

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION
QUALITY ASSURANCE SURVEILLANCE REPORT OF
PACIFIC NORTHWEST LABORATORY
STATUS OF GLOBAL CLIMATE MODELING
SURVEILLANCE YMP-SR-93-032
CONDUCTED AT RICHLAND, WASHINGTON
JULY 7 AND 8, 1993

ACTIVITIES SURVEILLED:

STATUS OF GLOBAL CLIMATE MODELING ACTIVITIES RELATED TO RESOLUTION
OF OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
CORRECTIVE ACTION REQUEST YM-93-024

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1.0 EXECUTIVE SUMMARY

This surveillance of Pacific Northwest Laboratory (PNL) activities related to Global Climate Modeling was conducted at Richland, Washington on July 7 and 8, 1993, as a follow-up to Corrective Action Request (CAR) YM-93-24. During the surveillance, the status of actions related to resolving those conditions identified in the CAR were evaluated. The results of the evaluation indicate that PNL has only performed preliminary work on qualification of the Global Climate Modeling software. As of July 2, 1993, the PNL Project Manager has appointed a Lead Developer to begin the qualification effort in accordance with PNL's Quality Assurance (QA) Program. Activities regarding verification of the code are expected to be completed by September 30, 1993. In summary, the corrective action specified in the accepted response to CAR YM-93-024, was found to be incomplete and new action will be proposed by PNL. A request for an amended response to CAR YM-93-024 will be issued to PNL from the Yucca Mountain Quality Assurance Division (YMQAD).

2.0 PURPOSE AND SCOPE

Surveillance 93-032 was conducted at PNL's facility in Richland, Washington to determine the status of activities relating to the resolution of the conditions identified in CAR YM-93-024.

3.0 SURVEILLANCE TEAM

Richard L. Maudlin, Surveillance Team Leader, YMQAD

4.0 PERSONNEL CONTACTED DURING THE SURVEILLANCE

R. Crawley, Work Breakdown Structure Manager for Climatology,
U. S. Department of Energy
P. Eslinger, Program Manager, PNL
K. Harrison, Technical Group Leader, PNL
V. Lauhala, Quality Engineer, PNL
J. McGarrah, OCRWM QA Program Manager, PNL
F. Schelling, Regional Climate Principal Investigator,
Sandia National Laboratories (SNL)
L. Vail, Senior Resident Engineer/Lead Developer, PNL
W. Walters, Global Climate Task Manager, PNL

5.0 SURVEILLANCE RESULTS

During the surveillance, discussions were held with the PNL Program Manager regarding the status of activities related to the implementation of corrective actions noted in CAR YM-93-024. Since PNL's initial response to CAR YM-93-024, a change in approach to the resolution of the open items from the 1990 audit of the University of Maine (Attachment 1), has occurred. PNL project management has elected to remove all Global Climate Modeling activities from the University of Maine, and perform the testing and qualification of the Global Modeling software in-house utilizing PNL's approved software procedures to accomplish the task. In this effort, PNL has elected to take responsibility for the resolution of the open items from the 1990 audit of the University of Maine. Resolution of these open items is essential to the resolution of CAR YM-93-024. Due to this change of course, PNL needs to resubmit a revised response to CAR YM-93-024, indicating the change in responsibility for resolution of the open items in the 1990 audit of the University of Maine and a new date for completion of corrective action. This was discussed with the PNL Project Quality Engineer and a commitment was made to submit a revised response. As part of the action to resolve the open items, PNL has agreed to perform monthly surveillances of the activities, starting July 1993, related to the qualification testing of the Global Climate Model and submit a copy of the surveillance reports to YMQAD. The purpose for this is to establish a level of confidence that PNL is addressing the issues related to the 1990 University of Maine audit and CAR YM-93-024.

To date, PNL has been performing limited work on the Global Climate Modeling effort. All of the work is considered preliminary since a Lead Developer had not been assigned. In a Memorandum, P. Eslinger to L. Vail, dated July 2, 1993, the PNL Program Manager appointed a Lead Developer to begin official work on the testing and qualification of the computer code. All work from this date forward will be done in accordance with PNL's approved QA program and implementing procedures. The deliverables that were acquired by PNL from the University of Maine for completion of the task included: Global Climatology Modeling Code, software Users Manual, Final Report discussing the computer code, and the Ice Sheet Database for the X-Y-Z coordinates of the ice masses. PNL has performed a preliminary code walk-through of the Ice Sheet Reconstruction Model by the person now designated as the Lead Developer. The review was informally documented on July 2, 1993 in Memorandum, L. Vail to W. Walters. The results of this walk-through identified 13 significantly serious problems that need to be addressed. In discussions with the PNL Program Manager, it was suggested that these items be rolled into the formal review of the code that will take place under the guise of the approved QA procedures. The PNL Program Manager acknowledged that the items identified in the preliminary review would be addressed in the formal review.

PNL's position is that the code developed by the University of Maine was not done under a qualified QA program and is treating the software as "Acquired Software." Qualification of the software will be processed in accordance with PNL's approved software procedures for Acquired Software. At this point, PNL is only going to perform verification of the Global Climate Modeling software and the responsibility for software validation will be performed by others (i.e. SNL). During the process of software verification (i.e. qualification process), PNL plans to update the software user documentation (Users Manual), verify the software performs as the Users Manual reflects, and verify software/hardware/operating system compatibility and function (i.e. system tests).

Prior to transition of the Global Climate Modeling task from PNL to SNL in September 1993, YMQAD should assess the need to perform a physical verification of the work completed to date by PNL regarding resolution of the open items from the 1990 University of Maine Audit and CAR YM-93-024.

6.0 RECOMMENDATIONS

1. PNL should assure that the 13 items addressed in the preliminary code walk-through are incorporated into the formal review and appropriately documented as required by approved procedures so that the items can be tracked until formally resolved.
2. PNL should perform monthly surveillances of the qualification activities starting July 1993 and ending in September 1993. Copies of these surveillance reports should be sent to YMQAD.

7.0 ATTACHMENTS

Attachment 1: Findings from PNL 1990 Audit/Survey of the University of Maine

ATTACHMENT 1

FINDINGS

Finding # 1

Software testing was not adequate to reveal all deficiencies associated with the code.

REQUIREMENTS

- a. "Tests of the models will be designed by the contractor for verification and validation."
(Contract 8-R7112-A-E, Attachment 1, page 2, item number 3)
- b. "The Software Testing Plan shall specify the testing documentation required, the evaluation methods, and acceptance criteria for review of testing. The testing shall, at a minimum, exercise the software options and the range of variables likely to be encountered in the application of the software."
(SMP-307, "Conversion Testing, Verification and/or Validation of Software", 3.3.2)

BACKGROUND

Following completion of code testing activities and issuance of the Operating Manual for the Global Ice Sheet Model to PNL, University of Maine personnel discovered a code error in the Northern Hemisphere program that caused underestimation of ice volumes by a factor of two.

Finding # 2

There was a lack of code configuration control necessary to provide traceability of results to a particular software version.

REQUIREMENTS

- a. "Document/material control shall be established to assure that work specific to this contract (i.e., software and documentation) are distinguishable from other such items located in the same facility during all periods of use, handling, or storage. Identification shall be maintained either on the item, or in documents traceable to the items."
(Contract B-R7112-A-E, Appendix A, page 3)
- b. "The code custodian shall assure that the unique software version number is identified in the software listing and is printed in scientific computer code output."
(SMP-305, "Software Configuration Control", 3.3.2)

BACKGROUND

Subsequent to the at-site audit, the code was modified to correct an error but the revision number remained unchanged.

Finding # 3

The Operating Manual for the Ice Sheet Reconstruction Model lacked inclusion of sample and/or test problems.

REQUIREMENTS

- a. "Users Manual Documentation shall include Sample and/or test problems."
(SMP-301, "Determination of Software Classification", Software Classification Form, Rev 0, Sept 7, 1990, Section V 13)

BACKGROUND

Review of the Operating Manual for the Ice Sheet Reconstruction Model revealed that it lacked inclusion of an output file corresponding with the input file (Table 2)

Paul W. Eslinger

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