control of task work will be accomplished through reviews of ongoing work, technical approach and quality objectives by the task leader.

The tracking system will be updated daily or as new material becomes available. At the completion of the project, the entire tracking system will be placed in the public domain. Updates will be prepared when warranted by the additions, but at least semi-annually.

Databases that address currently classified documents (1944-1960) will be updated as actions occur. When the 1450 documents identified by the public or TSP have been reviewed and appropriate actions taken, a printed summary will be prepared. (A summary of the multiple-request listing has been completed; the remaining single-request documents are being addressed.)

#### Milestones to the TSP

None.

#### Project Deliverables

- Input to monthly reports
- Input to task plans
- Database to files and RL Public Reading Room
- Retrieved documents to staff

## SUBTASK 1102: HANFORD DOCUMENT DECLASSIFICATION (WBS 11.1)

### Scope

The scope is work necessary to declassify, with or without deletions, Hanford-originated documents identified to be of use to the project. Approximately 550 of the 1450 classified documents dated between 1944 and 1960 remain to be evaluated to determine potential usefulness to the project.

### Approach

Declassified documents will be processed and made available in accordance with Battelle procedures. In accordance with DOE Orders, national and local classification guides, review and evaluate Hanford-Site-originated documents for declassification. Only Authorized Derivative Declassifiers will be utilized in this activity. Those documents containing information key to project objectives will be given the highest priority and upon declassification they will be made available to the public, using Battelle procedures. Those of secondary interest and/or use will be declassified as staff availability permits.

### Data Quality Objectives

Not applicable.

### Milestone to the TSP

- 1102A - Letter Report: Declassified, prioritized list of documents identified by the TSP to be of potential use to HEDR (September 1992). If declassification has been completed, this report will be a title listing with associated actions taken on each document. If declassification is not yet complete, the report will discuss the status of declassification to date and will estimate time to complete it. The declassification action listing may be used by the TSP as a basis for deciding whether additional documents need to be declassified or whether this initial prioritized listing is sufficient.

### Project Deliverable

- Lists of declassified documents to task leaders, Project Office, and RL Public Reading Room



SUBTASK 1103: HANFORD INFORMATION RESOURCES IDENTIFICATION AND SEARCH  
(WBS 11.2)

Scope

That work necessary to identify, search for, retrieve and evaluate Hanford-originated documents deemed of interest for further use in reconstructing environmental doses. The evaluation process for this task is iterative and is conducted in parallel with evaluation work of other tasks to support searching activities to determine what information impacts other information needs and what information is related to other information sources. Searching and retrieval will be essentially completed in FY 1992.

Approach

When a request for specific documents or a specific category of documents is received, the sources described in the task scope, above, will be checked to identify titles, authors or key words of documents (both classified and unclassified) that might contain the requested information. The use of many sources, some of which overlap or refer the user to related documents, will help ensure a thorough search. TSP members and HEDR staff from other tasks will also search for documents using the same process.

Once a document is identified, it will be searched for and retrieved using approved DOE and Battelle procedures and its title will be added to the HEDR Information Resources Tracking System (HIRTS) database. HIRTS contains bibliographic information on each report such as document number(s), author(s), title, date, document form (hard copy or microfilm), location (RHA-712 or 3760), public availability, and names of people who requested copies. The database currently contains more than 4,500 citations and goes from 1944 to the present. A printed listing of Hanford-originated documents in HIRTS is kept in the RL Public Reading Room and is updated periodically. Databases of task-specific, evaluated and annotated documents are kept by other HEDR tasks in accordance with project guidelines and will be periodically made available to the RL Public Reading Room.

HEDR staff receiving a Hanford historical document potentially useful to their work will evaluate the document to determine whether it can indeed be

used. Documents that are evaluated by TSP and HEDR staff will be annotated (briefly described) and entered into databases.

The general process to be used to ensure a high level of confidence that the identification and search for information is sufficient to complete task work is the development of "search trees," as shown in Figure 12.1.

The trees for a specific type of information consist of the following types of information sources applicable to the subject:

- an initial list of documents from the sources listed in the task scope
  - documents written by the authors of the initial documents
  - documents referenced in the initial documents

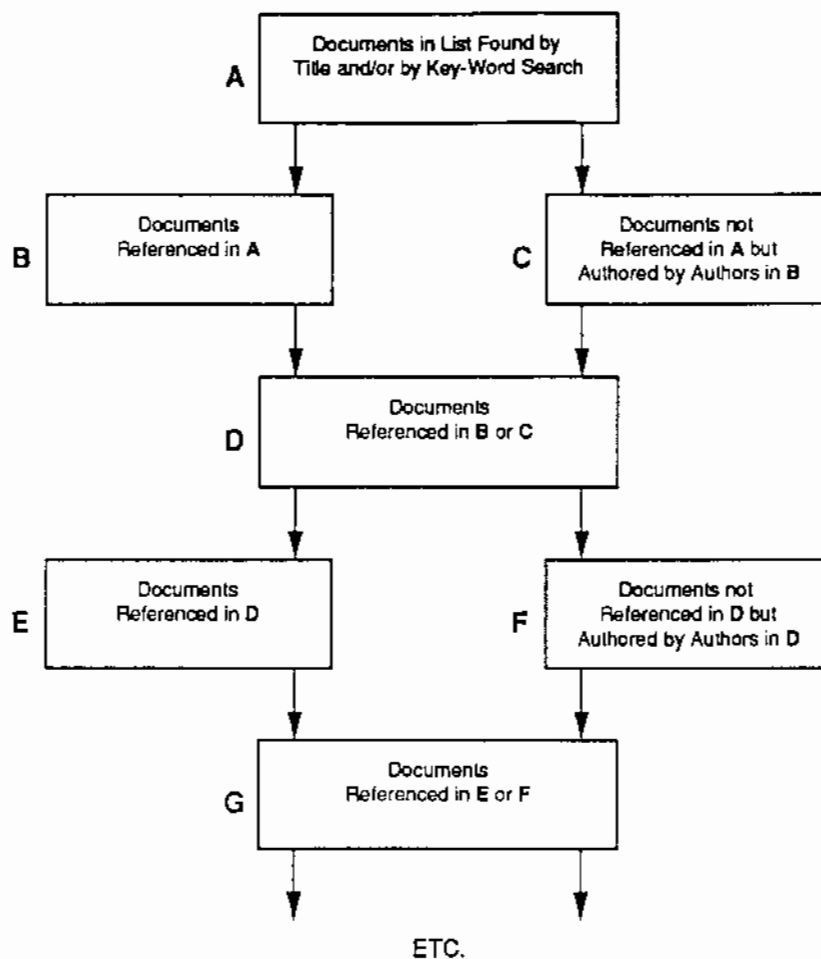


FIGURE 12.1. Typical Search Tree

- documents not referenced in the initial documents but written by the authors of the references
- documents referenced by the references
- documents found by key word searches (e.g., iodine, stacks, emissions)
  - documents written by authors of documents found by word searches
  - references in documents found by key word searches
  - documents written by the authors of the references found by key word searches
  - documents referenced in those referenced documents written by the authors of documents found by key word searches
- other sources
  - all periodic documents in records facilities
  - author's and associates' files
  - interviews with current or former Hanford employees
  - anecdotal information logs and notes.

Data quality objectives will be developed for each approved task/subtask scope to ensure that sufficient information is found and evaluated to provide a high level of confidence that any documents that may exist but have not been found would not have a significant impact on final dose estimates or their uncertainties.

Sensitivity analyses will be performed on the dose model to determine the change required in the input information (e.g., curies released) to change the dose estimates or their uncertainties by specified significant amounts. If the change is small, then further searches and evaluations of documents will not be required.

TSP members and HEDR staff will review the approximately 1,100 documents remaining on the 1944-1960 classified Hanford document list and determine those to be declassified. Identified, searched, retrieved and evaluated classified documents dated from 1961 through 1991 and determined to be of key significance to the project will be declassified.

Documents deemed of potential interest/use to the project and/or the public will be sent to appropriate HEDR staff, placed in the RL Public Reading Room, and sent to the Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee. OSTI abstracts, indexes, and inputs the documents to energy databases, which can be electronically searched on several commercial

systems. Subject-oriented listings of documents may be developed, recorded in chronological order, and directed to appropriate tasks.

#### Data Quality Objectives

##### New Data/Information to be Developed

As potentially relevant information is identified, it is added to the existing list of Hanford-Site-originated documents of potential interest/use to the HEDR Project, which is available at the RL Public Reading Room.

##### Final Use of Data/Information

1) Basis for further review by technical tasks/TSP, 2) declassification if needed, and 3) placing documents in RL Public Reading Room and providing public release nationally through the DOE Office of Scientific and Technical Information in Oak Ridge, Tennessee.

#### Data Quality Objectives

- **Completeness** - The objective is that the list contain titles of Hanford-Site-originated documents currently located at DOE and/or DOE contractor facilities that contain 1) information potentially useful to estimating radio-nuclide releases from Hanford or 2) data on radioactive contamination of Hanford and its environs. Any unidentified information is not expected to have a significant effect on project-reconstructed, release quantities or dose estimates based on them. The approach to achieve completeness is that currently available subject and author indices to archival documents will be searched to identify those potentially containing data of interest to the project. Unclassified and declassified documents will be directed to appropriate technical tasks, to the TSP, placed in the RL Public Reading Room, and made publicly available at the national level. Currently classified documents identified by cleared TSP members as containing potentially useful data will be declassified (with or without deletions) and made publicly available. Quality assurance and peer review will be applied to the process and results to ensure completeness.

### Documentation

A section in the report to the TSP will summarize the quality process and results.

### Milestone to the TSP

- 1103A - Letter Report: Status of document search and DQO efforts (September 1992). The report will describe the process used to identify, retrieve, and distribute to HEDR staff Hanford information used in dose reconstruction.

### Project Deliverable

- Complete search and retrieval of new documents identified by other tasks (June 1992)

### QUALITY ASSURANCE

Information Resources is identified as Impact Level III and will comply with the PNL Good Practices Standard that is in Part II of PNL-MA-70.

### INTERACTIONS

Information Resources identifies and collects documents of potential use to other tasks to meet their technical objectives. For example, documents addressing ruthenium releases will be supplied to Task 03 to aid them in developing ruthenium source terms.

ORGANIZATION

TSP Communications Subcommittee  
M. L. Blazek, Chair  
N. J. Germond, TSP, Declassification Representative

11	Information Resources	S. P. Gydesen, Task Leader
1101	Information Resources Planning, Control, and Reporting	S. P. Gydesen, Subtask Leader N. G. Carter R. K. Jahnel D. Krisher
1102	Hanford Document Declassification	S. P. Gydesen, Subtask Leader
1103	Hanford Information Resources Identification and Search	S. P. Gydesen, Subtask Leader



## TASK 12: TSP COMMUNICATIONS SUPPORT

### SCOPE

Task staff assist the TSP Communications Subcommittee in developing communications strategies to effectively communicate technical information to the public and to identify and address public concerns; establishing public information mailing lists; working with local, regional and national news media to provide project information; developing fact sheets on topics of interest; making project-related documents publicly accessible; and conducting public meetings to present project progress and receive and respond to public comments.

The work is divided into the following subtasks:

- TSP Communications Support Technical Planning, Control, and Reporting (1201)
- TSP Public Outreach Support (1202)
- Communications Assessment Research (1203)
- TSP Meetings and Materials Support (1204).

### SUBTASK 1201: TSP COMMUNICATIONS SUPPORT TECHNICAL PLANNING, CONTROL, AND REPORTING (WBS 12.7)

#### Scope

This subtask involves these activities not included in other subtasks necessary to plan and control TSP Communications support activities. Included in this subtask are planning and budgeting; monthly reporting; and meeting attendance, including TSP Communications Subcommittee meetings.

#### Approach

This subtask management requires regular involvement with TSP Communications Subcommittee members, project personnel, Battelle management and other TSP, project management and task components.



Activities include the following:

- Develop, plan and control communications activities and tasks that support Communications Subcommittee goals and objectives
- Develop details for FY 1993, 1994, and 1995 task plans
- Provide adequate reporting and proper documentation to track activities and encounters in such a manner as to accurately depict task status and project progress
- Maintain generally accepted QA practices as they apply to all activities conducted by the task leader, Project Manager, Chair of the TSP Communications Subcommittee and Battelle management.

#### Milestones to the TSP

None.

#### Project Deliverables

- Input to Project Task Plans
- Input to monthly reports

#### SUBTASK 1202: TSP PUBLIC OUTREACH SUPPORT (WBS 12.1)

##### Scope

Support the development and use of various communications vehicles and methods by the TSP Communications Subcommittee. Battelle HEDR staff support the TSP in the planning, development and use of public outreach support activities and products.

##### Approach

At TSP Communications Subcommittee request, the TSP videotape, poster, and other project-generated documents will be distributed to various audiences.

#### Milestones to the TSP

None. (Reports and assistance are provided to the TSP Communications Subcommittee.)

### Project Deliverable

- Memo reports to Project Office

### SUBTASK 1203: COMMUNICATIONS ASSESSMENT RESEARCH (WBS 12.2, 12.3)

#### Scope

Support audience analysis research to ensure that the TSP's communications efforts are effective and that the TSP is aware of public attitudes, needs and concerns.

#### Approach

Audience analysis activities include the following:

- A. Attend all TSP quarterly public meetings and communicate observations, areas of public interest or concern and opportunities for better public dialogue through written and verbal reporting to the TSP Communications Subcommittee and project management
- B. Collect media articles from local, regional and national newspapers and magazines that relate to the Project; distribute them to TSP Panel members, project management and the DOE-RL Reading Room two or three times a year as appropriate.
- C. Provide an informal review of media articles collected between August and December 1991 as to the concerns of various audiences (e.g., public, agencies, special interest groups) and issues of interest. The evaluation will compare the concerns and issues of previously reviewed articles (January through July 1991). Provide the same type of review in mid-year 1992.

#### Milestones to the TSP

- 1203B - Letter Report: Media analysis, 1991 (January 1992)
- 1203C - Letter Report: Mid-year media analysis, 1992 (June 1992)

### Project Deliverable

- Memo reports to Project Office

SUBTASK 1204: TSP MEETINGS AND MATERIALS SUPPORT (WBS 12.4, 12.5, 12.6)

Scope

Assist the TSP Communications Subcommittee in providing logistical support and arrangements, as necessary, for public presentations including meetings, workshops and briefings. Coordinate and arrange Battelle staff activities and responsibilities to participate in informational workshops. Provide materials for the development of TSP public information materials, and review draft materials when requested by the TSP.

Approach

Presentation coordination activities include the following:

- A. Arrange and coordinate date and time of public presentations
- B. Contact Subcommittee and identify available speaker for invitation
- C. Schedule the selected Panel member and communicate the vital presentation information to him/her
- D. Discuss and determine appropriate briefing for requester
- E. Assist in providing logistical support and arrangements as necessary
- F. Attend presentation if necessary

TSP materials support activities include the following:

- A. Provide photos, slides and publication materials for the development of public information materials
- B. Develop computer graphics and viewgraphs for presentation and publication purposes
- C. Provide review and evaluation of public information materials being developed by Subcommittee members and staff including newsletters, fact sheets, reports, press releases, etc.
- D. Provide editing and writing support to Subcommittee members and staff as needed for the production of public information materials. Includes technical reports, fact sheet quarterly newsletter articles, press releases, etc.

### Milestones to the TSP

Not applicable. Services and products are provided to the TSP Communications Subcommittee.

### Project Deliverable

- Memo reports to Project Office

### QUALITY ASSURANCE

Generally accepted QA practices will be applied to all activities by the task leader, Project Manager, Chair of the TSP Communications Subcommittee and Battelle management.

### INTERACTIONS

Task 12 staff work with the TSP Communications Subcommittee to receive specific direction on all activities, to provide professional counsel and present options and recommendations for communication activities, and to report progress.

### ORGANIZATION

#### TSP Communications Subcommittee M. L. Blazek, Chair

12	TSP Communications Support	G. L. Harvey, Task Leader
1201	TSP Communications Support Technical Planning, Control, and Reporting	G. L. Harvey, Subtask Leader
1202	TSP Public Outreach Support	G. L. Harvey, Subtask Leader
1203	Communications Assessment Research	C. W. Holmes, Subtask Leader
1204	TSP Meetings and Materials Support	G. L. Harvey, Subtask Leader A. H. McMakin T. A. Nelson



APPENDIX

PROJECT WORK BREAKDOWN STRUCTURE

## APPENDIX

### PROJECT WORK BREAKDOWN STRUCTURE

- 1.0 Project Management
  - 1.1 Project planning and control
    - 1.1.1 Work breakdown structure/dictionary
    - 1.1.2 Network development and control
    - 1.1.3 Planning guidance
    - 1.1.4 Corrective action planning
    - 1.1.5 Project Management Information System
    - 1.1.6 Project management reports
      - 1.1.6.1 HEDR monthly report
      - 1.1.6.2 Financial reports
      - 1.1.6.3 Scope/cost/schedule reports
      - 1.1.6.4 Battelle management reports
  - 1.2 Project documents
    - 1.2.1 Document hierarchy
    - 1.2.2 ~~Project plan~~ (deleted)
    - 1.2.3 Project management plan
    - 1.2.4 Task plans
    - 1.2.5 Quality assurance plan
    - 1.2.6 Other HEDR documents
  - 1.3 Project administration
    - 1.3.1 TSP liaison and response to requests
    - 1.3.2 CDC liaison
    - 1.3.3 Task management and coordination
    - 1.3.4 Staff development
    - 1.3.5 Battelle management liaison
    - 1.3.6 Project computer administration
  - 1.4 Records control
    - 1.4.1 Commitment tracking
    - 1.4.2 Document clearance
    - 1.4.3 Records transfer
    - 1.4.4 Records database management
  - 1.5 Peer review
    - 1.5.1 Plans review
    - 1.5.2 Presentation review
    - 1.5.3 Document review
    - 1.5.4 Technical review
  - 1.6 Subcontract administration
    - 1.6.1 TSP contracts
    - 1.6.2 Native American contracts
    - 1.6.3 Consultant contracts
  - 1.7 Project communications support
    - 1.7.1 Communication planning
      - 1.7.1.1 Communication policy/guidelines development
    - 1.7.2 Communications reviews
      - 1.7.2.1 Finalize Phase I reports

- 1.7.3 Meeting/workshop support
  - 1.7.4 Project communications products
  - 1.7.5 Response to public requests
- 2.0 Project Technical Integration
    - 2.1 Technical sensitivity/uncertainty analysis
    - 2.2 Technical coordination and integration
      - 2.2.1 Planning integration
      - 2.2.2 Public communication
      - 2.2.3 TSP coordination
      - 2.2.4 Native American Working Group liaison
      - 2.2.5 Data integration
      - 2.2.6 Review and interpretation of technical results
    - 2.3 Population dose model requirements
      - 2.3.1 Code design specifications
      - 2.3.2 Dominant radionuclides
      - 2.3.3 Dominant pathways
      - 2.3.4 Characteristics of population groups
    - 2.4 Individual dose model requirements
      - 2.4.1 Code design specifications
      - 2.4.2 Dominant radionuclides
      - 2.4.3 Dominant pathways
      - 2.4.4 Characteristics of individuals
    - 2.5 Code verification/validation
      - 2.5.1 IAEA model intercomparison
      - 2.5.2 Model/code verification and validation plan
    - 2.6 HTDS coordination
    - 2.7 Data management oversight
      - 2.7.1 Data management plan
    - 2.8 Technical planning, control, and reporting
      - 2.8.1 Project planning/task planning
      - 2.8.2 Meetings
        - 2.8.2.1 TSP/public meetings
        - 2.8.2.2 Project meetings
      - 2.8.3 Documentation, reporting, and publications
      - 2.8.4 Quality objectives, achievements, and verification
      - 2.8.5 Project integration/interactions
  - 3.0 Source Terms
    - 3.1 Release data availability and review
      - 3.1.1 Data on releases to air
      - 3.1.2 Data on releases to water
    - 3.2 Releases to air
      - 3.2.1 Early iodine releases from separations facilities (1944-1947)
      - 3.2.2 Late iodine releases to air (1947-present)
      - 3.2.3 Releases from separations areas (200 areas)
        - 3.2.3.1 Releases from separations facilities
          - 3.2.3.1.1 Releases from 1944-1957
          - 3.2.3.1.2 Releases from 1957-1990
        - 3.2.3.2 Releases from other separations areas



- 3.2.4 Releases from reactor areas (100 areas)
- 3.2.5 Releases from laboratory/test reactor areas (300/400 areas)
- 3.3 Hanford Historical Releases
- 3.4 Waterborne releases
  - 3.4.1 Waterborne releases (1944-1957)
  - 3.4.2 All waterborne releases
  - 3.4.3 Groundwater releases
- 3.5 Release model development (day time)
  - 3.5.1 Iodine release model (input to pathways and dose model) - air
  - 3.5.2 Other nuclide release model
    - 3.5.2.1 Air
    - 3.5.2.2 Water
  - 3.5.3 Model validation and verification
- 3.6 Technical planning, control, and reporting
  - 3.6.1 Project planning/task planning
  - 3.6.2 Meetings
    - 3.6.2.1 TSP/public meetings
    - 3.6.2.2 Project meetings
  - 3.6.3 Documentation, reporting, and publications
  - 3.6.4 Quality objectives, achievements, and verification
  - 3.6.5 Project integration/interactions
- 4.0 Environmental Transport
  - 4.1 Atmospheric transport
    - 4.1.1 Model restructuring and revision
      - 4.1.1.1 Wind (uncertainty)
      - 4.1.1.2 Stability (spatial variation and uncertainty)
      - 4.1.1.3 Mixing layer (calculation, spatial variation, uncertainty)
      - 4.1.1.4 Precipitation (uncertainty, spatial variation)
      - 4.1.1.5 Temperature (uncertainty)
      - 4.1.1.6 Wind profiles (uncertainty)
      - 4.1.1.7 Surface roughness (find data)
      - 4.1.1.8 Characteristic turbulence velocity (uncertainty)
      - 4.1.1.9 Diffusion coefficients (revise, uncertainty)
      - 4.1.1.10 Deposition (resistance model, spatial variation, uncertainty)
      - 4.1.1.11 Washout (uncertainty and spatial variation)
      - 4.1.1.12 Plume rise (uncertainty)
      - 4.1.1.13 Transport at center of mass
      - 4.1.1.14 Mass balance
      - 4.1.1.15 Multiple sources
      - 4.1.1.16 Polar grid (close-in workers)
      - 4.1.1.17 Input/output modification

- 4.1.2 Wind field modeling
  - 4.1.2.1 Literature search and model evaluation
  - 4.1.2.2 Tests
  - 4.1.2.3 Implementation
- 4.1.3 Model sensitivity
  - 4.1.3.1 Release time
  - 4.1.3.2 Wind data (resolution)
  - 4.1.3.3 Temperature (plume rise)
  - 4.1.3.4 Precipitation
  - 4.1.3.5 Mixing layer thickness
  - 4.1.3.6 Surface roughness
  - 4.1.3.7 Diffusion parameterization
  - 4.1.3.8 Deposition parameterization and deposition velocity
- 4.1.4 Meteorological database
  - 4.1.4.1 Hourly data (wind, stability, precipitation, and temperature)
  - 4.1.4.2 Daily data (precipitation)
  - 4.1.4.3 Surface roughness
- 4.1.5 Model validation
  - 4.1.5.1 Validation data sets
  - 4.1.5.2 Detailed validation plan
  - 4.1.5.3 Validation model runs
- 4.1.6 Final documentation
  - 4.1.6.1 Database
  - 4.1.6.2 Computer model
- 4.1.7 Calculations
  - 4.1.7.1 HTDS
  - 4.1.7.2 Chronic releases
  - 4.1.7.3 Special studies (e.g., "green run")
    - 4.1.7.3.1 Database preparation
    - 4.1.7.3.2 Model modification
    - 4.1.7.3.3 Model documentation
    - 4.1.7.3.4 Calculation
- 4.1.8 Special studies
  - 4.1.8.1 Resuspension
  - 4.1.8.2 Thunderstorms
  - 4.1.8.3 Air chemistry of iodine-131
- 4.2 Groundwater transport
  - 4.2.1 Well data analysis
    - 4.2.1.1 On-site well data evaluation
    - 4.2.1.2 Off-site well data evaluation
  - 4.2.2 Air deposition to groundwater transfer
  - 4.2.3 Off-site migration
    - 4.2.3.1 Effects on off-site wells
    - 4.2.3.2 Effects on the river

- 4.3 Surface-water transport
  - 4.3.1 Monitoring data evaluation
    - 4.3.1.1 Data/information assembly
    - 4.3.1.2 Develop bibliography
    - 4.3.1.3 Data quality evaluation
    - 4.3.1.4 Data gaps reconciliation (time/location)
  - 4.3.2 Conceptual modeling
    - 4.3.2.1 Basic river processes
    - 4.3.2.2 Significant locations/times
    - 4.3.2.3 Numerical modeling approach
  - 4.3.3 Calculation of concentrations
    - 4.3.3.1 Initial screening calculations
    - 4.3.3.2 Concentrations at points of interest
    - 4.3.3.3 Database for dose model
- 4.4 Technical planning, control, and reporting
  - 4.4.1 Project planning/task planning
  - 4.4.2 Meetings
    - 4.4.2.1 TSP/public meetings
    - 4.4.2.2 Project meetings
  - 4.4.3 Documentation, reporting, and publications
  - 4.4.4 Quality objectives, achievements, and verification
  - 4.4.5 Project integration/interactions
- 5.0 Environmental Monitoring Data
  - 5.1 Data availability and review
    - 5.1.1 Document search, review, and collection
    - 5.1.2 Document inventory and database entry
    - 5.1.3 Data evaluation and maintenance
  - 5.2. Terrestrial data (vegetation, crops, food stuff and soil)
    - 5.2.1 Document review and inventory
    - 5.2.2 Data extraction and database entry
    - 5.2.3 Sampling methods review and evaluation
    - 5.2.4 Analytical methods review and evaluation
    - 5.2.5 Biases and uncertainties
    - 5.2.6 Hanford contributions
  - 5.3 Surface-water data (Columbia River, sediments, aquatic biota)
    - 5.3.1 Document review and inventory
    - 5.3.2 Data extraction and database entry
    - 5.3.3 Sampling methods review and evaluation
    - 5.3.4 Analytical methods review and evaluation
    - 5.3.5 Biases and uncertainties
    - 5.3.6 Hanford contributions
  - 5.4 Air data
    - 5.4.1 Document review and inventory
    - 5.4.2 Data extraction and database entry
    - 5.4.3 Sampling methods review and evaluation
    - 5.4.4 Analytical methods review and evaluation
    - 5.4.5 Biases and uncertainties
    - 5.4.6 Hanford contributions

- 5.5 Groundwater data
  - 5.5.1 Document review and inventory
  - 5.5.2 Data extraction and database entry
  - 5.5.3 Sampling methods review and evaluation
  - 5.5.4 Analytical methods review and evaluation
  - 5.5.5 Biases and uncertainties
  - 5.5.6 Hanford contributions
- 5.6 Technical planning, control, and reporting
  - 5.6.1 Project planning/task planning
  - 5.6.2 Meetings
    - 5.6.2.1 TSP/public meetings
    - 5.6.2.2 Project meetings
  - 5.6.3 Documentation, reporting, and publications
  - 5.6.4 Quality objectives, achievements, and verification
  - 5.6.5 Project integration/interactions
- 6.0 Demographics, Agriculture, Food Habits
  - 6.1 Demographics
    - 6.1.1 General population
      - 6.1.1.1 Phase I area
      - 6.1.1.2 Extension of geographic study area
      - 6.1.1.3 Duration of residence/migration
    - 6.1.2 Special populations
      - 6.1.2.1 Native American tribes
      - 6.1.2.2 Construction workers
      - 6.1.2.3 Military personnel
      - 6.1.2.4 Migrant workers
      - 6.1.2.5 Extension of geographic study area
  - 6.2 Agriculture
    - 6.2.1 Milk production and distribution model
      - 6.2.1.1 Survey of producers - feeding
      - 6.2.1.2 School lunch sources of milk
      - 6.2.1.3 Extension of geographic study area
    - 6.2.2 Vegetables (and fresh fruits) model
    - 6.2.3 Other agricultural models
  - 6.3 Lifestyles
    - 6.3.1 Populations
    - 6.3.2 Individuals
  - 6.4 Food consumption
    - 6.4.1 General population
      - 6.4.1.1 Actual distributions
      - 6.4.1.2 Age-related factors
      - 6.4.1.3 Consumption for infants, nursing and pregnant women
      - 6.4.1.4 Dairy products, fruits and vegetables
      - 6.4.1.5 Wildlife and other local products
    - 6.4.2 Special populations
      - 6.4.2.1 Native Americans
      - 6.4.2.2 Construction workers
      - 6.4.2.3 Military personnel
      - 6.4.2.4 Migrant workers

- 6.5 Technical planning, control, and reporting
  - 6.5.1 Project planning/task planning
  - 6.5.2 Meetings
    - 6.5.2.1 TSP/public meetings
    - 6.5.2.2 Project meetings
  - 6.5.3 Documentation, reporting, and publications
  - 6.5.4 Quality objectives, achievements, and verification
  - 6.5.5 Project integration/interactions
- 7.0 Environmental Pathways and Dose Estimates
  - 7.1 Code Development
    - 7.1.1 Pathway development
      - 7.1.1.1 Air pathway
        - 7.1.1.1.1 Cow/milk
        - 7.1.1.1.2 Vegetation
        - 7.1.1.1.3 Meat
        - 7.1.1.1.4 Poultry/eggs
        - 7.1.1.1.5 Immersion
        - 7.1.1.1.6 Sky shine
        - 7.1.1.1.7 Ground shine
        - 7.1.1.1.8 Soil
        - 7.1.1.1.9 Inhalation
      - 7.1.1.2 Water pathway
        - 7.1.1.2.1 Fish/aquatic biota
        - 7.1.1.2.2 Drinking water
        - 7.1.1.2.3 Immersion
        - 7.1.1.2.4 Boating/fishing/shoreline
    - 7.1.2 Code structuring
      - 7.1.2.1 Correlations/demodularization
      - 7.1.2.2 Dynamics
      - 7.1.2.3 Data handling
    - 7.1.3 Coding implementation
      - 7.1.3.1 Writing code
      - 7.1.3.2 Verification/bench marking
      - 7.1.3.3 Quality assurance
    - 7.1.4 Code documentation
      - 7.1.4.1 Theory manuals
      - 7.1.4.2 Users manuals
      - 7.1.4.3 Dose estimation turnover package
    - 7.1.5 Model/code validation
      - 7.1.5.1 Monitoring data
      - 7.1.5.2 Bioassay data
  - 7.2 Dose Calculations
    - 7.2.1 Population group doses
      - 7.2.1.1 Native American tribes doses
        - 7.2.1.1.1 Yakima
        - 7.2.1.1.2 Umatilla
        - 7.2.1.1.3 Nez Perce
        - 7.2.1.1.4 Colville
        - 7.2.1.1.5 Coeur d'Alene
        - 7.2.1.1.6 Kalispel

- 7.2.1.1.7 Warm Springs
        - 7.2.1.1.8 Spokane
      - 7.2.1.2 Military doses
      - 7.2.1.3 Migrant doses
      - 7.2.1.4 Construction worker doses
    - 7.2.2 Individual doses
      - 7.2.2.1 HTDS doses
        - 7.2.2.1.1 Feasibility study doses
        - 7.2.2.1.2 Full study doses
      - 7.2.2.2 Individuals on request
    - 7.2.3 Nuclides of interest
      - 7.2.3.1 Iodine doses
      - 7.2.3.2 Ruthenium doses
      - 7.2.3.3 Plutonium doses
      - 7.2.3.4 Other nuclides
    - 7.2.4 Pathways of interest
      - 7.2.4.1 Air pathway doses
      - 7.2.4.2 River pathway doses
      - 7.2.4.3 Groundwater pathway doses
      - 7.2.4.4 River irrigation doses
      - 7.2.4.5 Cistern doses
      - 7.2.4.6 Rain-out doses
      - 7.2.4.7 Other pathways of interest
    - 7.2.5 Special release events
      - 7.2.5.1 "Green run" doses
      - 7.2.5.2 Fuel failures
      - 7.2.5.3 "Hot particles"
  - 7.3 Model parameter development
    - 7.3.1 Dose factors
    - 7.3.2 Transfer factors
    - 7.3.3 Accumulation Factors
  - 7.4 Technical planning, control, and reporting
    - 7.4.1 Project planning/task planning
    - 7.4.2 Meetings
      - 7.4.2.1 TSP/public meetings
      - 7.4.2.2 Project meetings
    - 7.4.3 Documentation, reporting, and publications
    - 7.4.4 Quality objectives, achievements, and verification
    - 7.4.5 Project integration/interactions
- 8.0 Statistics support
  - 8.1 Technical Integration (Task 02)
    - 8.1.1 Restructuring pathway dose codes
      - 8.1.1.1 Air
      - 8.1.1.2 Water
    - 8.1.2 Developing data management within pathway dose codes
    - 8.1.3 Review task plans and data quality objectives
    - 8.1.4 Review products
    - 8.1.5 Statistics publications

- 8.2 Source Terms (Task 03)
  - 8.2.1 Review task plan and data quality objectives
  - 8.2.2 Review products
  - 8.2.3 Sensitivity/uncertainty analysis and data management
  - 8.2.4 Review/evaluate/assist with data and calculations
- 8.3 Environmental transport (Task 04)
  - 8.3.1 Review task plan and data quality objectives
  - 8.3.2 Review products
  - 8.3.3 Sensitivity/uncertainty analysis and data management
  - 8.3.4 Review/evaluate/assist with data and calculations
- 8.4 Environmental monitoring data (Task 05)
  - 8.4.1 Review task plan and data quality objectives
  - 8.4.2 Review products
  - 8.4.3 Review/evaluate/assist with data and calculations
  - 8.4.4 Validation of air dispersion model
- 8.5 Demographics, agriculture, food habits (Task 06)
  - 8.5.1 Review task plan and data quality objectives
  - 8.5.2 Review products
  - 8.5.3 Review/evaluate/assist with data and calculations
  - 8.5.4 Sensitivity/uncertainty analysis and data management
- 8.6 Environmental pathways and dose estimates (Task 07)
  - 8.6.1 Review task plan and data quality objectives
  - 8.6.2 Review products
  - 8.6.3 Sensitivity/uncertainty analyses and data management
- 8.7 Technical planning, control, and reporting
  - 8.7.1 Project planning/task planning
  - 8.7.2 Meetings
    - 8.7.2.1 TSP/public meetings
    - 8.7.2.2 Project meetings
  - 8.7.3 Documentation, reporting and publications
  - 8.7.4 Quality objectives, achievements and verification
  - 8.7.5 Project integration/interactions
- 9.0 Records Management
  - 9.1 Battelle records management
  - 9.2 DOE Field Office, Richland, Public Reading Room
  - 9.3 Task planning, control, and reporting
    - 9.3.1 Project planning/task planning
    - 9.3.2 Project meetings
    - 9.3.3 Documentation, reporting, and publications
    - 9.3.4 Quality objectives, achievements, and verification
- 10.0 Quality Assurance
  - 10.1 Quality assurance procedures
  - 10.2 Data quality objectives
  - 10.3 Quality improvement
  - 10.4 Quality verification activities
  - 10.5 Task planning, control, and reporting
    - 10.5.1 Project planning/task planning
    - 10.5.2 Project meetings

- 10.5.3 Documentation, reporting, and publications
- 10.5.4 Project integration/interaction
- 11.0 Information Resources
  - 11.1 Document declassification
  - 11.2 Resource identification and availability
  - 11.3 Task planning, control, and reporting
    - 11.3.1 Project planning/task planning
    - 11.3.2 Project meetings
    - 11.3.3 Documentation, reporting, and publications
    - 11.3.4 Quality objectives, achievements, and verification
- 12.0 TSP Communications Support
  - 12.1 Public outreach support
    - 12.1.1 Video
      - 12.1.1.1 Production
      - 12.1.1.2 Distribution
    - 12.1.2 Posters
      - 12.1.2.1 Production
      - 12.1.2.2 Distribution
    - 12.1.3 Document accessibility
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    - 12.2.1 Focus groups
    - 12.2.2 Individuals
  - 12.3 Audience analysis
    - 12.3.1 Public meeting attendance
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  - 12.4 Presentation coordination
  - 12.5 TSP meeting/workshop/symposia support
  - 12.6 TSP materials support
    - 12.6.1 Material supply
    - 12.6.2 Reviews
    - 12.6.3 Editing/writing
    - 12.6.4 Document retrieval
  - 12.7 Task planning, control, and reporting
    - 12.7.1 Project planning/task planning
    - 12.7.2 Meetings
      - 12.7.2.1 TSP/public meetings
      - 12.7.2.1 Project meetings
    - 12.7.3 Documentation, reporting, and publications
    - 12.7.4 Quality objectives, achievements, and verification



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