# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
# QUALITY ASSURANCE
# SURVEILLANCE REPORT

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| **PROJECT NO:** 20.06002.01.031 | **REPORT NO:** 2003-02 | **PAGE** 1 **OF** 4 |

**SURVEILLANCE SCOPE:** Development and control of software

**REFERENCE DOCUMENTS:** TOP-018, Development and Control of Scientific and Engineering Software
QAP-004, Surveillance Control
QAP-013, Quality Planning
Corrective Action Request (CAR) 2001-04

**STARTING DATE:** December 30, 2002 **ENDING DATE:** February 4, 2003

**QA REPRESENTATIVE:** R. Folck Randy Folck 02/07/03

**PERSONS CONDUCTING TEST/EXAM/ACTIVITY:** V. Jain, R. Janetzke, B. Mabrito, S. Painter, R. Fedors, M. Ehnstrom, B. Dasgupta, G. Wittmeyer, M. Padilla, N. Franklin, M. Smith, S. Hsiung, P. Makin, I. Chichkov, M. Necsoiu, B. Winfrey, D. Gute, P. LaPlante, S. Colton, D. Waiting, D. Wyrick, O. Pensado, O. Povetko, D. Stead, A. ~~Alonzo~~ Lozano, R. Benke.

**SATISFACTORY FINDINGS:**

See page 2.

**UNSATISFACTORY FINDINGS:**

See page 2.

**NONCONFORMANCE REPORT NO:** None

**ATTACHMENTS:** None

**RECOMMENDATIONS/ACTIONS:**

See page 3.

APPROVED: _____
CENTER DIRECTOR OF QUALITY ASSURANCE

DATE: 2/7/2003

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ORIGINAL - CENTER QA DIRECTOR/ QA RECORDS
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PRICIPAL INVESTIGATORS
ELEMENT MANAGERS
TECHNICAL & ADMINISTRATIVE DIRECTORS
M. Ehnstrom

**Satisfactory Findings:**

Software Requirements Descriptions (SRD) are up-to-date as required by TOP-018, Section 5.3 for TPA, MULTIFLO, and 3DStress scientific and engineering software.

Software Development Plans (SDP) have been developed as required by TOP-018, Section 5.4, for TPA, MULTIFLO, 3DStress, and PCSA Tools. The code development process, coding guidelines, configuration control practices, and use of Software Change Reports (SCR) are being performed in accordance with applicable SDP guidelines. Acceptance testing is being performed in accordance with TOP-018, Section 5.6. See recommendations on revisions to SDP content.

Performed QA Verification for the following acquired, not to be modified, codes: MCNP, Version 4C2, ORIGEN-ARP, Version 2.0, GMT, Version 3.4.2, Scale, Version 4.4a, and RSAC, Version 6.1. Documentation and installation testing complied with applicable sections of TOP-018.

The SDP for 3DStress has been revised to reflect the "product" support nature of the project. See recommendations on SDP content.

Verified or adjusted target completion dates for validation of category I or II codes. Target dates are reflected in the CNWRA Master Directory of Scientific & Engineering Software.

**Unsatisfactory Findings**:

A new PCSA Tools feature termed "human error probability" is being implemented through a Software Change Report (SCR). The SRD was not updated to reflect this new feature as required by TOP-108, Section 5.3.3. The need for this additional feature as well as other new features is included in the PCSA Development Progress Report dated September 2001. A technically reviewed progress report, letter report, etc. should be considered equivalent as an SRD revision. See recommendation to clarify TOP-018 on this subject.

AMESH 2.0 was identified in a QRAM as being used for project-related work. The code was not listed on the CNWRA Master Directory of Scientific & Engineering Software. Further investigation revealed that the code had been placed under TOP-018 control but the directory had not been updated. The directory was updated and no further action is required.

NRC-WVDP-GIS, Version 1.1 was released without being listed on the CNWRA Master Directory of Scientific & Engineering Software. The delay was due to minor documentation corrections required to complete the QA verification process. Documentation was updated, the directory was updated and no further action is required.

**Recommendations:**

Recommendations related to TOP-018:

TOP-018, Section 1.0 states, "codes that are used for simple calculations or that substitute for hand calculations are covered by QAP-014, Documentation and Verification of Scientific and Engineering Calculations." In addition to codes that are used for simple calculations, codes that are "single use codes without intention to deliver the code to the customer, or share with others at the CNWRA" should also be considered for review via QAP-014.

TOP-018, Section 5.3.3 requires that revisions to the SRD shall be made if changes are planned to the objective, mathematical and numerical basis or user interfaces in an existing SRD. TOP-018 should be clarified that a QAP-002 technically reviewed progress report, letter report, etc. may be considered equivalent to a SRD revision.

TOP-018, Section 5.5.5 requires that code reviews shall be performed as determined by the Element Manager and documented in the SDP. Generally, it is too early in the development life cycle, during SDP development, to accurately identify important software modules that would require code reviews. The use of code reviews should be at the discretion of the developer and not included in the SDP.

TOP-018, Section 5.10 describes the software validation process for the CNWRA. Documentation, reporting and management of anomalies (e.g., bugs, future enhancements, annoyance, etc.) identified during validation testing should be addressed in this section and included in Appendix F, Software Validation Test Plan Outline.

Top-018, Section 5.10.6 requires that when validated software is changed, the SVTP/validation report shall be reviewed by the Developer/User and revised as appropriate. To enhance traceability, validation test cases, input data, etc. should be maintained under version control to correspond with the applicable version of software.

As part of the development/acceptance testing process, a CNWRA-developed code may be released to a limited group of users, internal and external to the CNWRA, to obtain feedback on usability, features, defects, etc. This practice is generally referred to as a beta release or beta testing. The process for beta release/testing should be incorporate intoTOP-018.

TOP-018, Appendix B states, "The SDP should be revised as the software development effort progresses through the development life cycle (e.g., transition from initial development and release to routine maintenance)." Typically, when the schedule, work breakdown structure, staffing plan, risk management plan, and/or resources have changed (in some cases significantly) applicable SDPs have not been updated. Active SDPs should be reviewed and updated at least once per year. This review and revision should coincide with development of CNWRA QRAMs.

TOP-018, Appendix B provides a template for a Software Development Plan. An additional SDP template should be developed to address those codes that are supported by the CNWRA on an on-going basis as a "product," e.g. 3DStress. The 3DStress SDP may be used as a model for this new template.

The Software Release Notice (SRN) provision for documenting persons authorized access to a particular version of software, read only or read-write, is neither useful nor effective. When software is placed on the CNWRA server, anyone with authorized access to the server may use the software. Recommend the SRN form be revised to list the distribution of the software, internal (e.g. specific work stations and/or CNWRA server) and external parties.

A quick reference guide to TOP-018 for developed codes has been developed and used by staff members. This quick reference guide should be placed under document control as an appendix to TOP-018. A quick reference guide should also be developed acquired codes.

Recommendations related to software validation:

Select a sample of validation category I and II codes, developed and acquired, and provide these codes to IMS to verify the adequacy of installation instructions. If results are unsatisfactory, e.g., unable to install and/or execute the software without recourse to the developer/user, a nonconformance should be initiated. Based on results, the QA verification process may be modified to address accuracy of installation instructions.

For complex code validation (e.g. TPA), consider using a code coverage tool to aid in the development of the validation test cases. For example, if a test case is to exercise a certain set of subroutines, the code coverage tool can be used to verify that the test case visited the subroutines of interest.

Recommendations related to specific codes:

PCSA, Version 2.0 will not be validated rather, PCSA Tool, Version 3.0 is scheduled for validation December 2003. It is recommended that a Software Requirements Document (SRD) for Version 3.0 be issued and reflect any new functionality for PCSA Tool beyond the current SRD. The Software Development Plan (SDP) should also be revised to reflect the Version 3.0 tasks, schedule and level of effort required to have the code ready for validation by December 2003.

Computer code named Prism, Version 1.0 (also known as mag_parallel, version 1.0) was developed by L. Connor and acquired by the CNWRA. Initially, a Software Requirements Description was submitted to the CNWRA for review. Since the code is an acquired code, it is recommended that a User's Guide would be more appropriate.