Sandia National Laboratories

Albuquerque, New Mexico 87185

February 15, 1986

'86 FEB 26 P12:01

Neil M. Coleman
Hydrology Section
Geotechnical Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Dear Mr. Coleman:

Enclosed is the monthly report on FIN A-1158, Repository Site
Definition and Technology Transfer for January 1986. Please
feel free to contact me if you have any questions or comments.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell, Supervisor
Waste Management Systems
Division 6431

RMC:6431:jm

Enclosure

Copy to:
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6431   C. P. Harlan
6431   G. F. Wilkinson

WM Record File
WM-RES
A1158
SNL

WM Project 10, 11, 16
Docket No. _____
PDR ✓
LPDR ✓ (B, N, S)

Distribution:
Coleman   Jean-ticket
                 NHill
(Return to WM, 623-SS)

2847

PROGRAM: Repository Site Definitions   FIN#:   A-1158
             Short-term Technical Assistance   Tasks I, V

CONTRACTOR: Sandia National   BUDGET PERIOD: 10/85 -
             Laboratories   9/86

NMSS PROGRAM MANAGER: N. M. Coleman   BUDGET AMOUNT: ?

CONTRACT PROGRAM MANAGER: R. M. Cranwell   FTS PHONE: 844-8368

PRINCIPAL INVESTIGATOR: G. F. Wilkinson FTS PHONE: 844-0074

PROJECT OBJECTIVE

To develop reference repositories in media other than bedded
salt (i.e., basalt, domed salt, welded tuff, and granite).

ACTIVITIES DURING JANUARY 1986

No activity.

PROGRAM: Technology Transfer   FIN#: A-1158
             Code Maintenance Validation   Task II
             and Verification of Computer Codes

CONTRACTOR: Sandia National   BUDGET PERIOD: 10/85 -
             Laboratories   9/86

NMSS PROGRAM MANAGER: N. M. Coleman   BUDGET AMOUNT: ?

CONTRACT PROGRAM MANAGER: R. M. Cranwell   FTS PHONE: 844-8368

PRINCIPAL INVESTIGATOR: G. F. Wilkinson   FTS PHONE: 844-0074

PROJECT OBJECTIVE

To ensure through technical support, problem definition, and
documentation the timely, thorough, and efficient transfer of
the information, analysis techniques, and analysis tools
developed for the U.S. Nuclear Regulatory Commission (NRC) by
the methodology program.

ACTIVITIES DURING JANUARY 1986

A Form 173 providing partial FY86 funding of $180,000 and a
revised Statement of Work (SOW) were received this month. The
173 was signed to indicate acceptance of the partial funds and
transmitted to the NRC. We have reviewed the SOW, which was
revised mainly to include the added work of implementing and
maintaining standard versions of codes at a facility where the
NRC has an established time-sharing agreement. a revised Form
189 has been prepared in response to the revised SOW, and is
currently in SNLA administrative review. As indicated on the
Form 173, the balance of FY86 funding will be provided to SNLA
by a subsequent Form 173 after NRC's receipt of an acceptable
Form 189.

Data input files included in the SWIFT II Self-Teaching
Curriculum are being verified with the 4.84 version of SWIFT II
to ensure consistency with output on the microfiche.

Ginger Wilkinson attended an NRC-sponsored workshop on
"Validation of Mathematical Models for Waste Repository
Performance Assessment" and "Confidence Building through
Synthesis of Experiments and Calculations" held in Bethesda,
Maryland on January 27-29, 1986. The objectives of the
workshop were to bring together experimentalists and
mathematical modelers to build a basis and consensus for
confidence in model predictions, and to define critical
experiments for testing models and their supporting
assumptions. Of particular interest to FIN A-1158 was a

discussion on the validation of computer codes. A detailed
trip report on this workshop is currently being prepared and
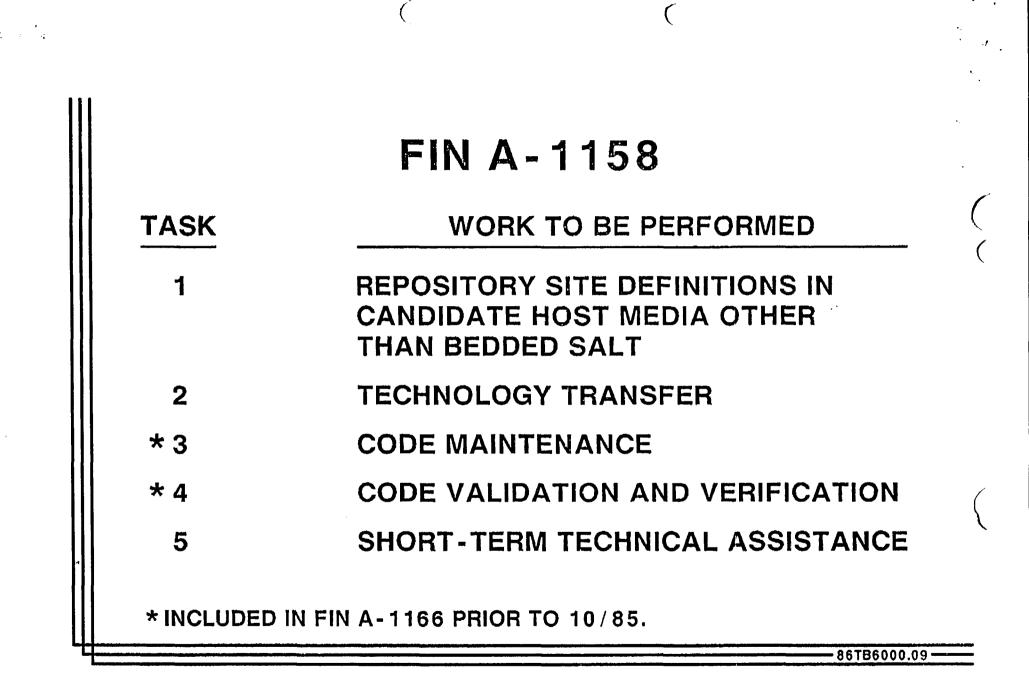will be transmitted with the next monthly report.

On January 30, 1986 a program review for FIN A-1158 was held at
the NRC offices in Silver Spring, Maryland. Ginger Wilkinson
presented a description of each of the five tasks, prior
efforts since the last program review in July 1984, and planned
efforts for FY86 and FY87. In addition, a brief presentation
was delivered on FIN A-1166, which was terminated on December
31, 1985, and its final product, the QA plan for computer
software (NUREG/CR-4369).

The NRC staff was particularly interested in current efforts to
implement and maintain standard versions of codes at a computer
facility with which the NRC has had a time-sharing agreement.
As mentioned in the discussion, we have applied for user
accounts at INEL and are continuing to investigate the
feasibility of establishing a time-sharing agreement for the
NRC at SNLA. Hard copies of the slides which were presented
during the program review have been enclosed for your
information and use.

FIN A-1158

REPOSITORY SITE DEFINITION

AND

TECHNOLOGY TRANSFER

WASTE MANAGEMENT SYSTEMS
DIVISION 6431

Sandia National Laboratories
Albuquerque, New Mexico

86TB6000.08

FIN A-1158

TASK	WORK TO BE PERFORMED
1	REPOSITORY SITE DEFINITIONS IN CANDIDATE HOST MEDIA OTHER THAN BEDDED SALT
2	TECHNOLOGY TRANSFER
* 3	CODE MAINTENANCE
* 4	CODE VALIDATION AND VERIFICATION
5	SHORT-TERM TECHNICAL ASSISTANCE

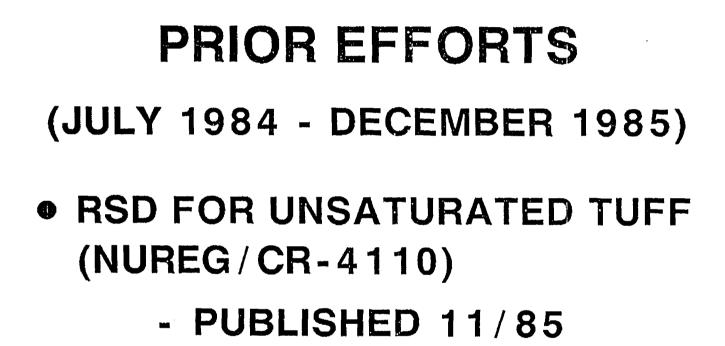* INCLUDED IN FIN A-1166 PRIOR TO 10/85.

TASK 1: REPOSITORY SITE DEFINITIONS IN CANDIDATE HOST MEDIA OTHER THAN BEDDED SALT

OBJECTIVE: DEVELOP RSDs FOR CANDIDATE HOST MEDIA AND PROVIDE DATA FOR USE IN DEVELOPING AND TESTING PERFORMANCE ASSESSMENT METHODOLOGIES FOR THE VARIOUS MEDIA.

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PRIOR EFFORTS

(JULY 1984 - DECEMBER 1985)

- RSD FOR UNSATURATED TUFF (NUREG / CR - 4110)

    - PUBLISHED 11 / 85

PLANNED ACTIVITIES

FOR FY86

- AS DIRECTED BY NRC, ALL WORK IN THIS TASK IS DEFERRED FOR AN INDEFINITE PERIOD.

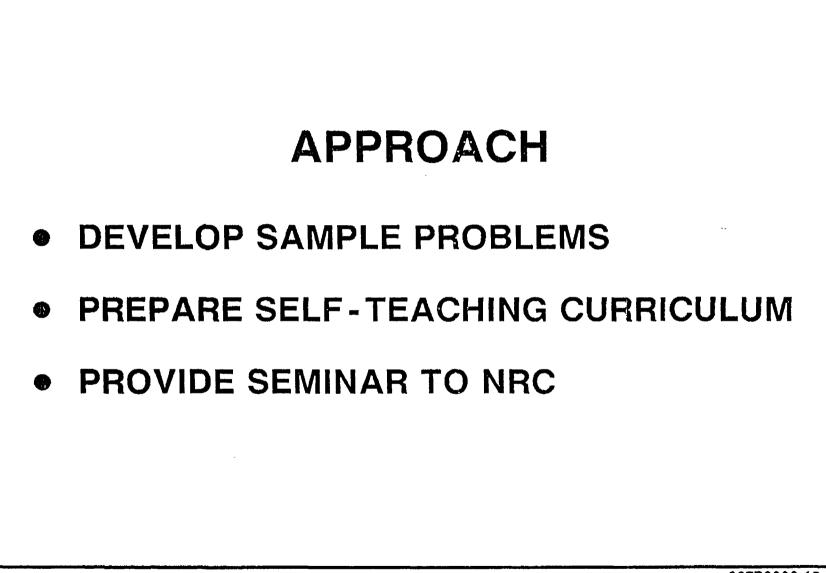86TB6000.12

TASK 2: TECHNOLOGY TRANSFER

OBJECTIVE: PROVIDE TECHNICAL SUPPORT FOR THE
TRANSFER TO THE NRC OF THE CAPABILITY
TO USE THE INFORMATION, ANALYTICAL
TECHNIQUES, AND TOOLS DEVELOPED
IN THE PERFORMANCE ASSESSMENT
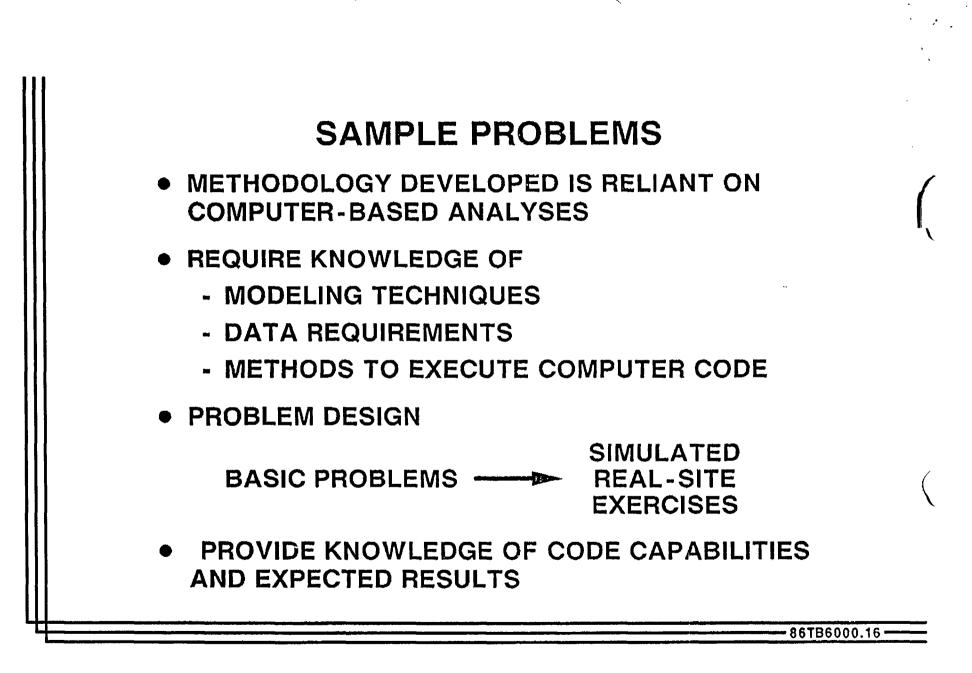METHODOLOGY DEVELOPMENT PROGRAM
(FIN A-1266).

TRANSFER OF PERFORMANCE ASSESSMENT METHODOLOGY

- SCENARIO DEVELOPMENT TECHNIQUES

- SENSITIVITY / UNCERTAINTY ANALYSIS TECHNIQUES

- SOURCE TERM MODELS

- HYDROGEOLOGY AND RADIONUCLIDE MIGRATION CODES

86TB6000.14

APPROACH

- DEVELOP SAMPLE PROBLEMS

- PREPARE SELF-TEACHING CURRICULUM

- PROVIDE SEMINAR TO NRC

SAMPLE PROBLEMS

- METHODOLOGY DEVELOPED IS RELIANT ON COMPUTER-BASED ANALYSES

- REQUIRE KNOWLEDGE OF
  - MODELING TECHNIQUES
  - DATA REQUIREMENTS
  - METHODS TO EXECUTE COMPUTER CODE

- PROBLEM DESIGN

  BASIC PROBLEMS ⟶ SIMULATED REAL-SITE EXERCISES

- PROVIDE KNOWLEDGE OF CODE CAPABILITIES AND EXPECTED RESULTS

86TB6000.16

SELF-TEACHING CURRICULUM

- PROVIDES STAND-ALONE DOCUMENT TO ASSIST USERS IN EXECUTING CODES

- ASSUMES USER'S MANUAL AVAILABLE TO USER

- PROVIDES EXAMPLES OF DATA INPUT REQUIRED TO EXECUTE SAMPLE PROBLEMS

- PROVIDES RESULTS OF ANALYSIS FOR COMPARISON

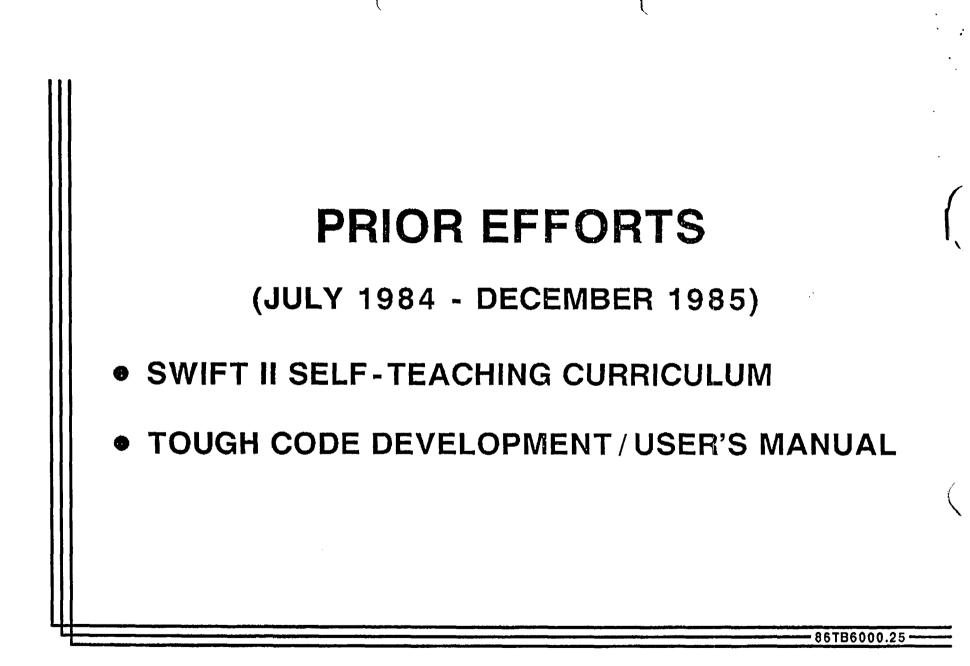86TB6000.17

SEMINAR

- PRESENTS

  - MATHEMATICAL MODELING APPROACHES
  - DESIGN OF COMPUTER CODE (FLOW CHART)
  - DATA INPUT REQUIREMENTS
  - ADDITIONAL SOFTWARE NEEDED FOR EXECUTION
  - LIMITATIONS OF SOLUTIONS
  - OUTPUT OF RESULTS

- DESCRIBES IN DETAIL SAMPLE PROBLEMS AND THEIR SOLUTIONS

- PROVIDES FORUM FOR INFORMAL DISCUSSION BETWEEN CODE DEVELOPERS (SNLA STAFF) AND POTENTIAL USERS (NRC STAFF)
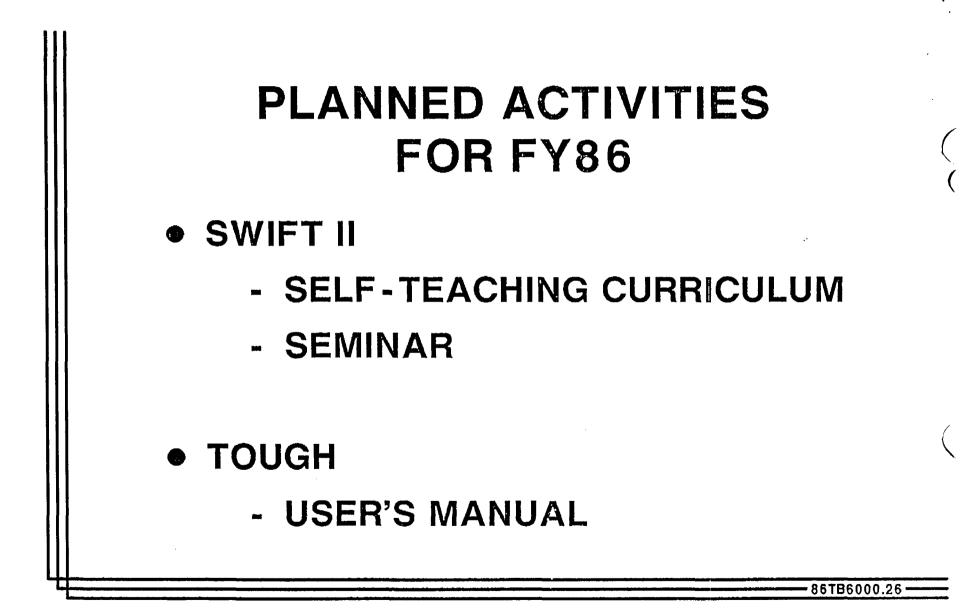
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BENEFITS OF TECHNOLOGY TRANSFER PROGRAM

- PROGRAM PROVIDES TECHNOLOGY DEVELOPED AT SNLA TO NRC STAFF IN AN ORDERLY AND UNDERSTANDABLE FASHION

- SEMINARS PROVIDE FORUM FOR DISCUSSION OF USE OF CODES, POTENTIAL PROBLEMS AND PRESENTATION OF STANDARD RESULTS FOR COMPARISON

- SELF-TEACHING CURRICULA PROVIDE UNDER-STANDING OF THE CODE AND GUIDE USER FROM SIMPLE TO COMPLEX ANALYSIS

86TB6000.24

PRIOR EFFORTS

(JULY 1984 - DECEMBER 1985)

- SWIFT II SELF-TEACHING CURRICULUM

- TOUGH CODE DEVELOPMENT / USER'S MANUAL

PLANNED ACTIVITIES
FOR FY86

- SWIFT II

  - SELF-TEACHING CURRICULUM

  - SEMINAR

- TOUGH

  - USER'S MANUAL

TASK 3: CODE MAINTENANCE

OBJECTIVE: IMPLEMENT A QUALITY ASSURANCE PROGRAM TO MAINTAIN COMPUTER CODES, DETECT AND CORRECT ERRORS, DOCUMENT CHANGES AND INFORM THE NRC STAFF.

86TB6000.27

APPROACH

- **SUPPORT A QA PROGRAM FOR STANDARD VERSIONS**

- **MAINTAIN STANDARD VERSIONS OF EACH CODE**

- **DEVELOP STANDARD PROBLEMS**

- **DETECT, CORRECT AND REPORT ERRORS**

- **IMPLEMENT AND MAINTAIN CODES AT A FACILITY WHERE NRC HAS AN ESTABLISHED TIME-SHARING COMPUTER USAGE AGREEMENT**

MAINTENANCE OF STANDARD VERSIONS

- DESCRIPTION

  - COMPATIBLE WITH CURRENT OPERATING SYSTEM

  - ACCOMPANIED BY USER'S MANUAL

  - PROVIDED TO NRC ON MAGNETIC TAPE, HARD COPY

- CURRENT STANDARD VERSIONS EXIST FOR THESE CODES:
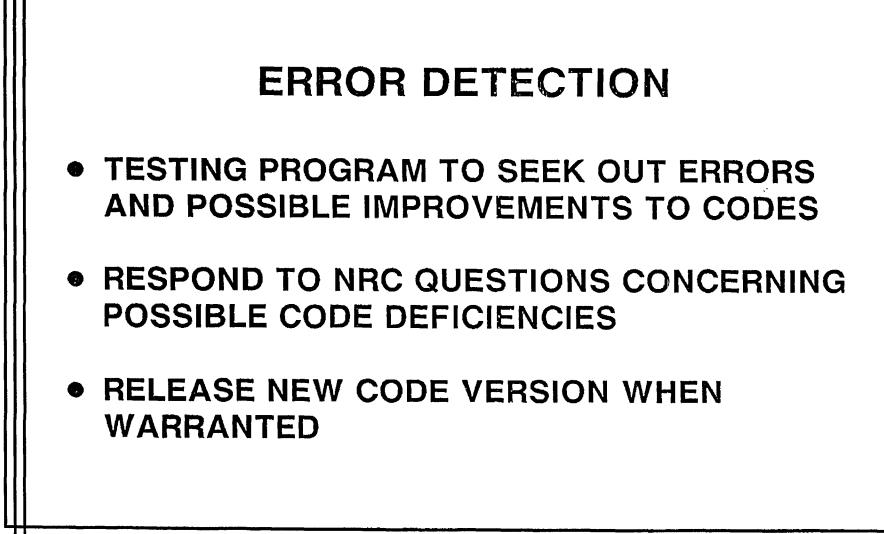
  SWIFT, DNET, NWFT, NWFT/DVM, LHSPL, DHEJL81, PATH1

- ADDITIONAL CODES AS DEVELOPED

  SWIFT II, TOUGH, USGS3D

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STANDARD PROBLEMS

- DEMONSTRATE IMPORTANT CAPABILITIES OF THE MODEL IMPLEMENTED BY THE COMPUTER CODE

- USE AS TESTS WHEN MAJOR CHANGES MADE TO EXISTING CODES OR NEW VERSIONS RELEASED

- PREPARE ADDITIONAL PROBLEMS AS NEW MAJOR CAPABILITIES ARE RELEASED

- PROVIDE CHECK BETWEEN RESULTS ON VARIOUS COMPUTER SYSTEMS

86TB6000.31

ERROR DETECTION

- **TESTING PROGRAM TO SEEK OUT ERRORS AND POSSIBLE IMPROVEMENTS TO CODES**

- **RESPOND TO NRC QUESTIONS CONCERNING POSSIBLE CODE DEFICIENCIES**

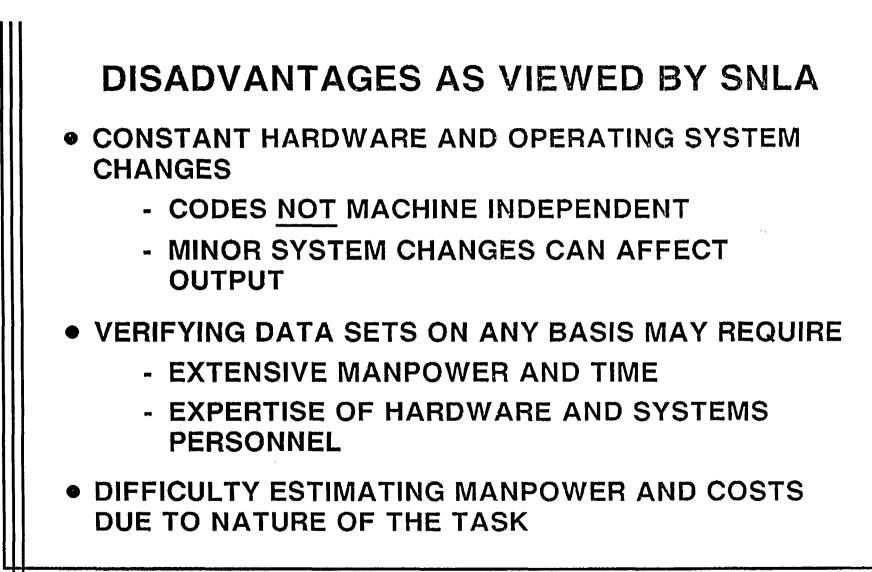- **RELEASE NEW CODE VERSION WHEN WARRANTED**

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TRANSFER OF CODES

- NRC REQUEST THAT STANDARD CODES
  BE MAINTAINED AT COMPUTER FACILITY
  WITH WHICH NRC HAS AN ESTABLISHED
  TIME-SHARING USAGE AGREEMENT.

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ADVANTAGES TO NRC

- AVAILABILITY OF STANDARD VERSIONS OF CODES TO NRC STAFF AND CONTRACTORS

- ACCESSIBILITY OF SOFTWARE IN EXECUTE-ONLY FORMAT PRECLUDES ALTERATION BY USERS

- REDUCTION OF ADP COSTS

86TB6000.34

DISADVANTAGES AS VIEWED BY SNLA

- CONSTANT HARDWARE AND OPERATING SYSTEM CHANGES

    - CODES <u>NOT</u> MACHINE INDEPENDENT

    - MINOR SYSTEM CHANGES CAN AFFECT OUTPUT

- VERIFYING DATA SETS ON ANY BASIS MAY REQUIRE

    - EXTENSIVE MANPOWER AND TIME

    - EXPERTISE OF HARDWARE AND SYSTEMS PERSONNEL

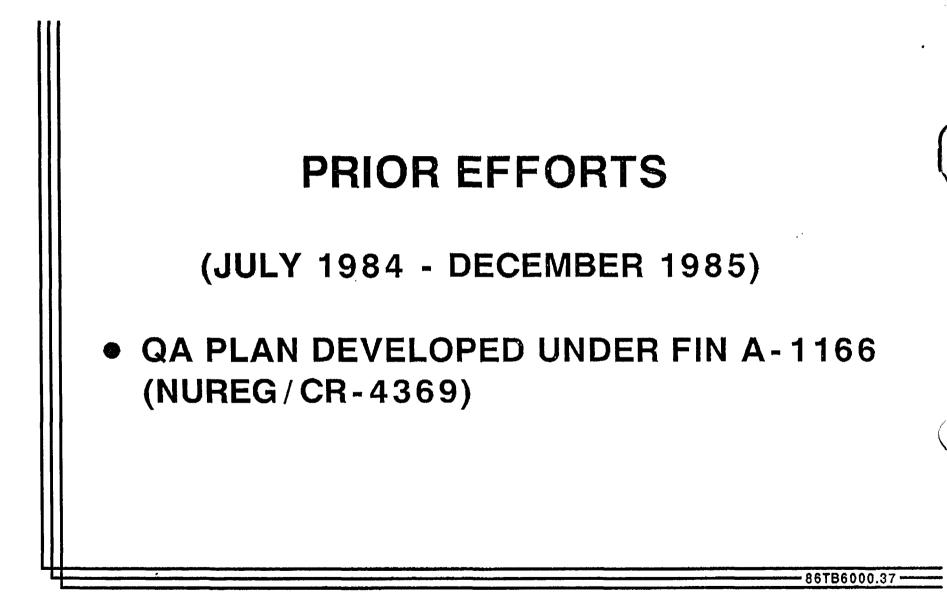- DIFFICULTY ESTIMATING MANPOWER AND COSTS DUE TO NATURE OF THE TASK

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STATUS

- **SNLA INTERNAL CHECK FOR PREVIOUS EXPERIENCE WITH INEL SYSTEM**

- **REVIEW OF INEL SYSTEMS INFORMATION**

- **APPLICATION FOR USER ACCOUNT AT INEL**

- **FURTHER CHECK ON POSSIBILITY OF USING SNLA SYSTEM**

86TB6000.36

PRIOR EFFORTS

(JULY 1984 - DECEMBER 1985)

- QA PLAN DEVELOPED UNDER FIN A-1166 (NUREG/CR-4369)

A-1158, Tasks I and V
0976.010
January 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

		Current Month	Year-to-Date
I.	Direct Manpower (man-months of charged effort)	0.0	0.6
II.	Direct Loaded Labor Costs	0.0	5.0
	Materials and Services	0.0	0.0
	ADP Support (computer)	0.0	0.0
	Subcontracts	0.0	0.0
	Travel	0.0	0.0
	Other	0.0	0.0
	TOTAL COSTS	0.0	5.0

Other = rounding approximation
        by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
107K	To be determined	None	To be determined

A-1158, Task II
0976.020
January 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

		Current Month	Year-to-Date
I.	Direct Manpower (man-months of charged effort)	1.8	4.7
II.	Direct Loaded Labor Costs	16.0	40.0
	Materials and Services	0.0	0.0
	ADP Support (computer)	1.0	2.0
	Subcontracts	6.0	-23.0
	Travel	0.0	0.0
	Other	0.0	0.0
	TOTAL COSTS	23.0	19.0

Other = rounding approximation
        by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
43K	To be determined	None	To be determined

A-1158

January 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

		Current Month	Year-to-Date
I.	Direct Manpower (man-months of charged effort)	1.8	5.3
II.	Direct Loaded Labor Costs	16.0	45.0
	Materials and Services	0.0	0.0
	ADP Support (computer)	1.0	2.0
	Subcontracts	6.0	-23.0
	Travel	0.0	0.0
	Other	0.0	0.0
	TOTAL COSTS	23.0	24.0

Other = rounding approximation
        by computer

III. Funding Status

Prior FY Carryover	FY86 Projected Funding Level	FY86 Funds Received to Date	FY86 Funding Balance Needed
150K	To be determined	None	To be determined