LOUISIANA POWER & LIGHT / 317 BARONNE STREET • P.O. BOX 60340
NEW ORLEANS, LOUISIANA 70160 • (504) 595-2204
MIDDLE SOUTH UTILITIES SYSTEM

November 21, 1984

J.M. CAIN
President

W3B84-0817
A4.05

Director of Nuclear Reactor Regulation
ATTN: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford 3 SES
Partial Response to Items
from Waterford Review Team

REFERENCES: 1) Letter W3B84-0807, J.M. Cain to D.G. Eisenhut, dated October 31, 1984
2) Letter, D.G. Eisenhut to J.M. Cain, dated June 13, 1984

Dear Mr. Eisenhut:

The purpose of this letter is to submit revised responses supplementing Issues 6, 7, 19, 20 and the assessment of Collective Significance. The revision to Issue 6 is provided in accordance with reference 1. The remaining limited revisions reflect information developed since the original submittals and limited technical corrections. The logic and the approaches to resolution of the issues remain unchanged. These revisions have been discussed with your staff.

To facilitate your review, change bars have been provided in the right hand margins of the revised responses to indicate the portions which have been revised.

The revisions to the responses have been reviewed and verified by LP&L QA in accordance with Procedure QASP 19-13. The designated subcommittee of the Waterford Safety Review Committee also has reviewed the adequacy of the revised responses for resolving the issues raised. The subcommittee scope of responsibility does not include independent validation of the facts.

The complete responses to Issues 1 and 10 with respect to QC inspectors will be submitted shortly.

B001
1/1

The Task Force has not yet completed its independent validation of the facts. The Task Force has committed to notifying me and the NRC immediately should it find significant deviations in the course of its validation. In the event of such notification, LP&L will amend individual responses as may be necessary.

Sincerely,

J.M. Cain

JMC:DED:pcl

Attachments

cc: (See next page)

cc: Mr. R.S. Leddick

Mr. D.E. Dobson

Mr. R.F. Burski

Mr. K.W. Cook

Mr. T.F. Gerrets

Mr. A.S. Lockhart

Mr. R.P. Barkhurst

Mr. L. Constable
USNRC - Waterford 3

Mr. R.D. Martin
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Suite 1000
Arlington, TX 76011

Mr. D. Crutchfield
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. G. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
Washington, D.C. 20555

Mr. M. Peranich
Waterford 3 Investigation and
Evaluation Inquiry Report Team
Leader
4340 E.W. Hwy. MS-EWS-358
Bethesda, MD 20114

Mr. D. Thatcher
Waterford 3 Instrumentation & Control
Leader
7920 Norfolk Ave. MS-216
Bethesda, MD 20114

Mr. L. Shao
Waterford 3 Civil/Structure Team
Leader
5650 Nicholson Ln.
Rockville, MD

Mr. J. Harrison
Waterford 3 QA Team Leader
Region III
700 Roosevelt Rd.
Glen Ellyn, IL 60137

Mr. J.E. Gagliardo
Director of Waterford 3 Task
Force
Region IV
611 Ryan Plaza Suite 1000
Arlington, TX 76011

Mr. D. Couchman
NUS Corporation
910 Clopper Road
Gaithersburg, MD 20878

Mr. R.L. Ferguson
UNC Nuclear Industries
1200 Jadwin, Suite 425
Richland, WA 99352

Mr. L.L. Humphreys
UNC Nuclear Industries
1200 Jadwin, Suite 425
Richland, WA 99352

Mr. G. Charnoff
Shaw, Pittman, Potts &
Trowbridge
1800 M. St. N.W.
Washington, D.C. 20555

Dr. J. Hendrie
50 Bellport Lane
Bellport, NY 11713

Mr. R. Douglass
Baltimore Gas & Electric
8013 Ft. Smallwood Road
Baltimore, MD 21226

Mr. M.K. Yates, Project Manager
Ebasco Services, Inc.
Two World Trade Center, 80th
New York, NY 10048

Mr. R. Christesen, President
Ebasco Services, Inc.
Two World Trade Center
New York, NY 10048

ISSUE: 20 DATE: 11/21/84

TITLE:

Construction Materials Testing (CMT) Personnel Qualification Records.

DESCRIPTION OF ISSUE:

Verify the proper certification of construction materials testing personnel.

LP&L APPROACH TO RESOLUTION:

GEO has been contacted to assist in providing additional background information or justification for qualification of QA/QC personnel identified as part of NCR W3-F7-116.

A verification program has been established to review the professional credentials of 100% of the GEO CMT site QA/QC personnel, including supervisors and managers who performed safety related functions at Waterford III during its construction. Criteria for certifications or qualification of QA/QC personnel will be based on ANSI N45.2.6-1973 and SNT-TC-1A for QC inspection personnel and construction QA program requirements for QA personnel.

In addition background investigations will be performed for personnel in all groups. If qualification of an individual can not be verified, appropriate site nonconformance documentation will be initiated to document evaluation of safety significance and corrective actions, including reinspection of work performed as necessary.

For GEO QC Inspectors remaining on site, a reverification is being completed of proper qualification in accordance with ANSI-N45.2.6-1973.

WORK INSTRUCTIONS AND PROCEDURES EMPLOYED:

COMPANY	PROCEDURE NUMBER	TITLE
Ebasco	QAI No. 32	Instructions for Verifications of QA/QC Personnel Qualifications.
LP&L	QASP 19.12	Review of Contractor QA/QC Personnel Qualification Verification.
	QASP 19.13	Response Validation

ORGANIZATIONS INVOLVED:

ORGANIZATION	FUNCTIONS PERFORMED	PERSONNEL QUALIFICATION/TRAINING REQUIREMENTS
Ebasco	1) Verify Education/Experience of QA/QC personnel.	1) Training requirements to QAI-32.
	2a) Review program requirements of GEO, review and collect data and identify inspectors whose qualifications are not verifiable against ANSI N45.2.6-1973. SNT-TC-IA and QA program requirements for QA personnel.	2) Ebasco's Quality Resources Training Manual-1 (QRTM-1) delineates the requirements for qualifying records reviewer. QAI-14, "Training and Qualification Requirements for Quality Assurance Records Personnel" endorses QRTM-1 and requires all reviewers have training on procedures they are reviewing to. For qualification/certification filed training requirements are QAI-32 and ANSI N45.2.6.
	b) Determine, to the extent feasible, inspections performed by personnel whose qualifications are not verifiable.	
	c) Disposition quality documentation generated by LP&L in item (5) below.	
LP&L	1) Audit Ebasco's implementation of QAI-32.	1) (a) Indoctrination/training to LP&L & Ebasco procedures, ANSI N45.2.6-1973 & 1978, ANSI N45.2.23-78 SNT-TC-1A-75 & interpretations. (b) Orientation as to task objectives, organizations, and associated responsibilities and duties.

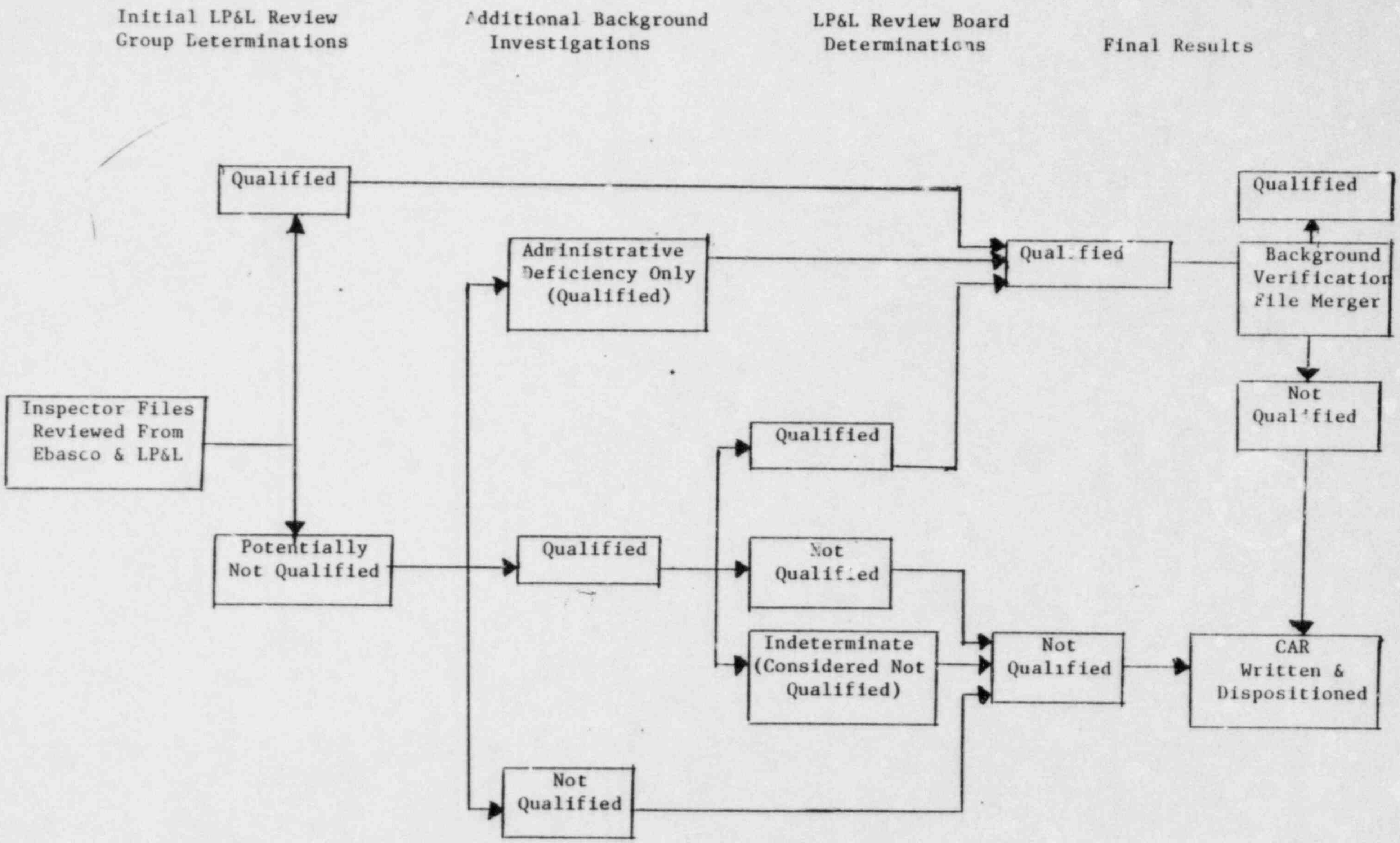
ORGANIZATION	FUNCTIONS PERFORMED	PERSONNEL QUALIFICATION/TRAINING REQUIREMENTS
LP&L	Cont'd	(c) OJT for three days to assure knowledge, understanding, and proficiency demonstration. (d) Individuals selected have inspection related and/or were involved in the training/certification or review of inspection personnel types. (e) Personnel involved in this process have not worked for Ebasco or GEO.
	2) Review all those verified by Ebasco.	2) See Item 1 above.
	3) Sample Education/Experience verification of GEO performed by Ebasco.	3) See Item 1 above.
	4) Perform final management determination of the qualifications of individuals who are potentially unqualified.	4) Review Board - Three Senior LP&L QA personnel qualified to ANSI N45.2.23 (1978).
	5) Initiate suitable quality documentation in cases where inspections were performed by personnel where qualifications could not be verified.	5) LP&L Lead Auditor who is qualified to ANSI N45.2.23 (1978).
	6) Make final determination on dispositioning of quality documentation mentioned in 4) above by Ebasco.	6) LP&L QA and Project Management.
	7) Validate response per QASP 19.13 to assure positive statements of fact are substantiated.	7) Validation will be performed under the direct supervision of the LP&L Lead Auditor who is qualified to ANSI N45.2.23 (1978).

ATTACHMENTS:

1. Flow Chart - Inspector Qualification Review

ATTACHMENT 1

FLOW CHART-INSPECTOR QUALIFICATION REVIEW



RESPONSE

ITEM NO.: 6 (Revision 1)

TITLE: Dispositioning of Nonconformance and Discrepancy Reports

NRC DESCRIPTION OF CONCERN:

The staff conducted a review of Ebasco nonconformance reports (NCRs) randomly selected from the Ebasco QA vault and the NCR tracking system. The selected NCRs were reviewed for content, compliance with procedures, accuracy, completeness of the disposition and final closure. Of the NCRs reviewed it is the staff's judgement that approximately one third contained questionable dispositions. Other NCRs were found still open.

The implied safety significance is that improperly dispositioned NCRs or lack of NCR closure could place the quality of installation in question.

For example, Ebasco NCR-W3-5564 identifies that welds were painted before the final weld inspection was performed. The NCR was closed out with a letter stating that the final inspection will be performed to inspect only for undersizing and lack of weld material where installation drawing calls for weld material. No paint was to be removed therefore the inspector could not inspect for welding defects.

The NCRs reviewed by the staff dealt with a wide variety of issues. The following is a list of example Ebasco NCRs that the staff feels contain questionable dispositions or exceeded closure time requirements.

Ebasco W3 NCRs

NCR-7139	NCR-7177	NCR-3912	NCR-7182	NCR-5563
NCR-7181	NCR-7184	NCR-6159	NCR-6723	NCR-3919
NCR-7547	NCR-6221	NCR-1650	NCR-6511	NCR-6623
NCR-4219	NCR-5586	NCR-7432	NCR-7180	NCR-4137
NCR-6165	NCR-4088	NCR-7099	NCR-[illegible]786	NCR-6597
NCR-7533	NCR-7179	NCR-7140	NCR-5565	

The staff also found similar type problems related to Mercury NCRs in that the dispositions were questionable; supporting documentation could not be located; rework appears to have not been accomplished; NCRs were not processed; a sufficient basis was not provided; and closure basis was inadequate.

The following NCRs fall into these categories:

Mercury NCRs

180	420	528	568	625
255	429	540	591	656
268	438	554	594	65[illegible]
363	487	560	595	
380	491	565	614	

Additionally during this review the staff found problems with Ebasco discrepancy reports (DRs) in that it appears some DRs should have been elevated to NCRs: closure references were incorrect or inappropriate; closure action was improper; documentation was inaccurate; closure was via a DR, should have been an NCR; disposition failed to address the discrepancy; and the disposition of "use-as-is" had insufficient basis.

The following DRs fall into these categories:

<u>Ebasco DRs Related to Turnover Packages</u>

Q2-CS-1C-27	BD-1C-1143
Q2/3-FW/1C-851	Q1-RC-LWS-RC-2
Q2-SI-1C-89	LW3-RC-29
QMC-APO-P47E	Q2-LW3-SI-10F/E
C(W)-1C-342	CC-1C-6

The staff concludes that some Ebasco and Mercury NCRs and Ebasco DRs were questionably dispositioned and that LP&L shall (1) Propose a program that assures that all NCRs and DRs are appropriately upgraded and adequately dispositioned and corrective action completed, and (2) correct any problem detected.

DISCUSSION:

LP&L initiated a program, beginning in February 1984, to review Ebasco site Nonconformance Reports (NCRs) to verify the effectiveness of the Waterford 3 deficiency reporting/disposition programs during construction. That program consisted of a review of Ebasco site NCRs closed prior to initiation of the program (approximately 7100). Each Ebasco site NCR was reviewed and independently assessed by LP&L to determine if:

- o The disposition addressed the described discrepancy;
- o The NCR was reviewed for reportability 10CFR50.55(e) and 10CFR21; and
- o The NCR had received the appropriate signatures.

This response discusses and presents summary results of the original review and a significantly expanded program addressing dispositioned NCRs/DRs (voided and administratively closed NCRs are addressed in the response to Issue 13). This program provides adequate confidence that the overall construction deficiency reporting/disposition system was effectively implemented. Corrective action as a result of the expanded review is also discussed. Discussion of the issue is structured along the lines of the major elements of the expanded program as follows:

I. Review of the specific nonconformance reports and deficiency reports identified by the NRC.
II. Review of Ebasco Nonconformance Reports
III. Review of Mercury Nonconformance Reports
IV. Review of Ebasco Deficiency Reports.

Three general conclusions have resulted to date from the original and expanded reviews, as follows:

1. No additional condition was identified in these reviews which, were it to have remained uncorrected, would have affected adversely the safety of operations of Waterford 3.

2. Corrective action required as a result of the reviews involved correction of documentation deficiencies, reinspection or engineering evaluation and only limited hardware rework.

3. Due to the structure of the filing system, systematic review of the Waterford 3 construction deficiency documentation is difficult, but is achievable.

I. Review of the Specific NCRs and DRs identified by the NRC

The Ebasco and Mercury NCRs and the Ebasco DRs identified by the NRC were first reviewed by Ebasco Quality Assurance Engineers. The NCRs and DRs were reviewed for proper disposition, corrective action completion, appropriate documentation, and proper closure. Upon completion of Ebasco's review and required corrective actions, LP&L QA reviewed the NCRs and corrective actions taken by Ebasco, and sampled the Ebasco review of DRs. LP&L Project Engineering reviewed the NCR's for technical content. The review of NRC identified Ebasco and Mercury NCRs and Ebasco DRs was scoped as follows:

A. Ebasco Nonconformance Reports

Thirty Ebasco NCRs are identified by the NRC in this issue. In addition, seven Ebasco NCRs related to this issue are specifically identified in Supplement 7 to the Safety Evaluation Report (SSER)* which was issued on October 1, 1984. Attachment 1 summarizes the results of the review of NRC identified Ebasco NCRs.

B. Mercury Nonconformance Reports

Twenty-three Mercury NCRs are identified by the NRC in this issue. An additional fifteen Mercury NCRs related to this issue are specifically identified in the SSER. Attachment 2 summarizes the results of the review of NRC identified Mercury NCRs.

C. Ebasco Deficiency Reports

Ten Ebasco DRs are identified by the NRC in this issue. An additional three Ebasco DRs related to this issue are specifically identified in the SSER. Limited documentation deficiencies were identified and corrected, none of which were safety significant.

* NUREG 0787 (SER Supplement 7 - September 1984)

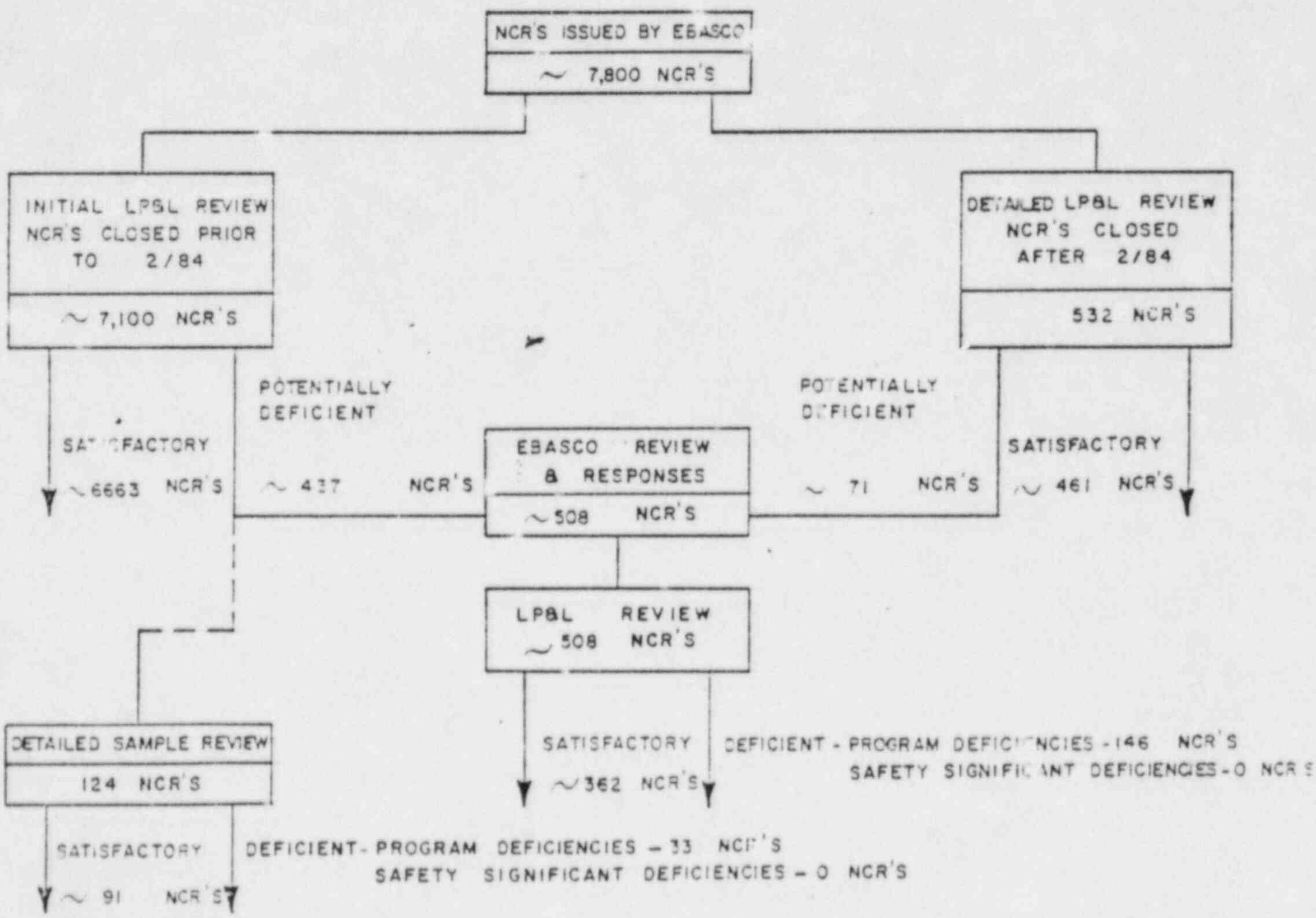
The review of the NRC identified documents has been completed. While QA program procedural deficiencies existed, no safety significant deficiencies have been identified.

II. Review of Ebasco Nonconformance Reports

The review of Ebasco site Nonconformance Reports encompassed approximately 98% of the site NCR numbers issued by Ebasco during the construction of Waterford 3. The review consisted of several elements, each with its own particular level of review. Figure 6-1 depicts the elements of Ebasco NCR review process in the form of a flow diagram, in order to facilitate understanding of the process.

FIGURE 6-1

REVIEW OF EBASCO NCRs



The following paragraphs discuss the individual elements of the review of Ebasco NCRs:

A. LP&L QA Review of Ebasco NCRs closed prior to February 1984

1. Initial Review

In February 1984, LP&L QA initiated a review of Ebasco NCRs. This review was undertaken to verify, by way of a Work Instruction, that:

a. The disposition addressed the described discrepancy;

b. The NCR was reviewed for reportability under 10CFR50.55(e) and 10CFR21; and

c. The NCR had received the appropriate signatures.

Approximately 7100 Ebasco NCRs were reviewed and 437 potentially deficient NCRs were identified. Upon completion of the evaluation, it was determined that 122 NCRs were deficient in disposition, corrective action, software or closure, or combinations thereof. Corrective action required as a result of this review involved only limited hardware rework and correction of documentation deficiencies.

Seventy-two of the NCRs were considered potentially deficient for lack of documented evidence that they had been reviewed for reportability per 10CFR50.55(e) or 10CFR21. Subsequent documented reviews of these NCRs determined that none were reportable.

2. Detailed Review

LP&L selected 124 (approximately 28%) of the potentially deficient NCRs identified in the initial review for an in-depth review. This review included hardware verification for rework/repair, software verification for updating as-built drawings and specifications and evaluation of documentation for the required corrective actions and retrievability of documentation.

As a result of this detailed review, 33 NCRs were found to be deficient, and seven CIWAs were initiated to address the deficiencies. None of these deficiencies met the criterion for safety significance. Corrective action for 30 of the deficient NCRs involved correction of documentation deficiencies, reinspection or engineering evaluation. For the remaining three, limited discretionary rework is being performed.

B. Detailed LP&L QA Review of Ebasco NCRs closed after February 1984

Ebasco NCRs closed after February 1984 were reviewed as a separate group by LP&L QA. Review of these NCRs was in-depth and was for the purpose of verifying proper disposition, adequate documentation to support the required corrective action, required software changes completed and proper closure. Five hundred thirty two (532) NCRs were reviewed with 71 NCRs requiring resolution of comments. Of those 71 NCRs, 24 were determined to have valid deficiencies. Corrective action for 22 of the deficient NCRs involved correction of documentation deficiencies, reinspection or engineering evaluation. For the remaining two, limited discretionary rework is being performed.

C. Ebasco NCR Closure Timeliness

With respect to the NRC concern regarding timeliness of Ebasco NCR closure, Ebasco procedure ASP-III-7, "Processing of Nonconformance", required completion of corrective action within twenty (20) days of receipt of the dispositioned NCR. If the verification of corrective action was not completed within the allotted twenty days, a written request for extension was to be filed with the Ebasco Quality Assurance Department for approval. The twenty day time period did not begin until the nonconformance report had been dispositioned and evaluated by the appropriate departments. The twenty day requirement was for administrative control only and did not adversely affect the quality of Waterford 3. In December, 1983, Ebasco procedure ASP-III-7 was revised to delete this requirement.

All Ebasco NCRs closed as of approximately the end of September, 1984 (Approximately 98% of the Ebasco NCRs issued) were subjected to an LP&L review as described above. While program deficiencies existed, and minor rework was required, no safety significant deficiencies have been identified.

III. Mercury Nonconformance Reports

Mercury dispositioned approximately 3700 Mercury NCRs. Of these, approximately 1700 were upgraded to Ebasco NCRs and, as such, were reviewed as Ebasco NCRs (See Section II of this response). The remaining Mercury NCRs were reviewed as follows:

A. Mercury NCRs dispositioned "Use-As-Is" were reviewed to assure that they were upgraded to Ebasco NCRs, as required. As a result of this review, eleven NCRs were deemed to require upgrading to Ebasco NCRs. These eleven NCRs are now identified on Ebasco NCRs, and were processed under the Ebasco NCR program.

B. Approximately 1850 Mercury NCRs were dispositioned "rework/repair" or "reject." In most cases, when Mercury designated a deficiency to be corrected by "repair", it was, in fact, a "rework." For example, in dispositioning rejected welds, Mercury would specify the weld be "repaired" in accordance with procedures to meet the design requirements. This is actually a "rework" disposition. Mercury procedures did state that deviations from original design or technical specification outside the tolerances allowed was a "repair". Mercury procedures required nonconformances meeting this criteria to be upgraded to Ebasco NCRs so that these deviations would be reviewed and approved by Ebasco.

A random sample of 66 Mercury NCRs from those dispositioned "rework/repair" was selected for review. These NCRs were reviewed for proper disposition, adequate documentation of corrective actions required and proper closure. LP&L QA reviewed each sampled Mercury NCR in accordance with QASP 19.17. Deficiencies were corrected and documented. None were found to be of safety significance.

C. Seven hundred twenty five (725) of the 1850 Mercury NCRs dispositioned "rework/repair" and "reject" were reviewed by Ebasco for reportability per 10CFR50.55(e). None of the NCRs were determined to be reportable. LP&L QA selected a random sample of 64 of these NCRs for a reportability review and the Ebasco conclusions were confirmed.

D. Mercury documented material conditionally released from Ebasco on Material Receiving Reports (MRR) and assigned Mercury NCR numbers to each such MRR in accordance with Mercury Procedure SP664. Approximately 120 Mercury NCRs of this type were identified by Ebasco. LP&L reviewed the Mercury files and, although the conditional releases appeared to have been properly handled, there were instances where supporting information (Ebasco NCRs, DNs) was neither referenced nor included in the documentation package. The supporting information is available and will be either included or referenced, in the NCR packages, as appropriate.

This review of dispositioned Mercury NCRs is complete. While program deficiencies existed, no safety significant deficiencies have been identified. The results of these sample reviews establish a 95% confidence level that at least 95% of the total population of Mercury NCRs do not contain unreported conditions reportable under 10CFR50.55(e) or 10CFR21.

IV. Review of Ebasco Deficiency Reports

The Ebasco QAIRG review of contractors records required that deficiencies be documented on Deficiency Reports in accordance with QAI-9, "Review and Handling of Construction Installation (DRs) Records". A random sample of DRs generated as result of the review of Mercury and Tompkins-Beckwith records was reviewed for proper closure. For each contractor, 230 QAI 9.2 Deficiency Report Sheets were selected and reviewed as follows:

A. The review of Deficiency Reports on Tompkins-Beckwith included 115 Deficiency Report Sheets on piping and one hundred fifteen QAI 9.2 Deficiency Report Sheets on seismic hangers and supports. These QAI 9.2 Deficiency Report Sheets included approximately 856 DRs. This review identified 12 DRs which required engineering evaluation and concurrence. Although minor deficiencies, such as missing references, signatures or dates were identified, the DR closures were satisfactory.

B. The review of the 230 Mercury QAI 9.2 Deficiency Report Sheets was divided equally among P-2 and P-3 tubing, and tube track supports. These QAI 9.2 Deficiency Report Sheets included approximately 1173 DRs. The review identified 31 DRs which required engineering evaluation. The engineering evaluations are in progress. Although minor deficiencies, such as missing references, signatures or dates were identified, the DR closures were satisfactory.

LP&L QA performed audits of the Ebasco review. These audits included random samples of the Mercury and Tompkins-Beckwith DRs reviewed by Ebasco. While documentation deficiencies existed, no safety significant deficiencies, or deficiencies requiring rework, have been identified.

CAUSE

The review program verified that deficiencies were generally processed in accordance with the site procedures. However, those procedures did not provide adequately specific guidelines for the implementation of procedural requirements which led to excessive need for judgements and interpretations. This program weakness led to the inconsistencies in handling deficiencies at Waterford 3 which have been identified by LP&L and the NRC.

GENERIC IMPLICATIONS

The review program encompassed approximately 98% of the Ebasco NCRs and statistically justified samples of Mercury NCRs and Ebasco DRs. The results of an in-depth review and verification of a conservative sample of NCRs and DRs has provided adequate confidence that the deficiency system did not allow conditions in dispositioned NCRs/DRs to remain unreported per 10CFR50.55(e) and 10CFR21.

SAFETY SIGNIFICANCE

LP&L has performed a review of major elements of the construction deficiency reporting/disposition system. The results of this review indicate that, in general, the system was effectively implemented. The procedures contained the basic requirements for documenting and controlling deficient conditions. The deficiencies identified during the review of nonconformances are considered minor in nature and were generally resolved with the addition of documentation or further evaluation. The items dispositioned as rework were based on good engineering practice or management conservatism rather than on safety significance. There is no recognized reason that this issue should constrain fuel load or power operation.

CORRECTIVE ACTION PLAN/SCHEDULE

All reviews and required corrective actions are completed.

ATTACHMENTS

1. Ebasco Nonconformance Reports Identified by the NRC.

2. Mercury Nonconformance Reports Identified by the NRC.

REFERENCES

None.

ATTACHMENT 1

EBASCO NONCONFORMANCE REPORTS IDENTIFIED BY THE NRC

The following is a list of EBASCO Nonconformance Reports (NCRs) identified by the NRC in Issue No. 6 and in Supplement 7 to the Safety Evaluation Report (SSER). The list identifies the NRC Concerns with each NCR and the Resolution or Corrective Action. The list also summarizes additional concerns identified as a result of the LP&L Review and the Resolution or Corrective Action. It should be noted that dispositioned NCR's were reviewed for reportability under 10CFR50.55(e) and 10CFR21 and none were found to be reportable.

A. Ebasco NCR's Identified in Issue No. 6

1. NCR W3-1650

(a) NRC CONCERN

How was it determined which bolts to retest when QCP 309 did not require the recording of tester serial number on previous tests?

RESOLUTION OR CORRECTIVE ACTION

All uses of gauge QC 4.2.2 by F&M (QCP-309) were accepted-as-is by ESSE with no further action required.

Tension tester gauge QC 4.2.2 was issued and tracked on Ebasco's M&TE Master Log. Review of this log indicated each contractor that was issued QC 4.2.2 during the time it was out of calibration. Each contractor reviewed his installation records to see if tension testing was done during this time. If so, a description of the work was given to ESSE for evaluation. Each use was accepted as-is by ESSE based upon the small degree of error found during recalibration.

(b) LP&L IDENTIFIED CONCERNS

1. All issuances of subject pressure gauge not properly addressed in NCR.
2. Statement by user of pressure gauge is not acceptable for dispositioning of NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Records of tension tests were evaluated by ESSE of those users (contractors) of gauge not previously addressed.
2. Review conducted of contractor tension test records did not reveal any use of pressure gauge by this individual. Documentation of this review attached to NCR.

2. NCR W3-3912

(a) NRC CONCERNS

1. Involved nine 23J-2 type supports discovered during walkdown for which the fit-up inspection was by-passed. The original NCR disposition failed to address the actions required to prevent the reuse of the items. Attachment No. 14 of this NCR identified this issue which was resolved by stating "it was not required for the disposition of this NCR..." No other NCR was reopened or referenced to resolve the issue.

RESOLUTION OR CORRECTIVE ACTION

1. Support #8 was not removed because of HVAC interferences. This support will be properly tagged as "not to be utilized-nonconforming".
2. Support #13 (angle to plate) would be acceptable for reuse in its intended design application since it would not be possible to cluster enough tubing attachments to reach the yield point of the structure.
3. The remainder of the supports (angle to existing steel) were removed. Since the material is traceable by heat number, it is approved for safety-related applications.

3. NCR W3-3919

(a) NRC CONCERNS

1. 530' more tubing installed than received.
2. Requisition on warehouse (ROW) changed using Liquid Paper.
3. 10% of OCR Packages selected to verify heat number of installed tubing. Only one (1) OCR Package actually reflected heat in question.

RESOLUTION OR CORRECTIVE ACTION

NCR re-opened and re-evaluated by QA Engineering and ESSE. Final evaluation was to accept-as-is based upon the contractor's Material Control Program.

4. NCR W3-4088 (Mercury 491)

(a) NRC CONCERNS

There was no description attached to the NCR to verify that corrective action was accomplished or completed.

4. NCR W3-4088 (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. Found and attached a copy of LP&L CIWA 828372, which was issued to perform the corrective action for NCR-W3-4088.
2. Found and attached a Mercury Q.C. report which verifies adequate completion of corrective action.
3. Found and attached a Mercury weld data report for the replacement welds.
4. Found and attached a copy of drawing 100-T-035-A, which reflects the replacement welds described in #3 above.

(b) LP&L IDENTIFIED CONCERNS

1. Inadequate "use-as-is" justification provided by engineering, for discrepant items B, C, & G on NCR attachment #1.
2. Drawing 100-T-035-A showing the affected instrument line was not attached to the NCR.
3. Supporting weld data documentation was not attached to the NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Obtained and attached additional ESSE evaluations to the NCR.
2. Obtained and attached copy of drawing 100-T-035A to the NCR.
3. Obtained and attached a copy of Mercury's weld data report for the replacement welds.

5. NCR W3-4137 (Mercury #420)

(a) NRC CONCERNS

1. Improper NCR closure and reopening.
2. Incorrect reporting system (DN in lieu of NCR).

RESOLUTION OR CORRECTIVE ACTION

1. NCR-W3-4137 was reopened and processed in accordance with applicable procedures.

(b) LP&L IDENTIFIED CONCERNS

1. NCR Corrective Action did not adequately correct the discrepancies.
2. DN-SQ-1991 was not properly processed in accordance with the applicable procedures.

5. NCR W3-4137 (Mercury #420)

RESOLUTION OR CORRECTIVE ACTION

1. Support was reinspected to provide "as-built" and submitted to engineering for design evaluation. ESSE evaluated the condition to be acceptable and drawing was revised to reflect existing field condition.
2. Corrective action for violation of Procedure WQC-150 (DN in lieu of NCR) cannot be accomplished since subject procedure has been retired.

6. NCR W3-4219

(a) NRC CONCERNS

There are no records for rework or reinspection to indicate satisfactory reinstallation of supports and sample lines.

RESOLUTION OR CORRECTIVE ACTION

Sample line was reworked to original design and tracked on Mercury NCR 684. Reference Attachment #3 of NCR W3-4219 for an acceptable evaluation by Construction Engineering.

7. NCR W3-5563

(a) NRC CONCERNS

1. Inspections signed off by an unqualified inspector.
2. Inspection reports co-signed by Level II inspector 3 years and 5 months later.

RESOLUTION OR CORRECTIVE ACTIONS

NCR reopened and CIWA #011340 written to re-inspect Fuel Handling Building (FHB) Crane. This work was completed and CIWA closed on 11/15/84. The installation was found to be acceptable.

8. NCR W3-5564

(a) NRC CONCERNS

Disposition of NCR for inspection through paint is unacceptable, due to paint precludes adequate visual inspection of the welds.

RESOLUTION OR CORRECTIVE ACTION

Downgrading of FHB stairways from seismic class I to seismic class II eliminates the requirements for visual inspection.

8. NCR W3-5564 (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. No QC verification signature on the sketches provided in attachment #23 of the NCR.
2. Insufficient ESSE evaluation for downgrading seismic Class I stairs in the FHB, to seismic class II.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco Q.C. performed and documented a verification of the items identified in the stairwell on NCR attachment #23, and attached the results to the NCR as attachment #24.
2. ESSE Electrical and HVAC reviewed the information in NCR attachments #23 and #24, and determined them to be non-safety.

9. NCR W3-5565

(a) NRC CONCERNS

1. The Qualification of the Q.C. inspector who performed the inspection of reeving of the F.H.B. Crane.
2. The documentation of the reinspection was not attached to the NCR as directed by the NCR.

RESOLUTION OR CORRECTIVE ACTION

1. The Fuel Handling Building Crane was turned over to the LP&L with subsequent testing and reinspection performed by the LP&L on 1/29/83 per procedure SPO-40-002.
2. The testing and inspection data performed by LP&L has been attached to the NCR.

(b) LP&L IDENTIFIED CONCERNS

Nonconformance was reopened on April 26, 1984 to add attachment 1A and closed the same day without documented evidence that the investigation as required in the attachment was actually performed.

RESOLUTION OR CORRECTIVE ACTION

Attachment 5 has been added to the NCR to reference LP&L test procedure SPO-40-002 which documented the final functional testing of the subject crane.

10. NCR W3-5586

(a) NRC CONCERNS

1. Welders Test Lab was not on Mercury's qualified suppliers list, and this item was not addressed in the NCR disposition.
2. Statement provided by Welders Test Lab, that "a Mercury Inspector reviewed all tests", is not adequate.

RESOLUTION OR CORRECTIVE ACTION

1. Mercury audits of Welders Test Lab for years 1979, 1980, 1981 & 1982 added as information to verify Mercury surveillance of supplier's activities.

2. Statements from present and former contractor employees and corporate officials added to support the fact that qualified contractor personnel reviewed all tests.

11. NCR W3-6159

(a) NRC CONCERNS:

1. Traceability problems were not identified and addressed by the NCR.
2. The sample used for tensile testing the welds was questionable in that the worst case example should have been used for the test.

RESOLUTION OR CORRECTIVE ACTION

1. All tubetrack materials are purchased, received and maintained by Ebasco's QA Program. Material is requisitioned by subcontractors from the Ebasco warehouse.
2. Calculated stress levels imposed on the weld were conservatively established, taking credit for only 50% of the specified weld length and assuming design basis earthquake.

(b) LP&L IDENTIFIED CONCERNS

1. Six (6) out of twenty-two (22) welds were found to contain weld defects. What was done to increase the sample size?
2. No evidence to indicate the test samples were selected from "Worst Case" installations.

11. NCR W3-6159 (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. QAIRG records review required reinspection of 67% of tube track. No other rejectable conditions were found.
2. Calculated stress levels imposed on the weld were conservatively established, taking credit for only 50% of the specified weld length and assuming design basis earthquake.

12. NCR W3-6165

(a) NRC CONCERN

1. There is no indication of measures taken to preclude recurrence.

RESOLUTION OR CORRECTIVE ACTION

1. A review of filler metal requisitions and T&B time sheets indicates that welder R-7 not R-1 made the weld concerned, and R-1 was not employed during the time the weld was made, therefore, measures taken to preclude recurrence was not necessary.

(b) LP&L IDENTIFIED CONCERNS

1. Documented verification that welder R-1 was not on site should be included.

RESOLUTION OR CORRECTIVE ACTION

1. Review attached to NCR indicating welder R-1 not on site during the time period weld was made.

13. NCR W3-6221

(a) NRC CONCERN

1. Weld control records signed off by Level I Inspector.
2. Letter of designation based on revision of QA Manual not if effect at the time of letter issuance.

RESOLUTION OR CORRECTIVE ACTION

1. LP&L QA evaluated inspectors experience, education, and training and determined the inspector was qualified to perform the designated activities.

ATTACHMENT 1

14. NCR W3-6511

(a) NRC CONCERNS

1. The NCR only addressed the fact that the maximum gap was violated, should have included undersize weld; lack of fusion; arc strikes and undercut.
2. There are no records of rework or reinspection.

RESOLUTION OR CORRECTIVE ACTION

1. Support was reinspected by Ebasco QC and as-built data supplied to ESSE. ESSE accepted support "as-is".
2. Documentation posted to Mercury installation package to assure update to as-built installation documentation.

15. NCR W3-6597 (Mercury #2870)

(a) NRC CONCERNS

1. NCR exceeded the closure time requirements of ASP-III-7, section 6.1.3.a.

RESOLUTION OR CORRECTIVE ACTION

1. The closure time requirement is generically addressed in Issue #6 report.

(b) LP&L IDENTIFIED CONCERNS

1. No traceability for installed bolt, nut and lockwasher.
2. No torquing for the bolting above.
3. DCN not referenced on drawing.
4. Were new Hilti's installed?
   If this was a re-verification of torque, where is original torque documentation?

RESOLUTION OR CORRECTIVE ACTION

1. None required - purchased commercial grade with C of C provided by supplier.
2. No torque value required.
3. DCN was incorporated on drawing.
4. New Hilti's were not installed. This was the original torque inspection.

16. NCR W3-6643

(a) NRC CONCERNS

1. What actions were done to assure that no additional heat numbers were falsified?
2. Identity of the person who forged the signature and entered the incorrect heat numbers on the Quality Records.

RESOLUTION OR CORRECTIVE ACTION

1. A review of all installed process tubing records back to their applicable CMTR was performed by Ebasco QAIRG.
2. Identity of person is unknown and cannot be ascertained since contractor is no longer on site.

(b) LP&L IDENTIFIED CONCERNS

1. Evidence that the "untraceable" material was returned to the warehouse or scrapped.
2. Evidence that a search for additional falsified records was performed with regard to the Mercury program.

RESOLUTION OR CORRECTIVE ACTION

1. Warehouse records were researched no evidence of return was found.
2. QAIRG and LP&L turnover review found no other cases of falsification.

17. NCR W3-6723

(a) NRC CONCERNS

F&M procedure QC-309 violated ANSI N45.2 Section 13, because it did not require the tension tester serial number, pressure gage number or calibration date to be recorded.

RESOLUTION OR CORRECTIVE ACTION

During the time frame involved there were only two (2) pressure gauges/tension testers that were utilized sitewide, QC 4.2.1 & QC 4.2.2. These gauges were maintained under Ebasco's M&TE procedure WQC-4. Copies of the calibration records are attached to NCR-W3-7184.

18. NCR W3-6786

(a) NRC CONCERN

1. Possible heat numbers not recorded on the as-built drawings.
2. NCR did not address where the required heat numbers were recorded.
3. NCR did not address how traceability was maintained.

RESOLUTION OR CORRECTIVE ACTION

1. NCR-W3-4593 was reopened and addressed the following:

   a. Verified that any tubing purchased non-safety was not used in a safety application or was replaced.
   b. Site procedure required material purchased non-safety to be identified (i.e. painting, marking, etc.)
   c. NCR-W3-4593 S/1 was referenced in all Mercury P2 and P3 OCR packages where direct traceability is not documented.
   d. A list of manufacturers and heat numbers for tubing is attached to NCR-W3-6786 and 4593.

(b) LP&L IDENTIFIED CONCERNS

1. Heat numbers not posted to "As-Built" drawings.
2. NCR did not adequately address if the "PAB" (Preliminary As Built) Program.
3. The NCR did not determine if all possible heat numbers were traceable to the safety/non-safety installations and/or to the applicable P.O.

RESOLUTION OR CORRECTIVE ACTION

1,2&3 NCR-W3-4593 was re-opened, redispositioned and addressed the concerns as stated above for NCR-W3-6786. NCR-W3-4593 S/1 with attachments addressing heat numbers added to NCR-W3-6786.

19. NCR W3-7099

(a) NRC CONCERNS

1. No documentation to adequately support the NCR Disposition.

RESOLUTION OR CORRECTIVE ACTION

1. Stress calculations utilized as a basis for disposition have been attached to the NCR.

19. NCR W3-7099 (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. Cracks in heat affected zone of cabinets 48A & B.
2. Smaller than design embed plates.
3. Flare bevel in lieu of fillet welds.

RESOLUTION OR CORRECTIVE ACTION

1. Cracks evaluated and accepted by ESSE based on low stress.
2. Embed plates are the correct size; cabinet 48A requires a split 4"x4"x3/8 tube steel (which leaves 3" wide exposure) and cabinet 48B required a 4" wide plate.
3. Flare bevels, fillets and lengths accepted by ESSE based on design calculations indicating low stresses in weld.

20. NCR W3-7139

(a) NRC CONCERNS

QC data in NCR was incorrect for 2 of 3 radiation monitors.

RESOLUTION OR CORRECTIVE ACTION

NCR re-opened and letter of clarification and inspection report added to NCR.

(b) LP&L IDENTIFIED CONCERNS

F&M Inspection Report #303-71-624 contains only sheet 1 of 3 and does not include a list of the discrepant supports.

RESOLUTION OR CORRECTIVE ACTION

Sheets 2 and 3 of Inspection Report added.

21. NCR W3-7140

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

21. NCR W3-7140 (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. Traceability of rework materials not recorded.

RESOLUTION OR CORRECTIVE ACTION

1. Rework consisted of additional welding only, filler metal requisition form enclosed in documentation of NCR.

22. NCR W3-7177

(a) NRC CONCERNS

1. No calibration of pressure gauge used on expansion anchor tension tester.
2. Requirement that three additional anchors be tested after failure of one not adhered to.

RESOLUTION OR CORRECTIVE ACTION

1. Inspectors signature attests that tension testing was performed per governing specification.
2. Subsequent retests were performed with acceptable results.

23. NCR W3-7179

(a) NRC CONCERN

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

NCR is acceptable

RESOLUTION OR CORRECTIVE ACTION

None required.

ATTACHMENT 1

24. NCR W3-7180

(a) NRC CONCERNS

F&M procedure QC-309 violated ANSI N45.2 Section 13, because it did not require the tension tester serial number, pressure gage number or calibration date to be recorded.

RESOLUTION OR CORRECTIVE ACTION

During the time frame involved there were only two (2) pressure gauges/tension testers that were utilized sitewide, QC 4.2.1 & QC 4.2.2. These gauges were maintained under Ebasco's M&TE procedure WQC-4. Copies of the calibration records are attached to NCR-W3-7184.

25. NCR W3-7181

(a) NRC CONCERNS

F&M procedure QC-309 violated ANSI N45.2 Section 13, because it did not require the tension tester serial number, pressure gage number or calibration date to be recorded.

RESOLUTION OR CORRECTIVE ACTION

During the time frame involved there were only two (2) pressure gauges/tension testers that were utilized sitewide, QC 4.2.1 & QC 4.2.2. These gauges were maintained under Ebasco's M&TE procedure WQC-4. Copies of the calibration records are attached to NCR-W3-7184.

26. NCR W3-7182

(a) NRC CONCERNS

F&M procedure QC-309 violated ANSI N45.2 Section 13, because it did not require the tension tester serial number, pressure gage number or calibration date to be recorded.

RESOLUTION OR CORRECTIVE ACTION

During the time frame involved there were only two (2) pressure gauges/tension testers that were utilized sitewide, QC 4.2.1 & QC 4.2.2. These gauges were maintained under Ebasco's M&TE procedure WQC-4. Copies of the calibration records are attached to NCR-W3-7184.

27. NCR W3-7184

(a) NRC CONCERNS

F&M procedure QC-309 violated ANSI N45.2 Section 13, because it did not require the tension tester serial number, pressure gage number or calibration date to be recorded.

RESOLUTION OR CORRECTIVE ACTION

During the time frame involved there were only two (2) pressure gauges/tension testers that were utilized sitewide, QC 4.2.1 & QC 4.2.2. These gauges were maintained under Ebasco's M&TE procedure WQC-4. Copies of the calibration records are attached to NCR-W3-7184.

28. NCR W3-7432

(a) NRC CONCERNS

1. Concrete preplacement & post-placement documentation could not be matched.
2. No specific references were used for voiding the NCR.
3. QA Engineer approved the recommended disposition and then voided the NCR.

RESOLUTION OR CORRECTIVE ACTION

1. NCR-W3-7431 R1 addressed curing violations. NCR-W3-7435 addressed the placement documentation.
2. Late entry added to NCR-W3-7432 referencing NCR's W3 7431 R1 & W3-7435.
3. Not a procedural violation per ASP-III-7 Rev. 5. The recommended disposition was approved 11/23/83; NCR was voided 1/16/84.

29. NCR W3-7533

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

NCR is acceptable.

RESOLUTION OR CORRECTIVE ACTION

None required.

30. NCR W3-7547

(a) NRC CONCERNS

1. Improper engineering evaluation is demonstrated with an accept-as-is disposition based on an acceptable hydrostatic test.

RESOLUTION OR CORRECTIVE ACTION

The disposition was based on prior acceptance of fit-up and final weld inspection and that the pressure boundary had not been violated therefore no hydrostatic test is required.

(b) LP&L IDENTIFIED CONCERNS:

1. Is the fit-up of FW-5 acceptable?

RESOLUTION OR CORRECTIVE ACTION

1. Radiographic examination of FW-5 was performed and fit-up gap engagement requirements were met.

B. Ebasco NCR'S Identified in Supplement 7 to the SSER

The following Ebasco NCR's were identified by the NRC in Supplement 7 to the Safety Evaluation Report published October 1, 1984.

1. NCR W3-3947

a) NRC CONCERN

Fit-up inspection was by-passed and the support had been completely welded out with only the welder's identification number.

RESOLUTION OR CORRECTIVE ACTION

Inspection revealed an acceptable heat number (15537) of ¼" angle and filler metal withdrawal authorization slip furnished for hanger. An additional visual inspection revealed an acceptable final weld.

2. NCR W3-4593

a) NRC CONCERN

Disposition inadequate.

RESOLUTION OR CORRECTIVE ACTION

NCR was re-opened as Supplement 1 (S/1) since original disposition of NCR-W3-4593 had not been correctly implemented. Mercury's material control program was analyzed based on purchase of materials, material identification and dimensional verification.

In April, 1984, NCR-W3-4593 S/1 was closed. Based on this analysis, it can be shown that safety-related tubing of correct size and wall thickness was installed by Mercury. Therefore, having addressed the requirements of a material control program and identified and corrected deficiencies noted, direct heat traceability is not required for Mercury tubing installation.

In addition, NCR-W3-4593 S/1 was referenced in all of Mercury's P2 and P3 OCR packages where direct traceability was not documented, and a document was attached, which provided a list of manufacturers of tubing, and heat numbers furnished.

3. NCR W3-5819

a) NRC CONCERN

Identified the problem of instrumentation supports being painted prior to final weld visual inspection. Disposition had been to inspect the welds through paint which was unacceptable.

RESOLUTION AND CORRECTIVE ACTION

NCR supplemented with ESSE evaluation "Reinspection of Welds through Paint for Size and Profile" for additional justification.

4. NCR W3-5973

a) NRC CONCERN

None were identified in the Allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

4. NCR W3-5973 (Continued)

b) LP&L CONCERN

NCR is acceptable.

RESOLUTION OR CORRECTIVE ACTION

None required.

5. NCR W3-5974

a) NRC CONCERNS

The NCR's disposition is questionable as the problem still existed in that safety and non-safety grade material could have been mixed.

RESOLUTION OR CORRECTIVE ACTION

The attachments added to NCR as a result of corrective action were the back-up data used in verifying whether or not the material was safety related. Each Seismic I hanger/piping system component was verified by the QAIRG group as being safety related. Those items which were found to be non-safety were removed and safety material installed.

6. NCR W3-6514

a) NRC CONCERN

Mercury installed supports without material traceability.

RESOLUTION OR CORRECTIVE ACTION

Bergen Patterson designed supports, other than ASME NF supports, do not require traceability. The structural members were supplied by Bergen Patterson and were received with a certificate of compliance.

b) LP&L CONCERN

Attachment No. 6, Item 1 is not justification for closure of NCR.

RESOLUTION OR CORRECTIVE ACTION

A late entry note added to Attachment No. 6 provided an expanded discussion on the use and acceptance of letter F-61147E. The statement (Item 1) of Attachment No. 6, in conjunction with Items 2 and 3 of the Attachment, were the basis for closing this NCR.

7. NCR W3-6719

a) NRC CONCERNS

The hydrostatic test conditions were assumed by Ebasco to be the "worst case" and therefore that "all" other hydrostatic tests performed by Mercury were deemed satisfactory. This was not the case, since only one test was reviewed by Ebasco.

RESOLUTION OR CORRECTIVE ACTION

Attachment No. 17 written by ESSE clarifying justification of selection of worst case condition and providing support calculations.

ATTACHMENT 2

MERCURY NONCONFORMANCE REPORTS IDENTIFIED BY THE NRC

The following is a list of Mercury Nonconformance Reports (NCR's) identified by the NRC in Issue No. 6 and in Supplement 7 to the Safety Evaluation Report (SSER). The list identifies the NRC concerns with each NCR and the Resolution or Corrective Action. The list also summarizes any additional concerns identified as a result of the LP&L Review and the Resolution or Corrective Action. It should be noted that dispositioned NCR's were reviewed for reportability under 10CFR50.55(e) and 10CFR21 and none were found to be reportable.

A. Mercury NCR's Identified in Issue No. 6

1. NCR-180 (Ebasco NCR W3-6839)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. No objective evidence provided for "as-built" condition of the discrepant Hilti's for the Engineering Evaluation.

RESOLUTION OR CORRECTIVE ACTION

1. Testing was performed on bolts with an embedment of 3" where field installation procedures required 3½". Results of re-inspection of Hilti bolts under records review and N1 instrument walkdowns have found the as-built conditions to be generally acceptable. Any Hilti bolts without letter designation were ultrasonicly tested for length to determine proper embedment.

2. NCR-255

(a) NRC CONCERN

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

The documentation of the corrective action was not available for eight of the fourteen supports requiring retorque.

RESOLUTION OR CORRECTIVE ACTION

The supports identified as having misplaced documentation were reinspected. This action has been completed with acceptable results and attached within the N.C.R. package.

3. Mercury NCR-268

(a) NRC CONCERN

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. This NCR is not a rework as stated, it is a "use-as-is" since as-built information is to be redlined.
2. Should have been up-graded to an Ebasco NCR.
3. No objective evidence Ebasco Engineering has approved the as-built conditions.
4. All deficiencies identified in the description are not addressed in the disposition completed section of the NCR.
5. There is not objective evidence to indicate that all existing field conditions have been incorporated into the redline drawing.
6. NCR was written 1/26/82 and closed 12/22/82. Training records supplied for corrective action are dated 11/29/82 (due to updated revision of five procedures released this date) and 6/17/84 (due to Ebasco audit) there is no evidence of timely retraining of personnel per disposition of NCR.

RESOLUTION OR CORRECTIVE ACTION

1. The NCR represents a procedural violation for failure to redline the drawing prior to the installation of the supports. There was no physical rework due to the actual installation being acceptable. This NCR was written as an in-process deficiency due to the inspector's findings during walkdown inspection.
2. The NCR was not used to accept a deviation from design requirements, thus, did not require upgrading to an Ebasco NCR.
3. As-built conditions were in accordance with Ebasco guidelines provided to Mercury in the specifications and drawings.
4. The deficiencies identified were addressed by redlining the drawing and requiring the training to address the procedural violation.
5. Copy of the drawing is attached.
6. No specific training records could be located for this NCR. However, as a result of SCD #57, all Mercury personnel were retrained. This training addressed redlining.

4. NCR-363

(a) NRC CONCERN

An Authorized Nuclear Inspector (ANI) review was not performed for installation of strongback support lugs to ASME process pipe.

RESOLUTION OR CORRECTIVE ACTION

ASME process pipe is class 3 and does not require ANI review.

(b) LP&L IDENTIFIED CONCERNS

1. Mercury NCR should have been upgraded to an Ebasco NCR.
2. Mercury Project Engineer did not verify similar installations for like condition.

RESOLUTION OR CORRECTIVE ACTION

1. ESSE approved the existing condition by issuance of an DCN.
2. Ebasco QA reviewed similar installations and the review results were placed with the Mercury NCR File.

5. NCR-380 (Ebasco NCR-W3-4015)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. Three sets of weld data records for support 604-70 are attached to the NCR. Unable to determine which record is being used as a basis for acceptability.
2. Mercury documentation cannot be found for welding performed by welder M-229.

RESOLUTION OR CORRECTIVE ACTION

1. NCR-W3-4015 was revised to NCR-W3-4015 R-1 for clarification of this discrepancy.
2. Research by Ebasco revealed that welder M-229 was qualified to perform the welding on the anchor plates.

6. NCR-420 (Ebasco NCR W3-4137)

See Ebasco NCR W3-4137 - (Attachment 1, Item A.5)

7. NCR-429 (Ebasco NCR W3-3965)

(a) NCR CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

NCR is acceptable.

RESOLUTION OR CORRECTIVE ACTION

None required.

8. NCR-438 (Ebasco NCR W3-4013)

(a) NRC CONCERN

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. The disposition did not address the action taken to preclude the use of the angle iron that was removed from the Mercury support.

RESOLUTION OR CORRECTIVE ACTION

The piece of angle was removed from the Mercury support, thereby resolving the nonconforming condition. Maintaining traceability of non-safety material (angle) is not required.

9. NCR-487 (Ebasco NCR W3-4044)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. Item No. 15 - Attachment #3 - Evaluation does not provide evidence that drawing has been redlined to reflect field conditions. Calculations should also be attached to verify additional loads for the attachment steel.
2. Per field verification, tubing for pressure indicator PI-SI-7140 has reverse slope and loose clamp.

9. NCR-487 (Ebasco NCR W3-4044) (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. The referenced item conforms to the hanger detail, therefore, Mercury drawing 160-T-033A does not require redlining. Calculations for the attachment steel have been attached to the NCR.
2. Additional engineering evaluation has been added to address the reverse slope and the loose clamp has been corrected.

10. NCR-491 (Ebasco NCR W3-4088)

See Ebasco NCR W3-4088 - (Attachment 1, Item A.4)

11. MERCURY NCR-528 (Ebasco NCR W3-4824)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. No statement or documentation was attached to the NCR to resolve traceability of heat #M2245.
2. Disposition of NCR fails to state whether the correct ID# was etched on the plate.
3. No documentation was attached to the NCR to verify corrective action taken.

RESOLUTION OR CORRECTIVE ACTION

1 & 3. Attached a copy of MRR-77-11206 to NCR, indicating heat code MZ-245 (M2245), and associated supplier C of C.
2. Field verified heat number 7428779 on anchor plate.

12. NCR-540

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

12. NCR-540 (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. Documentation not attached to NCR for replacement of support locator #31.
2. Documentation not attached to NCR for replacement of tubing that had cold spring.

RESOLUTION OR CORRECTIVE ACTION

1. Mercury documentation was attached to NCR for replacement of support locator #31 with an acceptable support locator #33.
2. Mercury documentation was attached to NCR for replacement of tubing with cold spring.

13. NCR-554

(a) NRC CONCERNS

No documented evidence of corrective action for hanger deficiencies identified during walkdown.

RESOLUTION OR CORRECTIVE ACTION

Documentation search and re-inspection established rework was accomplished.

(b) LP&L IDENTIFIED CONCERNS

1. No welding documentation for repair of supports.
2. No inspection documentation for repair of supports.
3. Inadequate documentation of corrective action to correct elongated holes in tube track.

RESOLUTION OR CORRECTIVE ACTION

1 & 2. Documentation search and reinspection established rework was accomplished.

3. Reinspection established rework was accomplished.

14. NCR-560 (Ebasco NCR W3-5428)

(a) NRC CONCERNS

None identified in the allegation associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

14. NCR-560 (Ebasco NCR W3-5428) (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. The NCR was closed without the appropriate documentation being attached to verify revision of drawing #163-L-003A and Support Inspection Reports.

RESOLUTION OR CORRECTIVE ACTION

1. A review of drawing #163-L-003A revealed the required revision to reflect locators 3, 4, and 5 to be 000-H-150-N. A copy of the drawing has been attached.
2. Copies of the Support Inspection Reports for each support locator 3, 4, and 5 have been attached.
3. CIWA 011645 was issued for reverification of the torque on Hilti bolts for supports 3 and 4.

15. NCR-565 (Ebasco NCR W3-4730)

(a) NRC CONCERNS

None identified in the allegation associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

The review of Mercury NCR-3243 which was issued to resolve items #1 and 2 of NCR-565 fails to provide adequate documentation to determine resolution.

RESOLUTION OR CORRECTIVE ACTION

The required documentation has been obtained from Mercury files and added to the NCR to resolve comments.

16. NCR-568 (Ebasco NCR-W3-4730)

(a) NRC CONCERNS

No documentation was attached to the NCR as objective evidence for corrective action taken.

(b) LP&L IDENTIFIED CONCERNS

The disposition of items #2, 3, 4, and 5 fail to provide adequate engineering basis for accept-as-is.

16. NCR-568 (Ebasco NCR-W3-4730) (Continued)

RESOLUTION OR CORRECTIVE ACTION

Items #2, 3, 4, and 5 were inspected for compliance to FCR-IC-579 (basis for accept-as-is of elongated holes). Items 3, 4, and 5 were acceptable. Item 2 was acceptable after evaluation by Design Engineering.

17. NCR-591 (Ebasco NCR-W3-4206)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. The analysis conducted for this NCR was not attached, including ESSE concurrence.

RESOLUTIONS OR CORRECTIVE ACTION

1. Calculations were performed by ESSE to substantiate analysis described in NCR. Analysis was attached to the NCR.

18. NCR-594 (Ebasco NCR-W3-5557)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

No documentation that drawing has been redlined.

RESOLUTION OR CORRECTIVE ACTION

Support in question is a typical detail and therefore not red-lined. Deviation is referenced appropriately in OCR package.

19. NCR-595 (Ebasco NCR-W3-4197)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

19. NCR-595 (Ebasco NCR-W3-4197) (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. Several supports installed which are not per an approved installation detail.

RESOLUTION OR CORRECTIVE ACTION

1. Description of NCR incorrectly written as Locator "5" was actually installed as Locator "23".
2. The anchor plate installation for Locator "23" is acceptable per the general notes section of the B-430 series detail drawings.
3. Attachments to NCR were made to clarify installation details.

20. NCR-614 (Ebasco NCR W3-4219)

See Ebasco NCR W3-4219 - (Attachment 1, Item A.6)

21. NCR-625 (Ebasco NCR-W3-5282)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

(b) LP&L IDENTIFIED CONCERNS

1. One weld sign-off for two welds.
2. Reason for voiding installation and location information.

RESOLUTION OR CORRECTIVE ACTION

1. Inspection reports identify welder of both joints.
2. Information voided due to redline #6.

22. NCR-656 (Ebasco NCR-W3-4303)

(a) NRC CONCERNS

None were identified in the allegations associated with this issue in Supplement 7 to the Safety Evaluation Report (SSER).

22. NCR-656 (Ebasco NCR-W3-4303) (Continued)

(b) LP&L IDENTIFIED CONCERNS

1. Process tubing supports installed without approved installation details.

RESOLUTION OR CORRECTIVE ACTION

1. Design Engineering reevaluated to accept-as-is per notation on installation detail of supports.
2. The current as-built condition was reverified by Ebasco QA Surveillance Engineering.

23. MERCURY NCR-658

(a) NRC CONCERNS

No documentation was attached to the NCR as objective evidence for corrective action taken.

RESOLUTION OR CORRECTIVE ACTION

1. A field verification by EBASCO revealed that corrective action per the NCR's disposition had been correctly performed.
2. Found and attached to the NCR, a Mercury anchor inspection report for retorquing of Hilti bolts.

(b) LP&L IDENTIFIED CONCERNS

No documentation was attached to the NCR as objective evidence for corrective action taken.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco field verification revealed that corrective action per the NCR's recommended disposition had been properly performed (see Ebasco General Inspection report SW-913).

2. Found and attached to the NCR, a Mercury anchor inspection report for retorquing of Hilti bolts.

B. MERCURY NCR's IN SUPPLEMENT 7 TO THE SSER

The following Mercury NCR's were identified by the NRC in Supplement 7 to the Safety Evaluation Report (SSER) published October 1, 1984. Mercury NCRs 888 and 889 were determined to have been administratively closed and accordingly are addressed in the response to Issue 13.

1. NCR-313

(a) NRC CONCERNS

Identified seven ½ inch stainless steel lines for P2 instruments that were damaged by weld spatter. The NCR stated that the lines were replaced and documented as such in operational control record (OCR) 995 and OCR 1020, but it could not be ascertained from these rework packages that the repair and reinspection was either started or completed. There was no documentation with these NCR's to prove that corrective action was completed.

(b) LP&L IDENTIFIED CONCERNS

The documentation of the corrective action was not included in the Mercury NCR package.

RESOLUTION OR CORRECTIVE ACTION

1. Documentation was copied from the referenced OCR packages, reviewed and added to the NCR package.

2. A reinspection was performed by Ebasco QC Inspector and the satisfactory QC Inspection Report was added to the NCR package.

2. NCR-322

(a) NRC CONCERNS

Identified seven ½ inch stainless steel lines for P2 instruments that were damaged by weld spatter. The NCR stated that the lines were replaced and documented as such in operational control record (OCR) 995 and OCR 1020, but it could not be ascertained from these rework packages that the repair and reinspection was either started or completed. There was no documentation with these NCR's to proved that corrective action was completed.

(b) LP&L IDENTIFIED CONCERNS

The NCR package was lacking documentation to support closure of the NCR.

2. NCR-322 (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. Documentation was retrieved from the referenced OCR package and added to the NCR package.

2. A reinspection was performed by Ebasco QC Inspector and the satisfactory QC Inspection Report was added to the NCR package.

3. NCR-337

(a) NRC CONCERNS

Identified seven ½ inch stainless steel lines for P2 instruments that were damaged by weld spatter. The NCR stated that the lines were replaced and documented as such in operational control record (OCR) 995 and OCR 1020, but it could not be ascertained from these rework packages that the repair and reinspection was either started or completed. There was no documentation with these NCR's to proved that corrective action was completed.

(b) LP&L IDENTIFIED CONCERNS

The NCR package was lacking documentation to support closure of the NCR.

RESOLUTION OR CORRECTIVE ACTION

1. The referenced OCR package was researched and records needed to support closure of the NCR were reviewed and found to be acceptable.

2. An inspection was performed by Ebasco QC Inspector with satisfactory results. QC Inspection Report was added to the NCR package.

4. NCR-572

(a) NRC CONCERNS

Noted that the weld on support locator #26 was undersized. The NCR stated that the weld was reworked and weld metal added to bring weld to sufficient size. There was no reference as to what OCR was issued to perform this rework or traceability of weld metal used in the performance of this job. Also, there were no inspection reports identified or contained in the package.

4. NCR-572 (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. Support No. 26 was redesignated as support No. 1714-33 by Redline No. 6 of Drawing No. 163-T-013-A.

2. A copy of documentation for weld build up was located and placed in file.

5. NCR-673

(a) NRC CONCERNS

Identified problems with instrument tubing installed by OCR #723.

(b) LP&L IDENTIFIED CONCERNS

The lines identified by Mercury NCR-673 were identified as P7N3 class lines and are covered by the requirements of ANSI B31.1. The corrective action was to be tracked and resolved by Mercury Co. Engineering Department. Documentation was not in NCR folder to show that the problem was tracked and resolved.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco re-inspected these lines on 8/2/84 and found that the discrepancies noted in this NCR had been corrected, and the condition no longer existed.

2. Copies of documentation to verify the re-inspection were placed in the NCR folder.

6. NCR-674

(a) NRC CONCERNS

Identified problems with the electromagnetic control panel worked by OCR #1246.

(b) LP&L IDENTIFIED CONCERNS

Documentation was missing from NCR folder to support disposition and closure of NCR.

6. NCR-674 (Continued)

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco reinspected the supports and tubing addressed on this NCR, and ESSE accepted the installation as-is.

2. Copies of the inspection and evaluation were placed in the NCR folder for support documentation to justify disposition and closure of this NCR.

7. NCR-675

(a) NRC CONCERNS

Identified problems with instrument tubing installed by OCR #720.

(b) LP&L IDENTIFIED CONCERNS

Documentation was not in NCR folder to support disposition and closure of the NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Documentation was located to show that Ebasco performed an inspection and copy of the inspection report was placed in the NCR folder.

8. NCR-676

(a) NRC CONCERNS

Identified problems with instrument tubing installed by OCR #720.

(b) LP&L IDENTIFIED CONCERNS

Documentation was not in the NCR folder to justify closure of this NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco inspected the tubing and found that the minor low would not affect the applicable pressure switch. ESSE concurred and accepted the installation as-is.

2. Copies of the evaluation have been placed in the NCR folder to support closure of the NCR.

9. NCR-677

(a) NCR CONCERNS

Identified problems with instrument tubing installed by OCR #1332.

(b) LP&L IDENTIFIED CONCERNS

Documentation not available in NCR folder to support disposition and closure of this NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco re-inspected the tubing addressed by this NCR and ESSE accepted the installation as-is.

2. Copies of the inspection and evaluation have been placed in the NCR folder to support disposition and closure of this NCR.

10. NCR-678

(a) NRC CONCERNS

Identified problems with instrument tubing installed by OCR #723.

(b) LP&L IDENTIFIED CONCERNS

Sufficient documentation not in NCR folder to support disposition and closure of NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Ebasco re-inspected the tubing addressed in this NCR, and the results were evaluated by ESSE to use-as-is.

2. Copies of the inspection and evaluation have been placed in the NCR folder to support disposition and closure of this NCR.

11. NCR-806 (Ebasco NCR W3-7547)

(a) NRC CONCERNS

Ebasco NCR W3-7547 noted discrepancies against OCR#1830 and Mercury NCR-806. The disposition of this NCR is unsatisfactory due to the system passing a hydrostatic test is used as the basis for accountability of fit-up discrepancy.

11. NCR-806 (Ebasco NCR W3-7547) (Continued)

RESOLUTION OR CORRECTIVE ACTION

See Attachment 1, Item A.30 (Ebasco NCR W3-7547).

12. NCR-2234 (Ebasco NCR W3-4593)

(a) NRC CONCERNS

Stated that no heat numbers could be verified between FW13 and FW13R. This is for OCR#666, System 52B. The recommended disposition was per Attachment #4 of NCR W3-4593.

(b) LP&L IDENTIFIED CONCERNS

Documentation not available is NCR folder to support disposition and closure of NCR.

RESOLUTION OR CORRECTIVE ACTION

1. Copies of the referenced attachment of Ebasco NCR W3-4593 were placed in this NCR package.

2. Documentation necessary to support closure of this NCR was added to the package as supplemental information.

13. NCR-3149

(a) NRC CONCERNS

Indicated that there was no documented indications that welder M-343 was qualified to welding procedure specification D (WPS-D). Disposition of this problem was by use of a weld test coupon subsequently found on April 27, 1983, but no longer available. No documentation existed on the qualification of this welder or on his retest. Thus, all welds made by this welder were suspect.

(b) LP&L IDENTIFIED CONCERNS

Documentation was not available in NCR folder to support justification and closure of this NCR.

RESOLUTION OR CORRECTIVE ACTION

The welder's (M-343) certification records were located and placed in the NCR folder.

RESPONSE

ITEM NO: 7 (Revision 1)

TITLE: BACKFILL SOIL DENSITIES

NRC DESCRIPTION OF CONCERN:

The staff found that records are missing for the in-place density test of backfill in Area 5 (first 5' starting at Elevation -41.25'). These documents are important because the seismic response of the plant is a function of the soil densities.

LP&L shall (1) Conduct a review of all soil packages for completeness and technical adequacy and locate all records and provide closure on technical questions, or (2) conduct a review of all soil packages for completeness and technical adequacy and where soil volumes cannot be verified by records as meeting criteria, perform and document actual soil conditions by utilizing penetration tests or other methods, or (3) Justify by analysis that the soil volumes with missing records, or technical problems as defined after the records review, are not critical in the structural capability of the plant under seismic loads.

DISCUSSION:

LP&L has reviewed all soils packages for completeness and technical adequacy, has located the items found missing by the staff, has identified those soil volumes for which complete records were not found, and has justified by analysis that the structural capability of the plant under seismic loads is assured. A detailed engineering report has been prepared and attached to this response describing the review and analysis of the soil backfill densities, which reconfirms the adequacy of the backfill. This was also repeatedly demonstrated in the seven (7) statistical studies of backfill densities performed during the construction period, which showed good control of the work was achieved and specification requirements generally exceeded.

The following discussion is a summary of the findings of the attached report.

The design criterion for the backfill was to obtain a liquefaction free material at 75% relative density. To confirm compliance with this design criterion, a detailed three stage program was implemented to perform a review for completeness and analysis of backfill soil density and inspection reports for technical adequacy which verifies the structural capability of the plant under seismic loading conditions.

The program effort was conducted under the direction of the Ebasco Site Soils Engineer who was present during the performance of the majority of the actual backfilling operations. Two basic sets of evaluations were performed, the first on soil backfill test records, and the second on the corresponding inspection Reports.

During the Stage I effort, a detailed search was made of all locations containing soil backfill data. Additional test records and inspection reports were obtained from contractor and laboratory files and also Engineering, Laboratory and Quality Control indices and tabulations were retrieved.

Once the packages of soil data were located and collected, Stage II activities concentrated on a review of the documents for completeness and a compilation of the data into a format amenable to review of the NRC concerns.

Included in the review were each type of Inspection Report and each type of test record in the soil packages. It was determined that the complete set of test records and a nearly complete set of inspection reports had been located.

In direct response to the first paragraph of the Description of the NRC Concern, the data for the 34 in-place density tests performed in the first 5.5' of Class A fill placed in Fill Area #5 from Elevation -41.75 to EL -36.25, has been located.

Stage III activities consisted of engineering evaluation of the data gathered and organized in Stages I and II. The results of the Stage II and III evaluations for completeness and technical adequacy for both the test records and inspection reports are summarized as follows:

(A) EVALUATION OF TEST RECORDS

Test records deal with quantitative attributes of the fill such as density, moisture content and gradation. The test most indicative of quality is density, since it relates directly to liquefaction potential, however, the other attributes were also reviewed for acceptability.

Utilizing the complete package of final backfill test records, totalling approximately 3100 tests, overlay plots of relative density were constructed at each one foot interval of elevation and laboratory test data were tabulated during the Stage II effort. These documents represent a graphical plot of density test frequency and distribution, and tabulate and display the final insitu relative densities.

The Stage III review and evaluation of the technical adequacy of the Class A backfill to provide structural stability of the plant under seismic loadings was based upon a comparison of the design requirements as stated in the Ebasco Specification LOU-1564.482 with existing documentation and with the relative density plots prepared in this review. These plots are available in the Site Quality Assurance Records Vault. These plots demonstrate satisfaction of requirements for test frequency and distribution throughout the fill volume.

The evaluation included each type of test record required by the governing specifications and procedures and analyzed:

- The completeness of all test records
- The testing frequency and distribution of in place density tests
- The frequency of laboratory control tests
- The performance of statistical studies
- The Class A Backfill relative density

The results of these analyses are as follows:

(1) The Class A backfill soil testing records are complete.

(2) Field density and laboratory density and gradation tests were generally performed in accordance with the specified frequencies.

In less than 8% of the cases reviewed, the laboratory control tests were run at intervals slightly larger than the specified (one control set per ten field density tests) criteria. The backfill placed during these periods was randomly located throughout the fills and the relative densities obtained during these intervals were found to be in compliance with the specification requirements. This variance was therefore evaluated to be acceptable.

(3) Field tests were located in accordance with the specified random distribution. In less than 5% of the tests reviewed, the location coordinates of the inplace density tests were found to be in error. These tests were still a valid indicator of the relative density of the backfill at a random spot at a known elevation in a known fill area and were therefore deemed to be acceptable tests.

(4) Statistical studies of relative density were performed in accordance with the specification requirements.

(5) The Class A backfill soil densities are in accordance with the specification requirements and will provide the required design structural capability to the plant under seismic loads.

(B) EVALUATION OF INSPECTION REPORTS

Inspection records generally deal with qualitative attributes of the fill such as proper preparation of the fill surface and cleanliness of fill received. Production-related quantitative information such as fill location, elevation and area are also provided.

During the Stage II review activity, the total file of inspection reports for Class A backfill was inventoried and combined into compatible soil packages. Included in the inventory were approximately 12,000 inspection reports ranging from EL -44 to EL+20 throughout all seven fill areas. The reports were grouped and compiled by fill location, elevation and placement date for each of the five types of inspection forms and summarized in several tabulations.

The evaluation of these inspection reports was divided into two phases: the evaluation of the inspection reports to determine their overall completeness, and the evaluation of the frequency and distribution of inspection reports to determine their content.

Two comparative analyses were performed to determine the relative completeness of the inspection documentation. The first analysis performed was a comparison of the quantity of inspection packages to testing packages throughout the fills, while the second compared the documented surface area of inspection to the total surface areas of the fill placement.

Once completeness of inspections was established, an additional analysis was performed to define the magnitude, the distribution and significance of the documentation found to be missing. This analysis evaluated the distribution of each type of inspection report by fill location and elevation, and determined types of missing documentation and the amounts of backfill by volume affected. The results of this analysis are as follows:

(1) The distribution of the existing inspection documentation throughout the backfill is essentially identical to the distribution of the field testing effort in that where inspection reports are found for a given fill area and elevation, a density test report is also found, thus indicating a one to one relationship between inspection and testing activities. This is an expected trend since the inspection activity included ordering tests performed. It is therefore concluded that the inspection activity took place whenever tests are found and that missing inspection reports are not indicative of lack of inspection activity.

(2) Eighty percent of the volume of the backfill has a sufficient quantity of each type of inspection report to fulfill the requirements of the specification and inspection procedures.

(3) For the 20% of the volume of the backfill which was missing some of the required inspection reports, 16% has an average of 81% of the reports required, 3.8% has one or more type of inspection missing, and 0.2% consisting of six one foot lifts in four fills have no inspection reports at all.

For details, see the Report, Section 4.B. and Table No. 2.

The effect on each of these types of deficiencies was evaluated based upon the quantity and type of inspection documentation existing above, below and around the affected fill areas, the relative density results in the affected areas and the relatively small volume of fill affected. It was concluded that the deficiencies found in the inspection documentation are most probably due to lost folders, are not indicative of a lack of inspection effort, and will have no effect on the structural capability of the plant under seismic loads.

CAUSE:

The cause of this concern was the fact that some of the field inspection and laboratory test records for the Class A backfill were still in the contractor's QA records vaults. This contractor is still active on site and had not initiated the transfer of documentation to the LP&L-Ebasco Quality Assurance Vault. All available soil records are now permanently stored in this vault.

GENERIC IMPLICATIONS:

Based upon the results of the detailed review and analysis of backfill soil densities and corresponding inspection reports described in the discussion above, the Class A backfill was found to be sufficiently in compliance with the specification requirements.

The large effort required to establish the completeness of the records is due to the intrinsic difficulty of scoping a bulk process such as backfill in the absence of an administrative control tool, such as a logbook of inspections, which was not required by the implementing procedures. This scoping problem is believed to be unique to the soils/backfill effort.

Difficulty in establishing records completeness also was due to incomplete records turnover from the onsite contractor involved. Therefore, a generic concern exists as to the extent to which there has been incomplete records turnover on the part of remaining site contractors. This is addressed in the CORRECTIVE ACTION PLAN below.

SAFETY SIGNIFICANCE:

Test records and inspection reports were located and analyzed demonstrating compliance with the specification. Therefore, the Class A backfill will perform its function with respect to structural design capability under seismic loads. LP&L therefore believes that this issue is of no safety significance with respect to fuel load, power ascension or operation.

CORRECTIVE ACTION PLAN/SCHEDULE:

The complete set of laboratory test records, along with the attached report and corresponding documents, has been transmitted to the LP&L-Ebasco Quality Assurance Records Vault.

The remaining site subcontractor records for completed work have also been transferred to Ebasco. Records for the minimal construction and testing activities are being turned over as work is completed. This will assure accessibility and retrievability of subcontractor records and ultimate turnover to LP&L in accordance with the established records turnover program.

ATTACHMENTS:

"Report on the Review and Analysis of Soil Backfill Densities" - NRC Concern No. 7.

REPORT ON THE REVIEW AND ANALYSIS

OF SOIL BACKFILL DENSITIES

IN RESPONSE TO

NRC CONCERN

NO. 7

FOR

LOUISIANA POWER & LIGHT COMPANY
WATERFORD STEAM ELECTRIC STATION
UNIT #3

EBASCO SERVICES INCORPORATED

AUGUST, 1984

REVISION 1

NOVEMBER, 1984

REVIEW AND ANALYSIS OF SOIL
BACKFILL DENSITIES
NRC CONCERN NO. 7

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REVIEW AND ANALYSIS OF SOIL
BACKFILL DENSITIES
NRC CONCERN NO. 7

1. INTRODUCTION

In the NRC letter of June 13, 1984, the following Concern No. 7 was expressed relative to the Soil Backfill Densities:

ITEM NO: 7

TITLE: BACKFILL SOIL DENSITIES

NRC DESCRIPTION OF CONCERN:

The staff found that records are missing for the in-place density test of backfill in Area 5 (first 5' starting at Elevation -41.25'). These documents are important because the seismic response of the plant is a function of the soil densities.

LP&L shall (1) conduct a review of all soil packages for completeness and technical adequacy and locate all records and provide closure on technical questions, or (2) conduct a review of all soil packages for completeness and technical adequacy and where soil volume cannot be verified by records as meeting criteria, perform and document actual soil conditions by utilizing penetration tests or other methods, or (3) justify by analysis that the soil volumes with missing records, or technical problems as defined after the records review, are not critical in the structural capability of the plant under seismic loads.

In response to the above stated concern, the Ebasco Civil ESSE Department implemented a three stage program to resolve this concern. The review and evaluation of soil test records was conducted in accordance with approach (1) of the concern while the review and evaluation of inspection reports was conducted in accordance with approach (3) of the concern.

The study plan depicted in Table 1 and described herein, was implemented to determine if the deficiencies that do exist in the soil packages will critically effect the structural capacity of the plant under seismic loadings.

Stage I of the program consisted of a data acquisition effort. After the data was located and collected, the Stage II effort consisted of a review for completeness and data compilation. Finally, the Stage III activity consisted of an overall review and evaluation of the soil packages for technical adequacy and specification compliance.

The program effort was conducted under the direction of M. Temchin, the Resident Sr. Site Soils Engineer, who was present during the performance of the majority of the actual backfilling operations.

2. SUMMARY AND CONCLUSIONS

As a result of the study program described herein, it has been concluded that:

REVIEW AND ANALYSIS OF SOIL
BACKFILL DENSITIES
NRC CONCERN NO. 7

A. Test Records

(1) The Class A Backfill soil test records are complete.

(2) Field and laboratory tests were performed in accordance with the specified frequencies. In less than 8% of the cases reviewed, the laboratory control tests were run at intervals slightly larger than the specified, one set per ten inplace density test criteria. The backfill placed during these periods was randomly located throughout the fills and the relative densities obtained during these intervals were found to be acceptable when compared to the specification requirements.

(3) Field tests were located in accordance with the specified random distribution. In less than 5% of the tests reviewed, the location coordinates of the inplace density tests were found to be in error. These tests were still a valid indicator of the relative density of the backfill at a random spot at a known elevation in a known fill area and were therefore found to be acceptable tests.

(4) Statistical studies of relative density were performed in accordance with the specification requirements.

(5) The Class A backfill soil densities are in accordance with the specification requirements and will provide the design structural capability to the plant under seismic loads.

B. Inspection Reports

(1) The distribution of the existing documentation throughout the backfill is essentially identical to the distribution of the field testing effort, thus indicating a one to one relationship between inspection and testing activities. Since the field testing activity is known to be complete, the inspection activity is also believed to be complete.

The majority of the missing inspection reports are therefore believed to be misplaced. Inspection trends based upon evaluation of inspection frequency and distribution indicate that the majority of the missing inspections were performed.

(2) 80% of the volume of the backfill has a sufficient quantity of each type of inspection report to fulfill the requirements of the specification and inspection procedures.

(3) For the remainder of the volume of the backfill which has missing inspection reports:

(a) 16.0% of the volume of the backfill has an average of 81% of the quantity of inspection reports required with at least one of each type of inspection report on each fill at each elevation in its volume.

(b) 3.8% of the volume of the backfill has a partially complete representation of inspection reports with one or more type of inspection missing on each fill at each elevation in its volume.

(c) 0.2% of the volume of the backfill has no inspection reports at the fill locations and elevations included in this volume.

The effect on each of these types of deficiencies has been evaluated and found to have no effect on the structural capability of the plant under seismic loads.

3. STAGE I - LOCATION OF EXISTING DATA

The primary emphasis of the Stage I activity was the collection of soils data which in addition to specifications and procedures, includes test records and inspection reports. To accomplish this task, a detailed review was performed of the following data locations:

- Ebasco Quality Assurance Records Vault
- Ebasco Engineering Files
- Ebasco Warehouse
- On-Site Laboratory Files (G.E.O.)
- Contractor Quality Assurance Records Vault (J. A. Jones)

As a result of this effort, several key document packages were located and are attached to this report for permanent storage. A brief description of each of these document packages is presented below. The hierachy of the documents is depicted in the Study Plan Flow Chart, Table No.1 attached.

DOCUMENT 1 - Ebasco Specification LOU-1564.482, R7 Filter and Backfill.

This is the latest revision of the specification under which all soil backfill was selected, placed, compacted and tested. The document presents the design requirements of the backfill activity and served as the basis for the development of the two Quality Inspection Procedures summarized below.

DOCUMENT 2 - Ebasco Quality Control Inspection Procedures, QCIP-2, RH and WQC-1, RA

These are the Ebasco Quality Control Inspection Procedures under which the soil backfill material was selected, placed, compacted, tested, documented and approved.

DOCUMENT 3 - J. A. Jones Site Inspection and Test Procedure for Backfill and Compaction, W-SITP-12, R8

This is the latest revision of the Contractor's Quality Verification procedure under which all soil backfill material was selected, placed, compacted, tested and documented.

Each of these documents required the performance of routine field and laboratory testing of the backfill material. The actual soil testing was performed by an onsite laboratory in accordance with these requirements. The following control documents were generated by the soils laboratory in addition to the standard set of test reports.

DOCUMENT 4 - Soils Laboratory - Class A Backfill Test Index

This index was developed by the test laboratory as a working record of each Class A test performed. This hardcover, bound notebook lists the test number, location coordinate, elevation date and type of test performed. It was developed as a system of assigning numbers to and documenting the completion of all Class A tests.

DOCUMENT 5 - Soils Laboratory - Class A Backfill Field and Laboratory Test Summary

This summary was developed by the soil testing laboratory as a daily tabulation of the results of soil testing performed. Contained in this document are the lab test number, fill number, test location, field density, lab density, grain size and relative density test results for each day of work, recorded on a single page for supervisory review and study.

Utilizing these records, Ebasco performed the required periodic statistical studies of insitu relative density of the backfill as described in brief in Document 6 below.

DOCUMENT 6 - Ebasco Statistical Studies of Class A Backfill Relative Densities

This document contains all of the seven statistical studies performed on the Class A backfill relative densities which document the backfills overall acceptability. It also contains letters to the earthwork contractors regulating the percent compaction criteria based upon the results of these studies.

DOCUMENT 7 - Class A Backfill Inspection Reports

In order to review the large quantity of inspection reports which make up the soil packages in the files, nine basic types of forms were identified. Document 7 contains samples of the typical forms found in each of the soil packages in the vault. These forms are discussed in detail in Stage II of the report.

After locating and collecting the data, Stage II activities concentrated on a review of the documents for completeness and on compiling the data into a format compatible for review of NRC Concerns.

In order to perform this task, the 17,000 existing soil documents were divided into the following two types:

(1) Soil Inspection Reports (Forms 1-5)
(2) Soil Test Records (Forms 6-9)

Since the test records provide a direct measure of the capability of the backfill to provide the required structural support to the plant island under seismic loadings, they were the first records to be reviewed. The remaining inspection reports were reviewed after the completion of the test record study. The details of these activities are presented below.

4. STAGE II - REVIEW OF SOIL PACKAGES FOR COMPLETENESS

A. Test Records

The first step in the review of the documentation was a detailed review of all soils laboratory documentation on site for completeness. Included in the review were:

- In-Place Density Tests - ASTM 2167 — Form 6
- Proctor Tests - ASTM 1557 — Form 7
- Moisture Content Tests - ASTM D2216 — Form 8
- Sieve Tests - ASTM D422 — Form 9
- Relative Density Tests - ASTM D2049 (Off Site Lab)

By comparing the Class A Backfill Test Index (Document 4) and the Field and Laboratory Soil Test Summary (Document 5) to the actual files of soil test data at the onsite laboratory, a complete set of field and laboratory test records was found to exist.

In direct response to the first paragraph of the NRC Concern No. 7, attached in Appendix "A" are copies of the 34 in-place density tests performed in the first 5.5' of fill placed in Fill Area #5 from Elevation -41.75 to EL -36.25. In addition to the density tests records, Table A-1 summarizes the elevation of the test, the test coordinate, the test number, the date the test was performed and, documents the number of the reference proctor and grain size lab tests used to determine specification compliance. Each test location and relative density are plotted on the corresponding overlay plots in Document 9 of this report.

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Utilizing the complete set of backfill density test records and the Class A Backfill Field and Laboratory Test Summary (Document No. 5), and keeping in mind the goals of completeness and technical adequacy, two new documents were developed for subsequent evaluation. A brief description of each of these documents and methodology used to prepare the documents is presented below.

<u>DOCUMENT 8</u> - Class A Backfill Test Index by Fill Number in Ascending Elevation

This document is a complete listing of all Class A density tests categorized by fill area in order of ascending elevation. It lists for each fill area, the field density test location, number and date of performance in order of ascending elevation.

This tabulation served as the basis for the preparation of the overlays of relative density by elevation, Document 9 discussed below.

<u>DOCUMENT 9</u> - Class A Backfill Relative Density Overlay Plots By Elevation

In order to evaluate the frequency and distribution of field test and relative density, the following procedure was used to construct the overlay plots:

(1) All Class A density tests were regrouped by fill number in order of ascending elevation (Document No. 8).

(2) A key plan drawing of the plant island excavation was constructed containing the soil backfill grid system. One original sheet was used for each one foot interval of backfill. Relative density overlay plots were then constructed from EL -44 to Elevation +20 to encompass all Class A backfill density tests.

(3) Using Document 8, each density test was plotted on the form using the test coordinates and elevation. A different symbol was used for each respective fill number. The test number was recorded adjacent to each data plot. It should be noted that the boundaries of each fill area are not represented. This is because the boundaries were somewhat arbitrary and changed in exact location at different elevations in the fill. In addition, backfill activities typically involved areas smaller than the numbered fill area, and in some cases, was carried across fill boundaries.

(4) The test number was then recorded in the test schedule on the side of the overlay along with the relative density value for each test found from the Class A backfill Test Summary (Document 5).

(5) For Class A backfill placed above Elevation +13 (See Statistical Study No. 7, Document 6), the percent compaction value for each field test was found in the Class A Backfill Field and Laboratory Test Summary (Document 5) and recorded in the test schedule with as asterisk.

(6) Once the data was plotted and tabulated, the theoretical surface boundaries of the backfill were approximated utilizing the fill boundaries and the Nuclear Plant Island exterior walls. The surface area of the backfill at each elevation was then calculated with a planimeter and recorded on the overlay.

(7) In cases where the actual distribution of the plotted density tests indicated backfill placement outside of the theoretical boundaries, the fill boundary was extended to include that material.

(8) By dividing the surface area by 20,000 ft^2, the minimum number of density tests required by the Specification LOU-1564.482 was calculated and recorded on the overlay.

(9) Finally, the actual number of density tests performed at each elevation was recorded, completing the overlay.

The completed overlay plots are a graphical presentation of the density test frequency and distribution, and most importantly, they tabulate and display the final insitu relative densities and/or percent compaction of the backfill.

These plots were utilized in the review and evaluation of Test Records for technical adequacy and specification compliance in the Stage III-A of the Study Program.

B. <u>Inspection Reports</u>

In the review and evaluation of the completeness of the inspection documentation, the following factors were considered:

- The requirements of the Quality Control Inspection Procedure in force at the time the work was done. Three different Ebasco procedures and one Contractor procedure existed during the eight years of placement. Each procedure was revised numerous times. Therefore, different inspection report forms were in use at different times during backfilling operations.

- The location and elevation of the fill. Some forms were used to document inspections of activities which were not common to all fill placements. Therefore all forms were not required in all packages.

- The frequency of inspection. Some backfilling activities required 100% Ebasco inspection and others not. Since the work was done by a contractor that had an acceptable quality assurance program, Ebasco inspection was designated as "once per day, by Checklist, when work is in progress." (QCIP-2, Section 8.4.2 - Document 2).

(1) Description of Inspection Forms

Considering these variations in procedures, fill locations and inspection frequencies, the following basic inspection report forms were found to exist, samples of which are found in Document 7:

- Form #1 - J. A. Jones Daily Backfill Inspection Reports
  W-SITP-12 (R1-R8)

  These forms summarized the overall acceptability of the daily backfill operation including material acceptability, excavation, backfill placement and compaction, and field testing. They were completed by the contractor on a daily basis for each backfill area of major earthwork.

- Form #2 - Ebasco Borrow Material Inspection Reports
  QCIP-2-1/WQC-1-9

  These forms summarized the acceptability of the borrow material used for Class A backfill including the material source, moisture content and gradation check test results. This inspection was performed by Ebasco daily.

- Form #3 - Ebasco Excavation and Stripping Inspection Reports
  QCIP-2-2/WQC-1-17

  These forms summarized the acceptability of the activities performed in preparing the fill area for the new backfill placement. Included on this form are drainage conditions, stripping, excavation, cleanup and moisture and density testing of exposed materials. The form was primarily utilized for excavation stripping and grubbing when the Class A backfill abutted and joined the natural clay slopes (below EL -5). Above this elevation, the use of this form was up to the discretion of the Ebasco Inspector.

- Form #4 - Ebasco Daily Backfill Inspection Reports
  QCIP-2-3/WQC-18

  These forms summarized the acceptability of the daily backfill operation emphasizing the backfill placement, compaction and field testing. It is very similar to the Form #1 completed daily by the J. A. Jones, quality verification inspection force and was utilized daily by Ebasco for all major Class A backfills.

- Form #5 - Ebasco Backfill Acceptance Report
  QCIP-2-4

  This form summarized the findings of the Ebasco inspection report forms #2, 3 & 4 and the soil laboratory test results resulting in the overall acceptance of a particular fill. The form was discontinued in revision H of QCIP-2 (12/6/77).

(2) Completeness and Distribution of Inspections

During the Stage II review activity, the total file of inspection reports for Class A backfill was inventoried and combined into compatible soil packages as exemplified in Document 7. Included in the inventory were approximately 12,000 inspection reports ranging from EL -44 to EL +20 throughout all seven fill areas. The reports were grouped and compiled by fill location, elevation and placement date for each of the five types of inspection forms summarized above. The resulting inventory of inspection reports is presented in Table No. 2 and discussed below.

The evaluation of these inspection reports was further divided into two phases; the evaluation of the inspection reports to determine their overall completeness and the evaluation of the frequency and distribution of inspection reports to determine their content. The following discussions summarize the results of these evaluations:

a. Completeness of Inspections

In the evaluation of the completeness of the inspection documentation, it must be noted that the exact numbers of inspection documentation required by the governing procedures cannot be reconstructed. Certain of the five types of inspections were required on a daily basis (100% coverage - Forms 1, 2 & 4) while others were required on a partial coverage basis (Form 3 & 5). For this reason several comparitive analyses were performed to evaluate relative completeness of the documentation.

When evaluating the total number of forms existing for each type of inspection (Table 2), it is found that Forms 2 and 4, which are representative of the required 100% inspection, number an average of 2900 each, and that Forms 3 and 5, which are representative of a partial inspection, number as average of 2000 each inspections. The Form 1 inspection (J. A. Jones Daily Inspection Report) which was performed at a 100% coverage and thus should have resulted in approximately 2900 forms, appears to be incomplete. It must be noted, however, that the Form 1 daily inspections by J. A. Jones and the Form 4, Daily Inspections by Ebasco, were duplicate inspections of the same placement and compaction activities. Since the missing Form 1 data is found on the duplicate Form 4 Inspection Reports, which appear to be complete, the missing Form 1 Reports constitute no loss of quality documentation and have no further significance to the inspection report evaluation unless the corresponding Form 4 is missing. Thus the existing inspection documentation would indicate that 100% inspection coverage consists of 2900 inspections.

In order to evaluate the validity of this number, consideration was given to the complete set of field density test records presented in Table No. 5 (which will be discussed in more detail in the evaluation discussions of density testing). This table indicates that 3076 Class A density tests were performed when only 858 tests were required based upon the one test per 20,000 ft^2 specified frequency. Thus approximately three times as many tests were performed as the fill surface area would require. Since the specification also requires one test for each area less than 20,000 ft^2 placed in any one day, the existence of so many extra tests would indicate that the large majority of fills placed were less than 20,000 ft^2 and that the testing frequency was governed by the less than 20,000 ft^2 placed in any one day criterion. This is further substantiated by a review of the density overlay plots (Document 9) which clearly indicate small fill placements at the upper elevations and around specific construction items. This being the case, since each small fill area of less than 20,000 ft^2 worked required a test, it would also require a set of inspections for the same fill area. Noting that the 3076 field density tests constitute a complete set of test records and considering the correlation developed above it is reasonable to conclude that the total number of inspection report packages for 100% coverage should also number around 3076. Taking into account that a small percentage of fills had more than one density test per fill, because their surface areas exceeded 20,000 ft^2, the number of required inspection packages should be slightly less. By comparing the 2900 existing inspections that represent the 100% inspection frequency to the 3076(-) packages which should have existed. It is concluded that based on this comparison, the inspection documentation files are substantially complete.

To further evaluate and better define the completeness of the inspection reports, a comparative analysis was performed of the surface area indicated on the Inspection Reports to the total surface area of the fill areas.

In this analysis, the surface area recorded in each of the daily inspection report packages (Form 1 or 4) was totalled and compared to the total surface area of the backfill at each elevation as calculated on the overlay plots (Document 9). By comparing the actual surface area of backfill inspected to the total surface area of backfill placed, the percentage of inspection coverage was calculated. The results of this analysis are summarized in Table No. 3 and discussed below:

(1) The actual inspected surface area in some cases was larger than the theoretical surface area (overlay plots). This is because many fill areas were constructed on more than one day, thus generating two reports for the same area.

(2) Evaluation of the percent of inspection coverage column of Table 3 indicates that for ?0% of the volume of the backfill, there exists a sufficient quantity of each type of inspection to document the acceptability of the backfill represented by the inspected surface area.

(3) For the remaining 20% of the volume of the backfill which was found to have missing inspection reports, the average percent of inspection coverage was found to be 81%.

As a result of these analyses of the completeness of the inspection documentation, it is concluded that the documentation is basically complete with 80% of the volume of the backfill documented with complete soil packages and the remaining 20% of the backfill containing partial deficiencies in the inspection reports.

b. Distribution of Inspections

As part of the evaluation of the significance of the missing inspection reports, the distribution of the existing inspection documentation was evaluated.

To consider the distribution of the existing inspection reports throughout the fill area, Table No. 4 was developed. It compares the distribution of the inspection effort to the distribution of the field testing effort which is known to be complete. By comparing the percent of inspections on each fill area to the percent of field density testing on each fill area, it is found that both the inspection and testing activities have essentially identical distributions of effort. This observation further supports the correlation that approximately one inspection report should exist for each density test and strengthens the conclusions that the inspection report documentation is basically complete.

In the further evaluation and definition of the distribution of the types of inspection reports shown in Table No. 2, two distinct trends are immediately apparent, with the division in trend at elevation -25.00.

(a) Between elevation -25 and the bottom of the excavation, there exist 52 fills with partial distribution of inspection report documentation, or none at all. Of these 52 fills:

- 25 fill areas have some types of inspections by both the Contractor and Ebasco. These fills constitute 6.3% of the total number of fills constructed and account for 1.8% of the total volume of Class A backfill constructed.

- 21 fill areas have inspection documentation only by the Contractor. These fills constitute 5.3% of the total number of fills constructed and account for 2.0% of the total volume of Class A backfill constructed.

- 6 fill areas have no inspection documentation. These fills constitute 1.5% of the total number of fills constructed and account for only 0.2% of the total volume of backfill constructed.

(b) For the remainder of the fill placements between elevation -25 and plant grade with minor exception, the data in Table 2 indicates that each type of inspection was performed at least once on each fill area at each elevation. In some cases, as many as 60 inspections of a particular type were performed on one fill at one elevation (Fill #6, EL 13.00 - 13.99).

Thus, a review of the distribution of the types of inspection reports that are missing indicates that the 52 fill areas with an incomplete distribution of inspection documentation are concentrated in 13.1% of the total number of fill areas constructed and account for only 4% of the total volume of backfill placed.

The impact of these findings on the evaluation of the technical adequacy of the inspection reports is discussed in Stage III-B of this report.

4. STAGE III - REVIEW AND EVALUATION OF SOIL PACKAGES FOR TECHNICAL ADEQUACY AND SPECIFICATION COMPLIANCE

A. Test Records

The review and evaluation of the technical adequacy of the Class A backfill to provide structural capability of the plant under seismic loadings was based upon the design requirements as stated in the Ebasco Specification LOU-1564.482. Those sections pertinent to the Class A backfill soil density are as follows:

" In-Place Density and Testing

Sand materials and clam shell to be used as Class A backfill shall have an in-place relative density of 75 percent. The variation for Class A fill from the above specified degrees of compaction shall be a maximum of one standard deviation less than the specified relative density. The numerical value of the standard deviation from Class A fill will be established by a series of field tests to be conducted during the initial compaction operations and will be reported in terms of minimum allowable density required.

The minimum allowable density for the basis of field control at the start of work and until establishment of the standard deviation for Class A fill shall be 95 percent of Modified Proctor. The required percent compaction will be adjusted either up or down, depending upon the results of statistical studies which will be made during the backfilling operations in order to maintain the 75 percent relative density requirement.

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"Clay materials to be used for Class A backfill shall have in-place density of 90 percent of the maximum density obtained in the Modified Proctor Compaction Test. All materials to be used for Class B backfill shall have an in-place density of 90 percent of the maximum density obtained in the Modified Proctor Compaction Test. The variation from the above specified degrees of compaction shall be a maximum of 10 percent of the density test results falling a maximum of 5 percent less than the specified density in a random distribution as determined by the Engineer.

.1 Control tests of densities and moisture contents shall be made by the Engineer as the work progresses, to assure that required densities and moisture contents are being achieved.

.2 The in-place density shall be tested in accordance with ASTM-D1556, ASTM-D2167, ASTM-D2922 and any other method suitable in the judgment of the Engineer to insure that the backfill has been properly compacted. One test shall be made in each layer for every 20,000 sq.ft. of compacted Class A fill area and one test for every area of less than 20,000 sq. ft. placed in one day.

.3 The optimum conditions for both moisture and density will be determined by the Engineer for the fill materials. One laboratory density test (ASTM-D1557) and one mechanical gradation test (ASTM-D422) shall be performed on samples taken from in-place density test holes for each ten in-place density tests performed. The results of these tests made during the backfilling operation shall be made available to the Contractor."

In summary, the basic criterion of the specification were to:

- Obtain 75% relative density in the Class A fill.
- To check the compaction of the fill with field in-place density and moisture tests and laboratory density and gradation tests at specified frequencies.
- To perform periodic statistical studies of the Class A backfill relative density in order to evaluate the results.

Compliance with these requirements is discussed in the following sections.

(1) <u>Test Frequency and Distribution of In-Place Densities</u>

By using the completed density overlay plots (Document 9), the frequency of Class A in-place density tests (ASTM D-2167) performed for each one foot elevation of backfill was compared to the backfill specification criteria stated above. Since each in-place density test includes a moisture test, verification of moisture tests was simultaneously developed with the density review.

In addition to this criteria, inherent in the requirement for the performance of statistical studies is the need to demonstrate a random distribution of test data. By studying the location of tests on each fill, an evaluation of the random distribution of the test pattern was also performed.

Table No. 5 and Document 9, the overlay plots present a summary of the results of these reviews. The minimum number of field density tests required for each fill was tabulated along with the actual number of tests performed and the distribution of those tests by fill number.

Since the relative density overlay plots were constructed at even one foot intervals and the backfill was placed in 15" lifts, density tests at an elevation one foot above and below each plot were reviewed to determine specification compliance. In addition, backfill placed in adjacent fills was also evaluated since each test represents 20,000 ft^2 of backfill. Thus, by superimposing three overlay sheets (36" of compacted fill), a three dimension test distribution was reviewed for each lift of backfill.

The results of a simultaneous review of Table No. 5 and the overlay plots indicates the following:

(a) A comparison of the total volume of the Class A backfill shown on the overlays to the neatline quantity shown on the design drawing (LOU-1564-G-497S01, Ro) indicates that the overlay Class A soil volume is 33% larger than the design quantity. This is due to the actual expansion of the Class A fill boundaries into Class B fill areas at the higher elevations during construction (as shown on the overlays as indicated by actual test locations). Taking the expanded backfill boundaries into account, the following evaluations were made:

(b) Based on the testing frequency of one field density test per 20,000 ft^2 of fill, 2794 in-place density tests were performed in fill areas requiring 858 tests. Thus, approximately three times as many density tests were run as the surface area of the fills required. This was due to the placement of numerous smaller fills each day at the higher elevations, as described in Section 4.B.2.a above.

(c) On only one fill of the 385 fills studied, was there an inadequate number of density tests performed in the 3 foot wedge of backfill reviewed (Fill #2, EL -19). In this case, the size of the fill was small and the relative densities of the fills on both sides and above and below this fill all met the specification requirements. Therefore, it is concluded that this deficiency will have no significance on the stability of the Plant Island under the event of seismic loadings

(d) Visual analysis of the location of the density tests shows them to be completely random and distributed without pattern throughout the backfill. It should be noted that some test locations on the lab forms were found to be in error (approximately 5%) when plotted on the overlays. This is certainly due to the inaccuracies of visually locating ones position in the field off of sign posts hundreds of feet away and tens of feet above the actual test elevation. Since these test locations were still indicative of the relative density at a random spot on the fill, the density values were accepted as valid and included in the density analyses.

Taking these factors into consideration, it has been determined that the specification requirements for in-place test frequency and distribution have been complied with.

(2) Frequency of Laboratory Control Tests

By using the Class A Backfill Test Index (Document 4) and the Field and Laboratory Soil Test Summary (Document 5), the frequency of the laboratory density control tests performed (ASTM D1557) and the mechanical gradation control tests performed (ASTM D-422) was compared to the specification requirements.

Table No. 6 presents the results of a detailed review of the laboratory testing frequency compared to the number of in-place density tests performed between laboratory check tests. Using the specification requirement of one set of control tests per ten in-place density tests, all nonconforming test intervals were tabulated in Table No. 7.

An evaluation of the data presented in these tables indicates the following:

(a) From the start of Class A backfilling operation in January, 1976 to the present date, a total of 3137 Class A in-place density tests have been performed. Of these 2794 tests are in backfill subject to potential liquefaction while the remaining 282 test are above this zone. During the same period of time, 361 sets of control tests (Proctor, Sieve and Moisture Tests) have been performed, thus averaging one set of tests per 8.6 in-place density tests compared to one set per 10 in-place density tests as required in the specification.

(b) During the performance of the 361 sets of control tests, in only 27 instances were the tests performed at intervals larger than the specification requirements. Thus, the control test frequency was adhered to 92.5% of the time in the last eight and one half years of backfilling activity.

(c) Analysis of the nonconforming intervals indicates that in 20 of the 27 cases, the test interval was extended from 10 to a maximum of 13 field tests per set of control tests. Since in each of these cases, the extra in-place density tests included in the extended interval were in material on the same fills, already tested in the allowable 10 density tests, the intent of the specification was complied with in these cases. By accepting these intervals, the intent of the specification requirement on control test frequency was adhered to 99.8% of the time.

(d) In the remaining seven cases, where the control test interval was extended from 15 to a maximum of 29, a review of the test locations and relative density test results presented in Table No. 8 indicates that the test intervals are completely random through the fill as a whole and that the relative densities obtained during these intervals are all acceptable within the statistical tolerance of the specification.

Taking these factors into consideration, it has been determined that the specification requirements for the performance of laboratory control tests relative to Class A backfill in-place density testing, has been complied with.

(3) Performance of Statistical Studies

Document 6 presents copies of all seven statistical studies performed during the actual backfilling operation, in addition to letters to the backfilling contractors informing them of the results. In addition, Table No. 9 presents the schedule of relative density correlation testing showing the periodic updating of these correlation curves during the major period of backfilling operations.

From these documents it has been concluded that:

(a) The specification requirements for the periodic performance of statistical studies during the backfilling operations has been complied with and that;

(b) The value of the field control (percent compaction) was adjusted either up or down, depending on the results of the statistical studies.

Taking these factors into consideration, it has been concluded that the statistical review of the relative densities of the Class A backfill was performed during the backfilling operations in accordance with the specification requirements.

(4) Class A Backfill Relative Density

In analyzing the relative density of the compacted Class A backfill as a whole, the following statistical approach was adopted to comply with the specification requirements.

The specification required the in-place compacted Class A backfill to have a relative density of 75 percent. The allowable variation for the Class A fill less than the specified density was a maximum of one standard deviation. The numerical value of the standard deviation for this material was periodically established by conducting a series of studies on field tests and was reported in terms of minimum allowable proctor density required to yield the required relative density.

During the performance of these statistical studies, the field densities were converted to relative densities by the use of the correlation curves. The correlation curves were constructed using cumulative test data from random samples taken from the fill. The following procedure was used to develop these curves.

For each family of materials:

(a) A representative 300 lb. sample was obtained from the fill for every 200 to 250 in-place density tests performed.

(b) A 100 lb sample was sent to the field lab and a 200 lb sample was sent to the home office lab (Peabody Testing) for parallel testing to determine a modified proctor compaction curve and percent finer than a #200 sieve.

(c) The parallel results were compared. The Proctor densities were found to agree within ±2 pcf and the percents finer than the #200 sieve within ±3 percent. Therefore, the home office lab proceeded to perform maximum (γmax) and minimum (γmin) density determinations on the material.

(d) The following equation was used to plot the correlation curves.

$$\text{Dry Density} = \frac{(\gamma_{max.}) \times (\gamma_{min})}{\gamma_{max.} - D_r\,(\gamma_{max.} - \gamma_{min})}.$$

Where:

Dry Density = field dry density

Dr = relative density

γmax, γmin. = measured in the home lab for this material type.

Each curve was established by assuming various D_r values and calculating Dry Densities.

Cumulative Statistical Study No. 6 (Document No. 6) was performed in August of 1978, and represented all Class A backfill placed to that date. Statistical Study No. 7 was performed in July, 1984 and includes the remainder of Class A tests in the backfill subject to potential liquefaction. For both studies, correlation curves of field density to proctor density were developed for three family of materials. The results of these studies are summarized as follows:

Study No. 6

Based upon the standard properties of the normal bell curve, the cumulative Study No. 6 was performed on 2499 Class A backfill tests. The density values of the original failing Class A density tests (that were retested) were not included in this study since those tests did not represent the final density of the backfill which formed the seismic support of the Plant Island.

The study determined that the standard deviation for all Class A backfill was 12.4%. The specification tolerances were then defined by this standard deviation (in a three standard deviation universe) as:

(a) 13% of the Class A backfill tests could have relative densities ranging from 62.6% to 75.0% and

(b) 3% of the Class A backfill tests could have relative densities ranging from 50.2% to 62.6%.

Using these definitions, cumulative Study No. 6 concluded that the Class A backfill was constructed in accordance with the 75% relative density requirement. In addition, those tests which fell below 75%, were found to be within the specification tolerances when compared to an allowable tolerances of 16%. Therefore, the backfill was found to be in compliance with the specification requirements.

Study No. 7

Study No. 7 consisted of 251 in-place density tests taken in backfill placed since August 1978 up to elevation +13.00 (the upper boundary above which liquefaction will not occur, see Study No. 7, Document 6). The results of this study indicate a mean relative density of 91.7% with a standard deviation of 18.6%.

The mean relative density is well above the specification requirements and is somewhat higher than the mean relative density from study No. 6 (83.8%). The standard deviation for the current work is larger than for previous studies. This is certainly not surprising considering the large variation in compaction techniques utilized to construct backfill in the six years of operations included in this study.

The actual number (12.4%) and values of in-place density tests in Study No. 7 which fell below the minimum density of 75% was found to be within the 16% allowable tolerance.

In summary, the backfill included in Study No. 7 was found to be in conformance with the specification requirements. Taking this into account and considering that:

(1) All the backfilled placed prior to this study also was in compliance with the specification requirements; and

(2) Study No. 7 completes the series of studies on backfill subject to potential liquefaction;

it is concluded that all backfill was placed in compliance with the specification requirements and that the final insitu soil densities will provide the required design structural capacity to the plant under seismic loadings.

B. <u>Inspection Reports</u>

The results of the Stage II evaluations on completeness and distribution of the existing inspection documentation, determined the following:

(1) Completeness of Inspections

Although no exact method exists for determining the quantity of inspections that were required during the backfill operations, two comparative analyses were performed to evaluate the <u>relative</u> completeness of the inspection documentation. These analyses concluded that the existing documentation is basically complete and that 80% of the volume of the backfill is documented with complete inspection packages while the remaining 20% of the backfill has some deficiency in the inspection packages.

(2) Distribution of Inspections

The distribution of the existing inspection documentation throughout the backfill is essentially identical to the distribution of the field testing effort by fill location, thus confirming a one to one relationship between inspection and testing activities.

For the 20% of the inspection packages found to be incomplete, three distinct types of discrepancies were found to exist. The following discussions and conclusions are presented relative to the effect of these discrepancies on the technical adequacy of the inspections.

(a) 16.0% of the volume of the backfill has an average of 82% of the quantity of inspection reports required with at least one of each type of inspection report on each fill at each elevation in this volume.

For example, although there are 28 existing Form 2 Inspection Reports, in the vault for Fill No. 3 at elevation +12 (Table No. 3), 6 Form 2 inspection reports are believed to be missing. In all these cases however, the 81% of existing documentation of each type of inspection clearly establishes that the Quality Control and Quality Verification processes were implemented during the construction process. In addition, the backfill relative density study documents that the required density tests were performed and resulting relative density for the fills included in this 16% volume were found to be within specification requirements. Thus the existing inspection reports coupled with the satisfactory density records indicate that this deficiency will have no significance on the stability of the Plant Island under seismic loadings.

(b) 3.8% of the volume of the backfill has a partially complete representation of inspection reports with one or more type of inspection missing on each fill at each elevation in this volume. Included in this volume of backfill are:

- 25 fills which have inspection records from both the Contractor and Ebasco. Although some of the five required inspection reports are missing, there exists a sufficient quantity of data on the existing reports to determine that the Quality Control and Quality Verification processes were implemented during the construction of each of these fill areas. In addition, the design specified relative densities were achieved within the specified tolerances (Section IIIA) for all the fills affected. Therefore, it has been concluded that this deficiency, which effects 1.8% of the backfill, will have no significance on the stability of the Plant Island under the event of seismic loading.

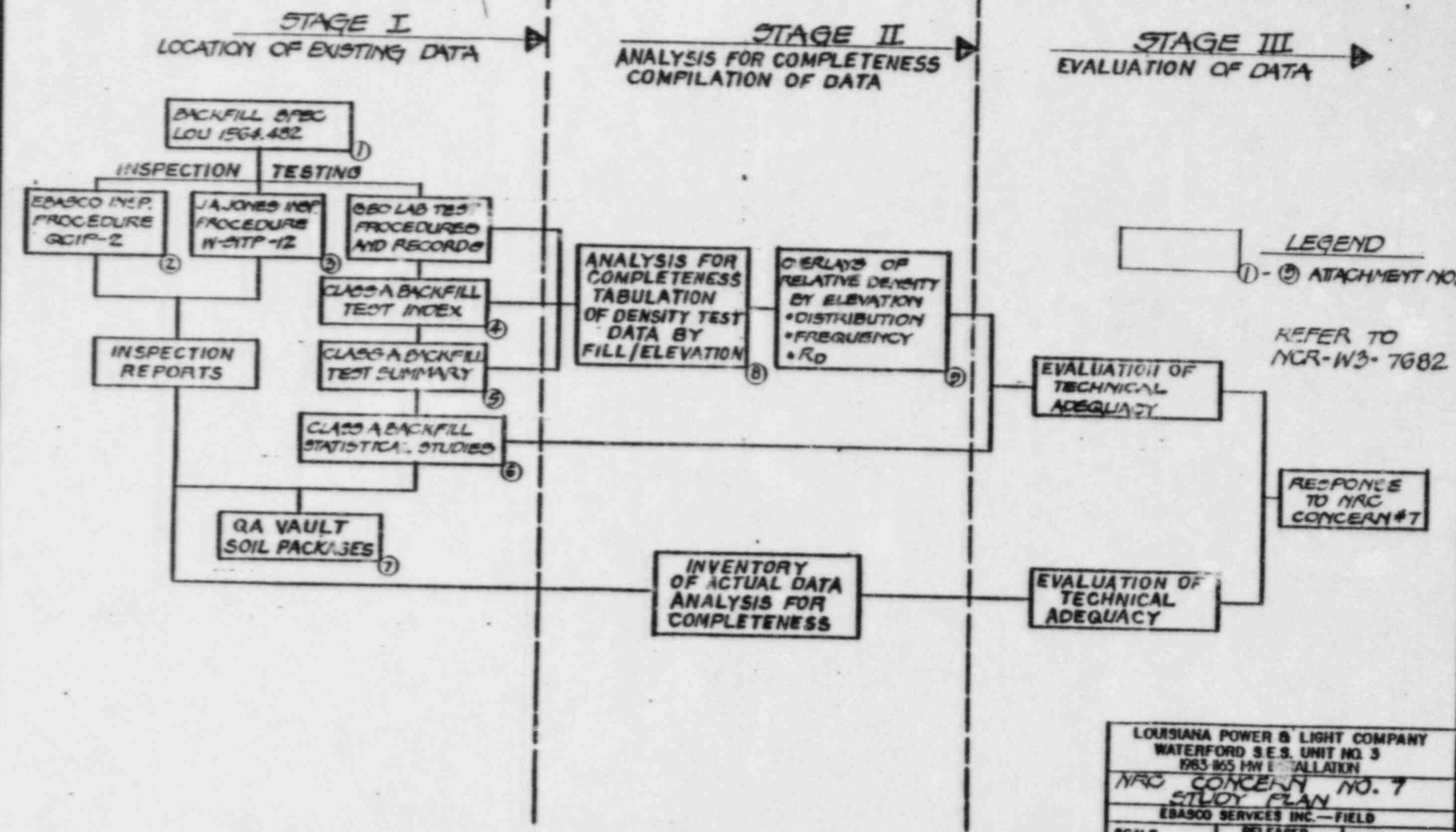
- Also, included in these fill areas are 21 fills which have documentation of inspections by either Ebasco or the Contractor. Since Ebasco did a 100% duplicate inspection of the contractors inspection, the fact that contractor inspection reports are missing does not necessarily lead to a loss in the documentation of quality. As stated before, the existing inspections on these fills clearly establish that the quality control process was implemented during the construction process. In addition, it should be noted that in accordance with the Quality Control procedures (Document 2 & 3), the in-place density tests performed on each of these fills were ordered by and directed by the Ebasco Q.C. Inspector. He witnessed and evaluated each field test for specification compliance while the test was being performed in the field. If the percent compaction was not in compliance with the specified minimum, the Ebasco QC Inspector directed the Contractor's QC Inspector to implement rework (recompaction). The rework was witnessed by the Ebasco Inspector and at its completion, retests were taken at his direction. Thus, the existing inspection documentation, coupled with the complete file of test records for each fill involved (indicating acceptable relative density and quality control involvement) indicate that this deficiency, which effects 2.0% of the backfill, will have no significance on the stability of the Plant Island under the event of seismic loadings.

(c) 0.2% of the volume of the backfill has no inspection reports at the fill locations and elevations included in this volume.

For these 6 fill areas, there was no inspection documentation found onsite. The material in these fills is found to be concentrated below elevation -37 in small drainage ditches and trenches which have very little volume or in fills. As stated above, the complete record of density testing testifies to the total involvement of the quality control inspectors and to the achievement of the relative density. The fact that the majority of the missing reports are clustered together in groups on three fills indicates a high probability of lost folders of soil packages. Thus, even if the records are lost, the acceptability of the relative density, the indication of Q.C. involvement, and the fact that the affected fills account for for only 0.2% of the backfill placed provides sufficient evidence to conclude that this deficiency will have no significance on the stability of the Plant Island under the event of seismic loadings.

Considering the discussions above, it has been concluded that the deficiencies found to exist in the inspection documentation are of minor significance and will have no effect on the structural capability of the plant under seismic loads.

TABLES



NO.	DATE	REVISION	BY	CH.	RELEASED

LOUISIANA POWER & LIGHT COMPANY
WATERFORD S.E.S. UNIT NO. 3
1983-1165 MW INSTALLATION

NRC CONCERN NO. 7
STUDY PLAN

EBASCO SERVICES INC.—FIELD

SCALE	RELEASED	DATE
DIV. CONSTR.	[signature]	FIELD SKETCH SK. 1564
DR. LKE	[signature]	
CH. MT	[signature]	TABLE 1

TABLE NO.2
NRC CONCERN NO.7
ANALYSIS OF SOIL INSPECTION REPORTS

ELEVATION	FILL 1 FORM NO					FILL 2 FORM NO					FILL 3 FORM NO					FILL 4 FORM NO					FILL 5 FORM NO					FILL 6 FORM NO					FILL 7 FORM NO					TOTALS FORM NO					COMMENTS
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
-44.00 - -43.01			*		*			*		*			*		*			*		*			*		*	1					*		*		*	1	0	0	0	0	
-43.00 - -42.01			*		*			*		*			*		*			*		*			*		*	5	6	6	4	8	1					6	6	6	4	8	* NOT REQUIRED
-42.00 - -41.01			*		*			*		*						2	1	2	1	1			*		*	10	10	10	4	16	1					13	11	12	5	17	
-41.00 - -40.01								*		*	1			1		4	2	2	4				*		*	9	7	6	5	5	1					15	9	8	10	5	
-40.00 - -39.01	1			1				*		*	2	1	2	2	1	1			1							17	10	11	11	14	1					22	11	13	15	15	
-39.00 - -38.01	5	1	1	3	2						3	1	2	3	1	4	3	3	4	3						11	9	7	9	8	2		1	2		25	14	14	21	14	
-38.00 - -37.01	3			3	2						6	5	6	6	5	2	2	2	4	2	2	2	2	2	1	19	9	7	7	6	22			22		54	14	17	44	16	
-37.00 - -36.01	3	2	2	2	3	1	1	1	1	1	7	5	7	6	6	6	3	3	4	3	6	4	5	5	6	18	13	19	16	14	3	1	1	2	1	44	[illegible]	38	36	34	
-36.00 - -35.01	2	2	2	2	2	1					9	9	11	10	10	2			1		4	2	2	4	1	9	5	5	6	5	3		1	2		30	18	21	25	18	
-35.00 - -34.01	1					2	1	1	1	1	3	4	5	4	4	1	1	2	1	1	1	1	1	1	1	5	6	12	7	8	4		3	1		17	13	24	15	15	
-34.00 - -33.01	1					2	1	1	1	1	4	2	4	2	2				1	1	2	2	2	2	3	2	4	4	4	4	4	1	4	1	1	16	11	15	11	12	
-33.00 - -32.01	1	1	1	1	1	1	1	1	1	1	4	3	5	3	2	1			1	1	1				2	3	4	5	4	4	3	1	4	1	1	14	10	16	10	12	
-32.00 - -31.01	1	2	2	1	3	2					4	4	4	4	3	1				1	1				1	2	2	2	2	2	4		3			15	8	11	7	10	
-31.00 - -30.01	1	1	1		2	2					4	5	8	5	4	1				1	1					4	5	5	5	5	3		3			16	11	17	10	12	
-30.00 - -29.01	1					2	1	1	1	1	8	9	9	9	10	1					1				1	1	4	4	2	5	3		3	2		17	14	17	14	17	
-29.00 - -28.01	1	1	1		2	2	1	1	1	1	4	4	6	4	4	1					1					1	4	4	4	4	5	1	4	2	1	15	11	16	11	12	
-28.00 - -27.01	1	1	1	1	1	1			1		5	4	9	4	4	1					1					4	4	4	4	4	3		3			16	9	17	10	9	
-27.00 - -26.01	1	1	1	1	1	1			1		2	2	5	2	2	1					1					3	4	4	3	4	4	1	4	2	1	13	8	14	9	8	
-26.00 - -25.01	1	1	1	1	1	2	2	2	2	2	3	2	3	2	2	1					1					7	7	7	7	6	5	1	5	1	1	20	13	18	13	12	
-25.00 - -24.01	2	1	1	2	2	1	1	1	1	1	7	5	7	5	5	1		1	1		1	1	1	2	1	6	6	6	6	6	4	2	5	2	2	22	16	22	19	17	
-24.00 - -23.01	4	1	1	1		2	1	1	1	1	7	4	6	3	4	2	2	1	3	2	3	2	3	2	2	9	5	5	5	5	7	4	7	4	4	34	19	24	19	18	
-23.00 - -22.01	3	1	1		1	3	3	3	3	3	5	3	6	4	3	4	4	4	4	4	3	2	2	4	2	5	5	4	5	5	5	2	6	2	3	33	20	26	[illegible]	21	
-22.00 - -21.01	4	3	3	3	3	4	4	4	4	4	[illegible]	3	3	3	3	6	7	6	6	6	0	5	5	4	5	5	4	4	4	4	5	3	6	3	3	39	29	31	27	28	
-21.00 - -20.01	4	2	2	2	2	3	2	2	2	2	3	3	3	3	3	2	1	2	2	2	5	5	5	6	5	5	4	4	4	4	2	3	3	3	3	24	20	21	22	21	
-20.00 - -19.01	5	2	2	2	3	3	2	2	2	2	2	2	2	2	2	4	4	4	4	4	3	3	3	2	2	7	5	5	5	5	3	3	3	3	3	27	21	21	20	21	
-19.00 - -18.01	4	2	2	3	2	3	2	2	2	2	3	3	4	3	3	4	4	4	4	4	4	4	4	4	4	6	4	4	4	4	4	4	4	4	4	28	23	24	24	23	
-18.00 - -17.01	3	2	2	2	2	3	3	3	3	3	3	3	4	3	3	6	6	6	8	6	5	5	5	5	6	8	7	7	7	7	3	3	3	3	3	31	29	30	31	30	
-17.00 - -16.01	2	4	3	4	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	5	4	4	4	4	4	6	5	5	5	5	3	3	3	3	3	16	27	26	27	30	
-16.00 - -15.01	2	1	2	2	2	2	2	2	2	2	4	4	5	4	4	3	3	3	3	3	3	3	3	3	3	6	4	5	5	4	4	3	3	3	3	24	20	23	22	21	
-15.00 - -14.01	2	2	2	1	2	1	1	1	1	1	5	5	5	6	5	4	4	4	4	4	5	5	5	6	5	6	3	3	5	3	5	4	4	5	4	28	24	24	28	24	
-14.00 - -13.01	3	3	2	2	2	5	5	5	5	5	4	4	4	3	5	5	4	4	4	4	8	8	8	7	3	4	4	4	4	4	4	4	5	4	4	33	32	32	29	32	
-13.00 - -12.01	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	8	8	8	7	8	8	9	9	12	9	4	4	4	4	4	4	3	3	3	3	30	30	30	[illegible]	30	

REVISED
PAGE 2 OF 2

TABLE NO. 2
NRC CONCERN NO. 7
ANALYSIS OF SOIL INSPECTION REPORTS

ELEVATION	FILL 1 FORM NO					FILL 2 FORM NO					FILL 3 FORM NO					FILL 4 FORM NO					FILL 5 FORM NO					FILL 6 FORM NO					FILL 7 FORM NO					TOTALS FORM NO					COMMENTS
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
-12.00 ~ -11.01	3	3	3	2	3	1	1	1	1	1	8	8	8	8	9	6	7	7	7	7	7	6	6	5	6	3	3	3	3	3	7	7	7	6	7	35	35	35	32	36	* NOT REQUIRED
-11.00 ~ -10.01	3	3	3	3	3	3	1	2	2	2	3	3	3	3	4	16	11	12	10	11	5	5	5	3	5	6	7	7	7	7	3	4	4	5	6	39	34	36	33	39	
-10.00 ~ -9.01	3	3	3	3	3	2	2	2	2	2	8	9	10	9	9	5	9	14	12	11	6	6	6	5	6	5	5	5	5	5	3	8	8	8	8	32	42	48	44	44	
-9.00 ~ -8.01	2	2	2	2	1	4	4	4	4	4	6	5	6	5	5	8	9	9	9	8	4	4	4	4	4	7	7	9	7	7	1	7	5	7	7	32	38	39	38	36	
-8.00 ~ -7.01	6	8	9	8	9	2	2	2	2	2	6	7	6	8	6	12	10	11	12	12	4	5	5	4	5	4	4	4	5	4	1	4	5	5	4	35	40	42	44	42	
-7.00 ~ -6.01	4	4	3	4	4	4	4	4	4	4	7	11	13	11	11	3	4	4	4	4	6	2	2	2	2	6	8	8	8	7	2	5	4	4	5	32	38	38	37	37	
-6.00 ~ -5.01	6	6	6	5	6	5	5	5	3	5	10	10	10	10	10	10	11	11	11	10	5	4	4	4	4	7	7	7	7	6	4	5	7	5	5	47	48	50	45	46	
-5.00 ~ -4.01	2	2	3	4	3	3	5	4	4	3	8	8	8	8	9	15	14	14	14	14	7	8	6	4	8	7	10	9	11	10	3	10	12	10	9	45	57	56	51	56	
-4.00 ~ -3.01	4	5	5	4	5	2	4	4	4	4	6	10	10	10	10	12	12	12	15	14	4	3	4	3	4	7	12	10	13	12	7	12	11	14	12	42	58	56	63	61	
-3.00 ~ -2.01	5	5	5	4	5	5	5	5	5	4	8	18	17	17	17	8	10	10	10	9	3	3	3	3	3	6	9	7	9	9	4	15	13	15	10	39	65	60	72	57	
-2.00 ~ -1.01	7	7	7	7	7	4	4	4	4	3	7	20	20	21	21	7	9	10	10	11	4	4	4	4	4	7	10	8	13	10	2	13	7	13	11	38	67	60	72	67	
-1.00 ~ -0.01	10	11	11	11	11	5	5	5	5	5	7	17	18	16	18	12	13	12	11	12	6	6	6	7	6	7	10	8	10	10	2	14	12	14	12	49	76	[illegible]	74	74	
0.00 ~ +0.99	4	6	6	6	6	3	2	2	2	2	3	18	14	16	16	3	4	2	4	4	9	7	8	7	8	7	12	8	14	11	2	12	8	[illegible]	7	31	61	48	62	54	
1.00 ~ +1.99	10	10	10	13	11	7	6	6	6	6	10	17	15	19	15	7	9	9	9	9	12	11	10	10	10	8	14	11	15	15	2	15	11	14	10	56	82	72	86	76	
2.00 ~ 2.99	7	9	9	9	9	4	3	3	5	3	8	16	18	18	17	7	9	6	6	7	5	5	5	5	6	9	16	13	17	14	2	13	7	12	10	42	71	61	72	66	
3.00 ~ 3.99	8	9	9	8	9	5	5	5	5	5	7	28	24	23	23	7	8	8	9	7	8	8	8	8	7	10	15	11	20	18		15	7	14	12	45	86	72	87	81	
4.00 ~ 4.99	8	10	11	9	8	4	4	4	4	4	16	14	15	15	13	7	6	6	7	6	11	10	[illegible]	11	10	8	16	11	17	12	1	16	8	16	12	55	76	66	79	65	
5.00 ~ 5.99	5	5	5	5	5	4	3	3	3	3	4	17	17	17	16	9	9	8	9	8	8	7	7	7	7	8	20	12	21	17		19	11	19	9	38	80	63	81	[illegible]	
6.00 ~ 6.99	9	11	11	12	9	3	4	3	4	3	2	20	18	21	17	4	4	4	4	4	10	4	3	6	4	13	21	11	24	16		20	11	20	12	41	84	61	21	65	
7.00 ~ 7.99	5	7	5	9	4	5	4	3	6	4	6	21	[illegible]	22	16	6	4	4	4	4	7	4	3	6	3	16	29	14	28	12		22	9	21	8	45	90	55	96	57	
8.00 ~ 8.99	4	6	5	6	4	5	5	1	5	1	4	21	15	20	13	6	7	6	7	6	6	7	6	10	6	20	28	13	[illegible]	8		24	6	23	5	45	98	52	98	43	
9.00 ~ 9.99	5	5	5	6	3	4	4	2	4	*	5	28	19	29	15	7	6	6	7	4	7	12	6	9	8	21	36	15	36	8		21	6	22	6	49	112	59	113	44	
10.00 ~ 10.99	7	7	2	8	2	4	5	2	4	*	5	30	19	29	14	7	7	4	7	5	2	10	5	10	4	27	44	12	43	7		32	8	33	4	52	135	52	134	36	
11.00 ~ 11.99	[illegible]	9	4	9	2	8	9	3	9	*	5	25	13	25	8	7	13	8	12	9	4	9	3	8	3	32	58	14	58	5	2	43	8	44	2	65	166	53	165	[illegible]	
12.00 ~ 12.99	5	8	6	8	3	5	8	2	8	*	8	28	12	27	6	6	15	10	16	6	3	10	5	13	3	25	61	10	50	3	4	57	4	30	*	50	167	42	161	21	
13.00 ~ 13.99	5	10	2	10	2	4	11	2	12	*	6	22	5	20	2	3	17	7	19	5	3	6	4	6	3	25	66	7	66	2	3	27	3	27		49	150	30	160	14	
14.00 ~ 14.99	6	11	2	13	1	7	13	4	10	2	5	12	5	11	1	6	11	6	13	5	7	10	6	10	4	17	38	3	38	2	*	2	*	2	*	48	97	26	97	15	
15.00 ~ 15.99	6	14	1	14	1	7	13	2	11	1	6	9	3	9	*	7	20	5	20	5	3	7	2	7		19	28	3	34	2	*		*		*	48	91	16	85	9	
16.00 ~ 16.99	3	10	2	10	2	2	3	2	1	1	6	7	3	7	*	2	13	4	12	3	2	6	1	6		9	17	2	[illegible]	2	*		*		*	24	56	14	52	8	
17.00 ~ 17.99		2	1		*	2	2	2		1	*		*		*			*		*			*		*	3	7	2	8	2			*		*	5	11	5	8	3	
18.00 ~ 18.99			*		*			*		*			*		*			*		*			*		*			*		*			*		*						
19.00 ~ 19.99			*		*			*		*			*		*			*		*			*		*			*		*			*		*						
20.00 ~ 20.99			*		*			*		*			*		*			*		*			*		*			*		*			*		*						
SUB TOTAL	223	247	194	235	187	177	185	132	180	114	310	557	501	565	426	300	346	295	366	286	237	256	217	262	215	557	790	432	405	434	180	469	296	492	241	2004	2850	2074	2225	1909	
TOTAL	1106					788					2359					1593					1207					3025					1678					11756					

TABLE NO. 3
NRC CONCERN NO. 7
ANALYSIS OF SOIL-INSPECTION REPORTS BY FILL SURFACE AREA (FT²)

ELEVATION	FILL NO.							TOTAL SURFACE AREA (FT²)		% COVERAGE BY	COMMENTS
	1	2	3	4	5	6	7	INSPECTION REPORTS	DENSITY OVERLAYS	INSPECTION REPORTS	
-44.00 ~ -43.01	*	*	*	*	*	*	*				
-43.00 ~ -42.01	*	*	*	*	*	4700	100	4800	N/A	–	* NOT REQUIRED
-42.00 ~ -41.01	*	*	Δ	200	*	3500	100	3800	N/A	–	
-41.00 ~ -40.01	Δ	*	25800	200	*	2450	100	28550	N/A	–	Δ APPROPRIATE INSPECTION REPORTS MISSING.
-40.00 ~ -39.01	6800	*	25800	10800	Δ	5900	14600	63900	55000	116	
-39.00 ~ -38.01	6800	Δ	26100	300	Δ	10050	48700	91950	65000	141	
-38.00 ~ -37.01	300	Δ	30500	10300	500	2200	45600	89400	71800	125	
-37.00 ~ -36.01	1550	300	27700	10600	850	5400	60900	107300	80000	134	
-36.00 ~ -35.01	16350	1700	84600	1000	1500	19200	61300	185650	94000	198	
-35.00 ~ -34.01	32000	7700	48000	400	500	8000	42200	138800	108000	129	
-34.00 ~ -33.01	16000	7700	29500	5000	7150	33700	61500	160550	99000	162	
-33.00 ~ -32.01	2000	2300	29000	5000	18000	33000	70000	159300	108000	148	
-32.00 ~ -31.01	16000	7700	30500	8450	17500	21000	50500	151650	114000	133	
-31.00 ~ -30.01	15000	16700	50000	5000	11500	4000	60500	168700	131800	128	
-30.00 ~ -29.01	15000	16700	41000	2500	17500	62000	60500	215200	146000	147	
-29.00 ~ -28.01	16000	25700	43000	5000	35000	35000	51500	211200	133000	159	
-28.00 ~ -27.01	16000	9000	77200	9700	35000	21000	14500	182400	158000	115	
-27.00 ~ -26.01	16000	9000	54000	5000	35000	35750	73500	228250	163000	140	
-26.00 ~ -25.01	16000	9000	47500	9850	18000	17728	68500	186578	168000	111	
-25.00 ~ -24.01	2100	9900	52000	5000	69500	39928	72500	250928	181000	139	
-24.00 ~ -23.01	3000	2950	95100	70600	68250	70000	57000	366900	183000	200	
-23.00 ~ -22.01	4100	5600	54000	47100	33750	58000	57000	259530	197300	132	
-22.00 ~ -21.01	5000	5600	52500	41000	67500	34200	57000	262800	219800	120	
-21.00 ~ -20.01	5000	4800	62000	37500	101500	12300	57000	270100	238500	113	
-20.00 ~ -19.01	4600	3700	52500	36300	71500	3000	57000	228600	247900	92	
-19.00 ~ -18.01	2600	3700	52500	43800	35150	39700	40000	218050	265700	82	
-18.00 ~ -17.01	3700	3700	52500	36500	37700	14900	58200	207200	261500	79	
-17.00 ~ -16.01	7600	3700	112000	41000	35700	11600	15000	286600	275400	82	
-16.00 ~ -15.01	2600	3700	112000	37000	35700	39100	47000	277100	304100	91	
-15.00 ~ -14.01	2000	2800	96950	38100	57000	12800	14300	223950	293500	76	
-14.00 ~ -13.01	46500	10000	69500	51000	50500	40000	47800	315300	298000	106	
-13.00 ~ -12.01	21300	16500	69500	47000	10000	60000	25700	250000	316500	79	

TABLE NO. 3
NRC CONCERN NO. 7
ANALYSIS OF SOIL-INSPECTION REPORTS BY FILL SURFACE AREA (FT^2)

ELEVATION	FILL NO.							TOTAL SURFACE AREA (FT^2)		% COVERAGE BY	COMMENTS
	1	2	3	4	5	6	7	INSPECTION REPORTS	DENSITY OVERLAYS	INSPECTION REPORTS	
-12.00 ~ -11.01	4500	30000	49500	56000	38000	35000	55700	268700	461000	58	
-11.00 ~ -10.01	3800	18000	77500	69400	38000	64000	66000	336100	369000	91	
-10.00 ~ -9.01	57000	18000	86500	79800	37500	104500	92000	477300	326500	146	
-9.00 ~ -8.01	32000	18000	128500	79000	37500	94000	103000	492000	327000	150	
-8.00 ~ -7.01	19000	27000	109000	138000	19500	63000	62000	437500	325500	134	
-7.00 ~ -6.01	35000	41000	86500	113700	14100	78000	96500	464800	332000	140	
-6.00 ~ -5.01	34000	39000	114800	95000	38000	136000	48500	505300	415500	122	
-5.00 ~ -4.01	70500	18500	110200	85300	10000	136350	108600	539450	421500	128	
-4.00 ~ -3.01	81500	8500	73950	105100	10500	140850	87600	508000	427800	119	
-3.00 ~ -2.01	72000	27500	89300	94900	10500	162050	71200	528150	439500	120	
-2.00 ~ -1.01	78000	9500	94450	110500	13100	98350	81000	484900	444000	109	
-1.00 ~ -0.01	16000	20500	96100	139300	46200	119250	47000	464350	469800	103	
0.00 ~ 0.99	138000	44100	131500	108800	47200	128300	75900	673800	484600	139	
1.00 ~ 1.99	137800	34500	131050	146000	47200	137400	65300	749250	484000	155	
2.00 ~ 2.99	117700	32600	148650	148700	40900	128600	77300	694450	456800	152	
3.00 ~ 3.99	118400	14600	168150	151000	48000	187700	85000	772850	429800	180	
4.00 ~ 4.99	35800	11400	167800	130100	56900	80150	46300	529050	458000	116	
5.00 ~ 5.99	41000	24400	226900	88600	69500	95150	90700	636250	464500	137	
6.00 ~ 6.99	32900	64600	219000	113600	88500	103500	80200	702300	451700	155	
7.00 ~ 7.99	36700	55800	148200	116000	48850	152550	41900	600000	445100	135	
8.00 ~ 8.99	46800	92500	142300	104500	58150	140950	119700	704900	397200	177	
9.00 ~ 9.99	106200	86000	147600	145500	22800	151350	76200	735650	361700	203	
10.00 ~ 10.99	126800	174000	82200	136000	16600	133950	104100	783650	342700	229	
11.00 ~ 11.99	133100	134000	98600	126600	29100	191850	83800	797050	397100	200	
12.00 ~ 12.99	101000	142500	78100	69000	22000	159900	93400	665900	319700	208	
13.00 ~ 13.49	279100	146250	61300	150900	33000	250000	93100	1013650	556900	182	
14.00 ~ 14.99	75800	74400	66100	28400	3000	82450	73000	408150	303500	134	
15.00 ~ 15.99	84000	77050	36900	90400	8500	101450	*	398300	275000	145	
16.00 ~ 16.99	56750	51500	28800	16450	8500	53400	*	2154[illegible]	281300	77	
17.00 ~ 17.99	*	*	*	*	*	*	*	37650	N/A	–	
18.00 ~ 18.99	*	*	*	*	*	*	*	N/A	N/A	–	
19.00 ~ 20.99	*	*	*	*	*	*	*	N/A	N/A	–	
SUB TOTAL	2473050	1725850	4794700	3657750	1854050	4320706	3515800	22342806	16646100	134	

TABLE NO. 4

NRC CONCERN NO. 7

RELATIVE DISTRIBUTION OF INSPECTION REPORTS TO DENSITY TESTS

FILL NO	NO. OF INSPECTIONS	% OF TOTAL INSPECTIONS	NO OF DENSITY TESTS	% OF TOTAL DENSITY TESTS	COMPARATIVE %	
					INSPECTIONS	TESTS
1	1097	9.3	246	8.0	9.3	8.0
2	785	6.7	178	5.8	6.7	5.8
3	2360	20.1	570	18.5	20.1	18.5
4	1592	13.5	375	12.2	13.5	12.2
5	1198	10.2	336	10.9	10.2	10.9
6	3026	25.8	826	26.9	25.8	26.9
7	1694	14.4	545	17.7	14.4	17.7
TOTAL	11752	100.0	3078	100.0	100.0	100.0

TABLE NO 5
NRC CONCERN NO 7
COMPARISON OF IN-PLACE DENSITY TEST FREQUENCY AND DISTRIBUTION

ELEVATION	FREQUENCY			DISTRIBUTION							NOTES
	SURFACE AREA	NO. OF TESTS		FILL NO							
		REQ'D	ACTUAL	1	2	3	4	5	6	7	
-44.00 - -40.01	N/A	N/A	(56)*	CLASS A FILL IN TRENCHES AND SUMP.							
-40.00~-39.01	55,000	3	32	5	0	2	1	4	18	2	
-39.00~-38.01	65,000	4	44	5	0	7	5	7	13	7	
-38.00~-37.01	71,800	4	75	7	6	7	4	9	16	[illegible]	
-37.00~-36.01	80,000	4	49	6	3	6	6	9	12	7	
-36.00~-35.01	94,000	5	38	2	2	9	3	6	11	5	
-35.00~-34.01	108,000	6	18	1	1	5	1	4	3	3	
-34.00~-33.01	99,000	5	13	0	1	2	1	2	3	4	
-33.00~-32.01	108,000	6	17	1	1	3	1	2	4	5	
-32.00~-31.01	114,000	6	18	1	2	4	1	2	2	6	
-31.00~-30.01	131,800	7	21	1	0	4	1	5	6	4	
-30.00~-29.01	146,000	8	21	0	1	9	1	2	5	3	
-29.00--28.01	133,000	7	15	1	1	2	1	1	4	5	
[illegible]8.00~-27.01	158,000	8	14	1	1	2	1	3	4	2	
-27.00~-26.01	163,000	9	17	1	1	3	1	2	4	5	
-26.00~-25.01	168,000	9	16	1	2	2	0	0	7	4	
-25.00~-24.01	181,000	10	15	1	1	4	1	1	5	2	
-24.00~-23.01	183,000	10	17	1	1	4	2	3	3	3	
-23.00~22.01	197,300	10	23	1	1	3	3	8	4	3	
-22.00~-21.01	219,800	11	24	4	2	3	3	6	3	3	
-21.00-20.01	238,500	12	19	2	1	2	3	5	3	3	
-20.00~-19.01	247,900	13	20	2	1	3	3	4	4	3	
-19.00~-18.01	265,700	14	22	1	1	3	5	5	3	4	
-18.00~-17.01	261,500	14	26	2	1	3	5	6	6	3	
-17.00~16.01	275,400	14	25	3	3	3	5	4	4	3	
-16.00~-15.01	304,100	16	22	2	1	4	3	5	4	3	
-15.00~-14.01	293,500	15	28	3	1	6	4	6	4	4	
-14.00~-13.01	298,000	15	29	0	3	4	6	8	4	4	
-13.00~-12.01	316,500	16	27	2	2	2	8	7	4	2	
-12.00~-11.01	461,000	24	36	3	1	8	8	6	3	7	
[illegible]00~-10.01	369,000	19	36	3	2	3	9	8	10	1	
-10.00~-9.01	326,500	17	43	2	2	9	10	6	6	8	
-9.00~-8.01	327,000	17	38	3	4	6	8	3	7	7	
-8.00~-7.01	325,500	17	40	6	2	6	12	5	5	4	
-7.00~-6.01	332,000	17	40	4	2	10	6	6	7	5	

TABLE NO 5
NRC CONCERN NO 7
COMPARISON OF "IN PLACE" DENSITY TEST FREQUENCY AND DISTRIBUTION

ELEVATION	FREQUENCY			DISTRIBUTION							NOTES
	SURFACE AREA	NO. OF TESTS		FILL NO							
		REQ'D	ACTUAL	1	2	3	4	5	6	7	
-6.00 – -5.01	415,500	21	48	6	4	9	8	5	9	7	
-5.00 ~ -4.01	421,500	22	60	4	3	12	15	5	10	11	
-4.00 – 3.01	427,800	22	53	3	3	11	12	+	10	13	
-3.00 – 2.01	439,500	22	65	6	3	20	10	5	10	11	
-2.00 – 1.01	444,000	23	61	7	4	18	10	1	9	12	
-1.00 – -0.01	469,800	24	79	14	5	17	12	10	10	11	
0.00 – +0.99	484,600	25	73	8	5	16	9	10	11	14	
+1.00 ~ +1.99	484,000	25	72	8	4	20	9	6	11	14	
+2.00 ~ +2.99	456,800	23	93	9	3	26	9	8	20	18	
+3.00 ~ +3.99	429,800	22	80	7	5	14	5	11	21	17	
+4.00 ~ +4.99	458,000	23	82	5	4	16	10	8	23	16	
+5.00 ~ +5.99	464,500	24	80	7	2	17	5	9	21	19	
+6.00 ~ +6.99	451,700	23	83	6	5	22	8	7	19	16	
[illegible].00 ~ +7.99	446,100	23	86	7	3	18	6	5	28	19	
+8.00 ~ +8.99	397,200	20	96	3	4	23	8	7	27	24	
+9.00 ~ +9.99	361,700	19	111	4	5	26	8	9	40	19	
+10.00 ~ +10.99	342,700	18	133	7	5	24	10	10	43	34	
+11.00 ~ +11.99	397,700	20	156	7	8	24	12	10	57	38	
+12.00 ~ +12.99	319,700	16	174	7	8	22	15	9	71	42	
+13.00 ~ +13.99	256,900	13	78/92*	9	11	22	19	11	71	27	
+14.00 ~ +14.99	303,600	16	37/60*	12	12	13	13	6	38	3	
+15.00 ~ +15.99	275,000	14	36/64*	14	15	13	17	10	31	0	
+16.00 ~ +16.99	281,300	15	22/43*	8	2	10	13	10	22	0	
+17.00 ~ +17.99	240,000	13	3/18*	0	1	4	0	3	13	0	
+18.00 ~ +21.00	N/A	N/A	5*								
	—										
SUB-TOTALS	10,581,200 ft²	858	2794/282	246	178	570	375	336	826	545	
VOL. OVERFILL	614,300 YD³	EL -44 – -40	56			3076					
VOL. DESIGN DWG	462,000	EL +18 → 21	5								
	133%										
TOTALS	—	858	3137								
	—										

*-% COMPACTION-NOT PART OF STATISTICAL STUDY- SEE STATISTICAL STUDY NO. 7 FOR DETAILS

TABLE NO 6
NRC CONCERN NO 7

FREQUENCY CHECK - PROCTORS/SIEVES TO DENSITIES

PROCTOR CURVE NO	LAB TEST NO.	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO. OF DEN TESTS BETW PROCTORS
1	LRWE 717, 718, 719	17	37	106	10	71	→ B0041M	
2	768	22	38	117	9	72	397	8
6	788	5	39	129	11	73	408	8
3	809	12	40	139	9	74	419	8
3A	815	4	41	149	9	75	429	8
7	817	1	42	161	12	76	439	8
5	935	29	44	170	8	77	443	3
11	945	8	43	172	1	78	444 (INDY)	0
12	952	6	45	184 (CLAY)	11	79	452	7
13	959	6	46	184 (SAND)	0	82	465	9
14	971	11	47	196	10	84	476	10
15	985	4	48	210	13	86	494	15
16	1002	11	49	220	9	87	500	4
17	1014	10	50	231	10	90	520	17
18	1021	6	51	251	19	91	526	5
19	1032	11	52	255 CORRELATION	3	92	532	4
19A	1039	5	53	256 INDY	0	93	533 INDY	0
INDY	1040	0	54	266	9	94	543	7
22	B0005A	4	55	271	4	97	556	11
26	15	9	56	272	0	98	566	7
27	22	6	58	281	8	100	579	11
INDY	23	0	59	291	9	102	505	5
28	31	5	60	302	10	105	595	9
29	42	10	61	312	8	106	605	8
30	47	5	63	326	10	108	613	6
INDY	50	2	64	335	8	109	620	6
31	52	1	65	346	6	110	621 INDY	0
32	62	9	66	356	5	112	633	10
33	69	5	67	366	7	113	643	8
34	77	7	67A	374	2	115	653	9
INDY	78	0	68	376	1	117	663	9
35	87	8	69	377 INDY	0	118	673	6
36	94	6	70	387	7	120	683	9

TABLE NO 6
NRC CONCERN NO 7

FREQUENCY CHECK - PROCTORS/SIEVES TO DENSITIES

PROCTOR CURVE NO	LAB TEST NO.	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO OF DEN TESTS BETW PROCTORS
122	694	9	164	1052	10	206	1429	10
123	701	5	165	1063	9	207	1441	10
125	713	10	166	1076	10	208	1453	10
127	723	8	167	1087 A	9	190	1465	10
128	737	9	200	1087AA	7 (INDY.)	191	1476	9
130	746	8	168	1100	3	209	1482	4
131	759	10	172	1148	12	193	1488	5
132	770	9	173	1160	10	210	1500	10
133	781	10	174	1173	10	191	1512	10
134	793	10	175	1186	8	211	1524	10
135	804	10	177	1197	9	212	1538	10
137	816	10	178	1211	10	213	1550	11
138	826	8	180	1223	10	214	1562	10
139	837	10	183	1234	10	215	1574	10
140	848	9	184	1246	9	217	1588	10
141	855 INDY	6	185	1259	10	218	1601	10
142	856 (CORRELATION)	0	186	1270	10	219	1613	10
144	867	9	187	1283	10	220	1625	8
146	878	9	188	1294	10	222	1639	9
148	891	9	189	1305	10	223	1651	10
149	904	10	190	1311	3	224	1663	10
150	915	9	191	1312	0	226	1677	10
151	927	10	195	1319	6	227	1689	7
152	940	10	192	1321	1 (INDY)	228	1701	9
153	953	10	193	1322	0 (COORELATION)	229	1712	10
154	961	7	196	1332	9	231	1724	10
155	973	9	197	1344	10	232	1735	9
156	983	9	198	1357	10	233	1747	10
157	996	9	199	1370	10	235	1758	9
158	1007	10	201	1382	10	236	1784	0 (COORELATION)
159	1016	8	202	1393	10	237	1771	10
160	1027	9	203	1405	10	238	1782	10
163	1040	10	205	1417	10	239	1796	10

TABLE NO 6
NRC CONCERN NO 7

FREQUENCY CHECK - PROCTORS/SIEVES TO DENSITIES

PROCTOR CURVE NO	LAB TEST NO.	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO OF DEN TESTS BETW PROCTORS
240	1807	10	275	2181	10	326	2548	10
241	1819	10	277	2194	10	328	2561	10
243	1831	9	278	2206	10	329	2573	10
244	1842	10	280	2219	10	330	2578	3
245	1853	10	283	2231	10	331	2586	7
246	1865	10	285	2245	10	333	2598	10
247	1877	10	287	2258	9	334	2610	10
248	1889	10	288	2263	3	336	2623	10
249	1901	10	289	2268	3	337	2635	10
250	1912	10	290	2273	3 (CORRELATION	341	2648	9
251	1922	9	291	2274	0 (INDY)	342	2659	10
252	1934	10	292	2286	10	344	2671	10
253	1945	10	293	2287	0 (INDY)	346	2683	10
254	1957	10	295	2300	10	347	2695	10
255	1968	10	296	2312	10	349	2706	10
256	1980	10	297	2324	10	350	2717	10
257	1991	10	299	2336	10	351	2730	10
258	2004	10	300	2350	10	353	2742	10
259	2015	10 (CORRELATION)	301	2364	9	354	2754	10
260	2026	10 (INDY)	305	2379	8	356	2767	10
261	2027	0	307	2392	10	357	2779	10
262	2038	10	309	2405	10	358	2791	10 (CORRELATION)
263	2050	10	314	2418	10	359	2792	0 (INDY)
264	2063	11	316	2430	10	361	2805	10
265	2074	9	317	2443	10	362	2818	10
266	2086	10	318	2456	10	365	2831	10
267	2098	10	319	2468	10	367	2843	10
268	2109	10	320	2481	10	369	2855	10
269	2121	10	321	2493	10	372	2867	10
270	2132	10	322	2506	10	373	2879	10
271	2144	8	323	2519	10	375	2892	10
273	2156	10	324	2534	10	376	2904	10
274	2169	10	325	2535	0 (CORRELATION INDY)	379	2917	10

TABLE NO 6
NRC CONCERN NO 7

FREQUENCY CHECK - PROCTORS/SIEVES TO DENSITIES

PROCTOR CURVE NO	LAB TEST NO.	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO. OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO OF DEN TESTS BETW PROCTORS
380	2929	10	449	3341	10			
382	2941	10	451	3352	10	—		
383	2953	10	452	3363	10	—		
386	2967	11	453	3374	10	—		
391	2978	9	454	3385	10	—		
392	2990	10	455	3396	10	—		
393	3002	10	456	3407	10	—		
396	3014	10	457	3418	10			
397	3027	10	459	3430	11	—		
400	3053	24 (CORRELATION TO INDY)	460	3443	12	—		
404	3065	10	471	3454	10			
405	3076	6	473	3464	9	—		
409	3088	10	474	3474	9			
410	3099	10	475	3482	7			
412	3110	10	481	3493	10			
415	3121	10	485	3506	10			
416	3154	10/10/10 REUSED MATL	488	3509	3			
418	3165	10	488A	3522	12			
421	3176	10	490	3538	13			
422	3187	10	493	3547	5			
423	3198	10	493	3548	0			
425	3209	10	498	3556	6			
426	3220	10	499	3569	7			
428	3231	10	500	3576	4			
429	3242	10	503	3581	3			
430	3253	10	504	3582	11			
431	3264	10	505	3589	4			
432	3275	10	506	3592	12			
434	3286	10	507	3600	10			
439	3297	10 (MEMPHIS)	508	3601	10			
441	3308	10	509	3628	8			
445	3319	10		END				
447	3330	10						

TABLE NO. 7
NRC CONCERN NO. 7

NONCONFORMING INTERVALS · PROCTOR/SIEVE TO FIELD DENSITY

PROCTOR CURVE NO.	LAB TEST NO.	NO OF DEN TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO OF DEN- TESTS BETW PROCTORS	PROCTOR CURVE NO	LAB TEST NO	NO OF DEN. TESTS BETW. PROCTORS
14	LRWE 971	11	42	B0161A	12	1	LRWE 717,718,719	17
16	1002	11	172	1148	12	2	768	22
19	1032	11	460	3443	12	5	935	29
39	B0129A	11	488A	3552	12	51	B0251A	19
45	184	11	506	3592	12	86	494	15
97	556	11	3	LRWE 809	12	90	526	17
108	579	11				400	3053	24
213	1550	11	48	B0210A	13			
386	2967	11	490	3538	13			
459	3430	11						
504	3582	11						
264	2063	11						

381/6-81

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATIV. DENSITY
1	LFWE 699	F4 45W 0N	5B	-41.6	1-21-76	78
	700	F4 80W 28S	5B	-39.6	1-21-76	72
	701	F4 44W 21S	5B	-40.3	1-21-76	74
	702	F4 40W 16N	5B	-39.0	1-21-76	84
	703	F4 70W 17N	5B	-38.3	1-21-76	79
	704	F4 43W 10S	5B	-37.7	1-21-76	78
	705	F4 42W 10N	5B	-36.4	1-22-76	78
	706	F4 78W 5S	5B	-36.4	1-22-76	66
	707	E2 6E 14S	4	-36.4	1-22-76	66
	708	D2 10W 16S	4	-35.1	1-22-76	75
	711	F4 5N 80W	5B	-35.1	1-22-76	68
	710	F4 9S 57W	5B	-35.1	1-22-76	87
	712	E2 15S 7E	4	-41.25	1-23-76	72
	713	E2 6W 5S	4	-41.25	1-23-76	73
	714	F4 45N 44W	5B	-34.75	1-23-76	72
	715	F4 49W 3N	5B	-34.75	1-23-76	82
	716	F4 61W 12S	5B	-34.75	1-23-76	68

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION			FILL NO	TEST ELEV	DATE	RELATIVE DENSITY
2	LRWE 720	C2	20E	13S	1	- 39.75	1-26-76	62.5
	721	F4	45N	38W	5A	- 41.75	1-26-76	81
	723	D2	13W	13S	4	- 38.50	1-26-76	79
	724	F4	62N	43W	5A	- 40.50	1-26-76	79
	725	F3	7N	43W	5A	- 39.20	1-26-76	79
	726	F4	40W	53N	5A	- 39.20	1-27-76	77
	727	E6	35S	68E	3B	- 42.50	1-27-76	81
	731	E6	78N	68E	3B	- 42.50	1-27-76	97
	733	E6	22S	30W	3B	- 41.50	1-28-76	74
	734	E5	7N	32W	3B	- 41.50	1-28-76	81
	736	F5	20S	33W	3B	- 41.50	1-28-76	85
	754	B3	20E	30S	6B	- 43.25	2-11-76	72
	755	B4	20E	31S	6B	- 42.25	2-11-76	72
	757	B4	30N	35E	2	- 38.00	2-12-76	97
	758	B4	0N	55E	2	- 38.00	2-12-76	95
	759	B4	37S	53E	6B	- 38.00	2-12-76	92
	760	B4	22S	33E	6B	- 36.75	2-12-76	73
	761	B4	7N	52E	2	-36.50	2-12-76	68
	762	B4	18S	56E	6B	-36.75	2-12-76	68
	763	B4	10S	37E	6B	-35.50	2-12-76	84
	766	B4	29S	55E	6B	-35.50	2-13-76	88
	767	B4	0N	50E	2	-35.50	2-13-76	84

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATIV. DENSITY
5	LRWE 818	F4 80W 85S	5A	-37.25	2.26.76	90
	819	E5 20N 30E	3B	-38.25	3.1.76	64
	820	C6 35S 10W	6A	-40.25	3.1.76	79
	821	E5 25N 32E	3B	-37.25	3.1.76	57
	822	E5 30N 30E	3B	-36.25	3.1.76	69
	848	C6 40S 35E	7	-38.25	3.17.76	71
	866	C2 37S 15W	1	-39.75	4.23.76	65
	{ 865	B2 68S 42E	1	-39.75	4.23.76	55
	863	RETEST				71
	867	C2 15S 15E	1	-39.75	4.23.76	69
	869	C2 10S 8E	1	-38.75	4.26.76	80
	873	B2 53S 40E	1	-38.75	4.26.76	68
	875	B2 90E 50S	1	-37.50	4.27.76	59 *
	878	B2 40E 80S	1	-37.50	4.27.76	-
	911	E3 50N 5W	4	-40.25	5.18.76	69
	912	E3 54N 20W	4	-40.25	5.18.76	62 *
	913	E3 80N 30W	4	-39.25	5.19.76	69
	915	E3 51N 80W	4	-37.00	5.19.76	66
	917	E3 40N 81W	4	-37.00	5.19.76	91
	918	E3 25S 50E	4	-37.25	5.20.76	80
	919	E3 27S 48W	4	-37.25	5.20.76	70
	920	D3 87N 30E	4	-35.75	5.20.76	61
	921	E3 37E 24N	5A	-36.25	5.20.76	84
	922	E3 25E 24N	5A	-36.25	5.20.76	60 *
	923	E3 60E 15N	5A	-35.25	5.21.76	88
	924	E3 28E 15N	5A	-35.25	5.21.76	84
	932	C6 35N 30W	6A	-39.25	6.2.76	65
	931	C6 47W 30N	6A	-39.25	6.2.76	74
	933	C6 52N 50W	6A	-38.25	6.3.76	60 *
	934	C6 0N 45W	6A	-37.25	6.3.76	61 *

* ACCEPTED AS PART OF STATISTICAL TOLERANCE

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATIV. DENSITY
51	B0232ARR	B6 91N 65E	6	-44.00	11-5-76	84.5
	233A	B6 94N 68E	6	-42.75	11-5-76	96.0
	234A	B6 97N 62E	6	-41.50	11-5-76	84.0
	235ARR	B6 91N 54E	6	-42.05	11-5-76	94.0
	236A	B5 3N 65E	6	-40.75	11-6-76	116.5
	237A	B5 6N 63E	6	-40.00	11-6-76	108.0
	238A	B6 90N 63E	6	-39.50	11-6-76	131.5
	239A	B6 93N 58E	6	-41.25	11-6-76	99.5
	240A	B6 93N 64E	6	-39.00	11-6-76	151.5
	241ARR	B5 4N 55E	6	-40.25	11-6-76	140.5
	242A	B6 98N 63E	6	-37.75	11-6-76	124.0
	243A	B6 93N 64E	6	-37.25	11-7-76	112.5
	244AR	B6 96N 55E	6	-39.50	11-7-76	92.0
	245AR	B5 3N 53E	6	-38.50	11-7-76	86.5
	246A	B6 94N 57E	6	-37.00	11-7-76	87.5
	247A	B5 18N 66E	6	-36.50	11-7-76	90.5
	248A	B6 45N 63E	6	-35.50	11-7-76	14[illegible].0
	249A	B5 3N 56E	6	-36.00	11-8-76	105.0
	250AR	B5 66N 65E	6	-37.25	11-8-76	92.5

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATV. DENSITY
86	B0477A	E7 80N 96E	3	- 27.30	3.16.77	88.5
	478A	E7 90N 25E	7	- 30.30	3.16.77	68.5
	479A	F7 48N 0E	3	-26.30	3.17.77	88.0
	480A	E6 30N 55E	3	- 26.30	3.17.77	79.0
	481A	E7 15S 15E	7	- 29.30	3.17.77	77.0
	482A	E8 91N 33E	7	- 28.30	3.17.77	72.0
	483A	D8 70N 62E	7	- 32.30	3.17.77	67.5
	484A	D7 30S 12E	7C	- 32.30	3.18.77	81.0
	485A	E7 0N 5E	7A	- 26.30	3.18.77	93.5
	486A	E8 80N 33E	3B	- 25.30	3.18.77	87.0
	487A	E7 55N 43E	7A	- 25.30	3.18.77	79.0
	489A	D7 45S 24E	7C	- 31.30	3.19.77	65.5
	490A	D7 25N 70E	7C	-29.30	3.19.77	70.0
	492A	C7 30N 10E	7E	- 38.30	3.21.77	75.0
	493A	D7 11N 81E	7C	- 28.30	3.21.77	—

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATIV. DENSITY
90	B0501A	C7 32N 67E	7E	-34.25	3·22·77	75.0
	502A	D7 12S 75W	7	-34.30	3·23·77	85.5
	503A	D7 0N 0E	7	-33.30	3-23·77	99.0
	504A	C7 18N 96E	7	-32.30	3-23·77	97.0
	505A	C7 35N 51E	7	-31.30	3-23·77	83.0
	506A	C8 0N 0E	7F	-31.05	3-24-77	—
	507A	C7 8S 0E	7F	-30.30	3-24-77	81.5
	508A	D7 60N 0N	7E	-30.30	3-24·77	74.5
	509A	B7 37N 96E	7E	-29.30	3·24·77	79.0
	510A	C8 92N 95E	7	-28.30	3·24·77	79.0
	511A	C7 2N 33E	7E	-27.30	3·25-77	74.0
	512A	D7 31N 11E	7E	-26.30	3·25·77	87.0
	513A	B6 90N 5E	6	-38.30	3·26·77	75.0
	515A	C8 95N 0E	7E	-25.30	3·28·77	91.5
	516A	B7 62N 38E	6A	-34.25	3·28·77	77.0
	517A	B7 53N 38E	6A	-33.25	3·28·77	112.0
	519A	B7 72N 20E	6	-33.30	3·29·77	66.0

TABLE NO 8

NRC CONCERN NO. 7

ANALYSIS OF NONCONFORMING CONTROL TEST FREQUENCIES

PROCTOR CURVE	LAB TEST NO	LOCATION	FILL NO	TEST ELEV	DATE	RELATIVE DENSITY
400	B 3029 A	F8 8N 18E	3	+12.50	8-1-78	102.5
	3030 A	F8 5N 17E	3	+13.50	8-1-78	108.5
	3031 A	F8 55N 5E	3	+14.00	8-1-78	106.0
	3032 A	F8 2N 15E	3	+14.50	8-1-78	100.5
	3033 A	F7 35N 25E	3	+13.00	8-2-78	104.5
	3034 A	F7 20N 30E	3	+14.00	8-2-78	103.0
	3035 A	B8 5N 5E	6	+10.00	8-9-78	113.0
	3036 A	B8 40N 10E	6	+12.00	8-9-78	104.0
	3037 A	B8 8N 5E	6	+11.00	8-9-78	106.0
	3038 A	B8 45N 10E	6	+13.00	8-10-78	116.0
	3039 A	B8 5N 0E	6	+12.00	8-10-78	101.5
	3040 A	B8 48N 5E	6	+14.00	8-10-78	107.0
	3041 A	B8 0N 4E	6	+13.00	8-10-78	106.0
	3042 A	B8 30N 25E	6	+11.00	8-10-78	106.5
	3043 A	B8 5N 6E	6	+14.00	8-10-78	102.5
	3044 A	B8 30N 35E	6	+12.00	8-10-78	102.5
	3045 A	B8 38N 28E	6	+13.00	8-11-78	112.0
	3046 A	B8 38N 35E	6	+14.00	8-11-78	101.0
	3047 A	B8 25N 5E	6	+6.00	8-11-78	102.5
	3048 A	B8 20N 8E	6	+7.00	8-11-78	100.0
	3049 A	B8 18N 3E	6	+8.00	8-11-78	102.5
	3050 A	B8 15N 9E	6	+9.00	8-12-78	106.0
	3051 A	B8 17N 2E	6	+10.00	8-12-78	91.5
	3052 A	B8 12N 5E	6	+11.00	8-12-78	101.5

TABLE NO. 9
NRC CONCERN NO. 7
SCHEDULE OF RELATIVE DENSITY
CORRELATION TESTING

TEST NUMBER	TEST DATE
LRWE 815	2/25/76
1040	8/12/76
B 0023A	9/9/76
50A	9/22/76
78A	10/8/76
256A	11/9/76
271A	12/15/76
377A	2/2/77
444A	2/23/77
532A	4/1/77
621A	4/22/77
855A	5/31/77
1087A	7/7/77
1321A	8/5/77
1482A	8/19/77
1500A	8/20/77
1784A	9/28/77
2015A	10/18/77
2026A	10/18/77
2274A	11/17/77
2287A	11/22/77
2535A	2/23/78
2792A	5/23/78
3053A	8/21/78
3297A	2-16-79
1197B	12/17/79

REVIEW AND ANALYSIS OF SOIL
BACKFILL DENSITIES
NRC CONCERN NO. 7

APPENDIX A

IN-PLACE DENSITY TESTS FILL 5

EL -41.75 to EL -36.25

TABLE A-1

IN-PLACE DENSITY TESTS - FILL #5
EL -41.75 TO EL -36.25

TEST EVALUATION	TEST LOCATION	TEST NUMBER	TEST DATE	PROCTOR TEST CURVE NO.
-41.75	F4 45N 38W	LRWE721	1/26/76	1
-41.60	F4 ON 45W	LRWE699	1/21/76	1
-40.50	F4 62N 43W	LRWE724	1/26/76	1
-40.30	F4 21S 44W	LRWE701	1/21/76	1
-39.60	F4 28S 80W	LRWE700	1/21/76	1
-39.25	F4 20N 80W	LRWE808	2/24/76	6
-39.25	F4 18N 20W	LRWE807	2/24/76	6
-39.20	F4 53N 40W	LRWE726	1/27/76	1
-39.20	F3 7N 43W	LRWE725	1/26/76	1
-39.00	E3 30N 33E	LRW1031	8/12/76	15/18
-39.00	F4 16N 40W	LRWE702	1/21/76	1
-38.75	E4 10N 33E	LRW1036	8/12/76	15/18
-38.30	F4 17N 70W	LRWE703	1/21/76	1
-38.25	F4 30N 50W	LRWE811	2/25/76	3
-38.25	F4 35N 43W	LRWE812	2/25/76	3
-38.25	E4 10N 31E	LRW1037	8/12/76	15/18
-38.00	E3 31N 32E	LRW1033	8/12/76	15/18
-37.75	E3 31N 34E	LRW1035	8/12/76	15/18
-37.70	F4 10S 43W	LRWE704	1/21/76	1
-37.50	E4 11N 32E	LRW1038	8/12/76	15/18
-37.50	E4 69N 27E	B0102A	10/13/76	34
-37.25	F3 80S 70W	LRWE 813	2/26/76	6
-37.25	F4 80S 84W	LRWE 816	2/26/76	6
-37.25	F4 85S 80W	LRWE 818	2/26/76	6
-37.25	E5 40N 27E	B0089A	10/11/76	34
-37.00	E4 60N 27E	B0101AR9	10/14/76	34/36
-36.76	E4 60N 28E	B0110AR4	10/14/76	36
-36.75	E5 42N 32E	B0090AR2	10/12/76	34
-36.40	F4 15S 78W	LRWE706	1/22/76	1
-36.40	F4 10N 42W	LRWE705	1/22/76	1
-36.25	E4 45N 27E	B0116AR	10/15/76	36
-36.25	E3 24N 25E	LRWE922	5/20/76	7
-36.25	E3 24N 37E	LRWE921	5/20/76	2
-36.25	E5 58N 27E	B0097AR	10/12/76	34

NOTE: Actual In-Place Density Test sheets are available at the Waterford 3 Site

RESPONSE

ITEM NO.: 19 (Revision 1)

TITLE: Water in Basemat Instrumentation Conduit

NRC DESCRIPTION OF CONCERN:

In examining the safety significance of the allegations, the NRC staff performed system walkdowns as a means of verifying the as-built conditions. During one of those walkdowns, the staff noted that there was water in an electrical conduit that penetrated the basemat. If the seals in that conduit should fail there is a potential direct path for ground water to flood the auxiliary building basement. LP&L should review all conduit that penetrates the basemat and terminates above the top of the basemat to assure that these potential direct access paths of water are properly sealed.

DISCUSSION:

During the construction period, several permanent conduits embedded in the basemat were observed to seep water at the stub-up couplings. None of them leaked in a quantity sufficient to cause flooding concerns during construction.

Silicone foam seals were placed in these conduits beginning in late 1983.

In May, 1984, a walkdown, as described in Attachment 1, was performed by Ebasco which identified 29 places where wetness due to seepage from conduits or conduits within 9 boxes plus one piezometer riser were found and 12 places where evidence of past leaking from conduits and piezometer risers were found. These cases will be addressed by LP&L by removing the existing seals and replacing them with a light density silicone elastomer which has the capability to stop the seepage as required. This work will be performed as a routine maintenance item as directed by the Plant Operations Staff, since the slow seepage through the seals is a maintenance inconvenience and not a flooding hazard. This is reflected in Attachment 1.

The 12 sheet table that is part of Attachment 1 is in fact 2 related listings. The first 2 sheets list 36 items (27 conduits including one piezometer riser and 9 pull boxes). These items were checked off in the listing as either having a leak or giving evidence of once having a leak. The remaining 10 sheets detail what conduits come into each of the 9 pull boxes listed on the first 2 sheets (Items 4,5,7,9,10,23,27,28 and 32). These 10 sheets have listed on them 56 conduits (within pull boxes) which when combined with the 27 conduits (not in pull boxes) on the first 2 sheets makes a total of 83 identified conduits. (Note: Attachment 1/Paragraph I indicates that 8 pull boxes were identified. Subsequent to issuance of Attachment 1, additional conduits and one pull box were added to the table. The first sentence of Attachment 1/Paragraph 1 requires correction. The first walkdown resulting in the memo consisted of an inventory of individual conduits which had seepage or evidence of past seepage and pull boxes containing numerous conduits which had a potential for seepage or evidence of past seepage. Subsequent to the first walkdown, the covers were removed from the pull boxes to identify individual conduits within the pull boxes with seepage or evidence of past seepage. This reduced the totals reflected in the sentence and provides the actual numbers of conduits with evidence of current or past seepage as shown in the tables.)

Temporary conduits which enter the basemat from outside, and which once allowed passage of ground water in quantities that required periodic pumping, have now all been pressure grouted as part of the normal design requirement and their temporary blockout pits filled with concrete as shown on Drawing LOU-1564-G-499 S09. Therefore, they no longer serve as leak paths for ground water.

Attachment 2 discusses the sealing of a piezometer riser and a piezometer standpipe. The piezometer riser (Item 8 of Attachment 1) consists of piezometers in a conduit down in the aquifer (surrounded by a well pipe). The conduit was internally sealed behind the piezometers and was sealed again in the portion of conduit that transverses the basemat. As recommended in Attachment 2, this conduit will be sealed with a light density silicone elastomer since two of the piezometers are still operable. The piezometer standpipe is basically a well pipe filled with water under pressure from the aquifer with piezometers attached at the -35 level. This standpipe has been pressure grouted. The location of the riser is just south of the J wall, between 5A and 6A (i.e., in corridor south of EFW pump A - see FSAR Figure 1.2-11). The location of the standpipe is north of the L wall, between 6A and 7A (i.e., in the radioactive pipe chase - see FSAR Figure 1.2-19).

CAUSE:

Except in the case of the piezometer riser, the seal material in place does not provide total waterstop characteristics.

GENERIC IMPLICATIONS:

There are no generic implications since the potential paths for ground water to flow in appreciable quantities had already been addressed.

SAFETY SIGNIFICANCE:

There was never a path for ground water to flow in sufficient quantity to flood the auxiliary building basement, even before the seals were installed and before the temporary conduits were grouted. The floor drain and sump pump system was more than adequate to handle the quantity of water which entered the building during construction, and is adequate to handle the much reduced quantity presently observed, most of which evaporates before ever reaching a floor drain. On this basis, there is no recognized reason that this issue should constrain fuel load or power operation.

CORRECTIVE ACTION PLAN/SCHEDULE:

As stated above, there is no safety significance associated with this issue. Corrective action will be taken as part of good construction practice. The decision to replace the seals on the conduits will be based strictly on operating and maintenance considerations. Any replacement seals will consist of a light density silicone elastomer which has the capability to stop the seepage.

ATTACHMENTS:

(1) Memorandum ES-9160-84 of May 18, 1984

(2) Memorandum ES-9409-84 of June 1, 1984

REFERENCES:

(1) Drawing LOU-1564-G-499 S09

(2) FSAR Figure 1.2-11

(3) FSAR Figure 1.2-19

ATTACHMENT 1

MEMORANDUM

May 18, 1984
ES-9160-84

To: J. Houghtaling

From: J. T. Griffo [signature]

Subject: LOUISIANA POWER & LIGHT COMPANY
WATERFORD SES - UNIT NO. 3
WATER SEEPAGE FROM CONDUITS,
ELEVATION -35

In accordance with your request, Civil and Electrical ESSE conducted a walkdown of the conduits which penetrate the mat at Elevation -35 of the RAB, FHB and Cooling towers to determine which conduits are leaking water. At the same time NTEE was requested to review the type of material that could be employed to seal the conduits and eliminate seapage of water onto the floor.

The results of this study are as follows:

I. Results of Walkdown

A comprehensive walkdown of all conduits which penetrate the Mat at Elevation -35 revealed either seepage of water or evidence that water has leaked from 76 of these conduits. The attached table provides a complete listing of the affected conduits including their location and cables contained. A large number of these conduits (53) penetrate the Mat and enter floor mounted pull boxes. There are eight such pull boxes that have been identified.

II. Results of NTEE Study

NTEE was requested to review this problem and identify the type of fix that would prevent water from penetrating these conduits. It was determined that sealing the conduits with Light Density Silicone Elastomer (LDSE) which has been provided by B&B in accordance with existing specification LOU 1564.249W will prevent the seepage of water through the conduits.

Assuming the water table to be equal to grade elevation of +17.5 feet and the affected conduits end flush with slab elevation -35 feet (worse case), the pressure on top of the conduit opening can be calculated as follows:

Pressure (PSI) = Head (ft.)/2.31(ft/psi) where
Head (ft.) = $d_1 - d_2$, therefore

Pressure (PSI) = 17.5-(-35)/2.31 or 22.7psi

A four (4) inch thickness of LDSE has been tested by B&B to be a fire rated seal and a hydrostatic seal rated for 20 psi.

Since the pressure on the conduit is 22.7psi, it is recommended that a six (6) inch thickness of LDSE in each conduit end will provide a margin for flooding at grade elevation. The existing Silicone Foam fire barrier material must be completely removed prior to pouring the LDSE. Also, upon curing the LDSE becomes hard and can only be removed by using a chisel.

It should be noted that the seepage of water onto the floor of Elevation -35 through these conduits is not an immediate hazard to the safety of the plant or its personnel, but rather a nuisance to maintenance. On this basis, it is recommended that replacement of the Silicone foam fire barrier material with the LDSE be scheduled as a post fuel load task at a time convenient to LP&L.

JTG/kw

cc: J. F. Montalbano
J. Costello
J. DeBruin
C. Ruiz
R. Vidal

CLIENT LOUISIANA POWER & LIGHT
PROJECT WATERFORD S.E.S. #3
SUBJECT EMBEDDED CONDUIT INVESTIGATION

OPS NO. ____ DEPT. NO. ____
BY ____ DATE ____
CHECKED BY ____ DATE ____

ITEM NO.	LINE Nº OR BOX Nº	CONDUIT SIZE	APPROX LOCATION	DESCRIPTION: LEAK	DESCRIPTION: EVIDENCE	FROM / TO	CABLE TYPE	VOLTAGE	CABLE Nº
1	35075	2"ϕ	W. OF WALL ON 12A, BETW. H & J	✓		CAP NEAR J/12A / B3276-NB	-	-	-
2	30370A	4"ϕ	DITTO	✓		SWGR 3AB31S 480V(4) / CHG P "AB" (CH-3)	3/C #1/0T (075-03)	POWER	30370A
3	30873A	2"ϕ	S. OF SUMP IN WASTE TANK A	✓		B3267-NA / W OR TKSMP #11A	3/C #8 (075-09)	POWER	30873A
4	B3278 (PULL BOX)	8-2"ϕ	E. OF WALL ON 6A, INJECT. PUMP AREA "B"	✓ (1 CND)		SEE SHEET-3			
5	B3279 (PULL BOX)	11-2"ϕ	DITTO	✓ (3 CNDS)		SEE SHEET-4			
6	30863B	2"ϕ	DITTO	✓		B3276-NB / REAC OR P FD SMP #5A	3/C #8 (075-09)	POWER	30863B
7	B3753 (PULL BOX)	3-2"ϕ	W. OF WALL ON 10A, INJECT. PUMP AREA "B"	✓ (1 CND)		SEE SHEET-6			
8	4" RISER PIEZOMETER	4"ϕ	3'-0 S. OF J, 3'-0 W. OF 6A	✓					
9	B3270 (PULL BOX)	5-2"ϕ	E. OF WALL ON 6A, INJECT. PUMP AREA "A"	✓ (2 CNDS)		SEE SHEET-7			
10	B3271 (PULL BOX)	6-2"ϕ	DITTO	✓ (1 CND)		SEE SHEET-8			
11	33537	2"ϕ	S. OF WALL ON H, BETW. 4A & 5A		✓	CAP NEAR H/4A (SP) / B3279-NB	-	-	-
12	7902203 TEMP. POWER CONSTR	4"ϕ	S. OF WALL ON W, W. OF 2FH - FHB.	✓					
13	30876E	2"ϕ	W. OF WALL ON 1M, BETW. V & W - C.T.		✓	B3168-NA / B3174-NA	2/C #14 (050-03)	CONTROL	30876E, G, N
14	30340	2"ϕ	NEXT TO N. WALL INSIDE B.A. MAKE-UP TANK "B"		✓	P201-5A: 3403 / B3289-5A	1/C #4 (075-07)	POWER	30340A
15	30370A	4"ϕ	INSIDE CHARGE PUMP ROOM-AB	✓		SWGR 3AB31S 480V (4) / CHG P "AB" (CH-3)	3/C #1/0T (075-03)	POWER	30370A
16	38011	2"ϕ	S.W. OF COL LINES 5A & K	✓		CAP NEAR K/5A (SP) / CAP NEAR K/6A	-	-	-

CLIENT: LOUISIANA POWER & LIGHT
PROJECT: WATERFORD - S.E.S. #3
SUBJECT: EMBEDDED CONDUIT INVESTIGATION

OFS NO. ____ DEPT. NO. ____
BY ____ DATE ____
CHECKED BY ____ DATE ____

ITEM NO.	LINE Nº OR BOX Nº	CONDUIT SIZE	APPROX LOCATION	DESCRIPTION LEAK	DESCRIPTION EVIDENCE	FROM / TO	CABLE TYPE	VOLTAGE	CABLE Nº
17	30851V	2"ø	BETW. 4A & 5A, NEXT TO SUMP.	✓		C701B-5A13307 CCW M-U P "A"	-	-	-
18	37107	2"ø	S.E. OF COL LINES 4A & K		✓	B3397-SAB GOV CNTL PNL	3/c #1851 (033-66)	LOW	31541H
19	30686A	2"ø	DITTO		✓	L705A-NB: 3304 TE-651	3/c #14ST (083-01)	LOW	30686A
20	30872V	2"ø	S. OF WALL ON L, EQUIP. DRAIN & SUMP PUMP.		✓	B3759-NA B30276-NA	2/c #14 (050-03)	CONTROL	30872 C, D, G, H, J.
21	30872B	2"ø	DITTO		✓	EQUIP DR SMP #18 B3276-NB	3/c #8 (025-09)	POWER	30872B
22	30528A	2"ø	N. OF WALL ON L, BETW. 9A & 10A.	✓		P102-5B:3708 MV251-V136486 (SI-646)	3/c #8 (025-09)	POWER	30528A
23	B 3319 (Pull Box)	8-2"ø	S. OF COL. ON COL. LINE 9A & M	✓ (2 CNDS)		SEE SHEET - 9			
24	30516A	2"ø	N. OF WALL ON L, BETW. 8A & 9A	✓		B3317-5A MV251-V809A (SI-668)	3/c #8 (025-09)	PWR	30516A
25	30516B	2"ø	DITTO		✓	B3318-5A MV251-V809A (SI-668)	9/c #14 (050-07)	CONTL	30516B
26	38001	2"ø	N. OF WALL ON L, BETW. 7A & 8A		✓	B3319-5B (SP) CAP NR 6Y/7A	-	-	38001-5B
27	B 3318 (Pull Box)	6-2"ø	S. OF COL. ON COL. LINE 6A & LY.	✓ (2 CNDS)		SEE SHEET - 10			
28	B 3317 (Pull Box)	6-2"ø	DITTO	✓ (2 CNDS)		SEE SHEET - 11			
29	30877B	2"ø	E. OF A.D. SUMP W. OF WALL ON 12A. - C.T.		✓	MCC 3B314-5(51) CLG. TWR. AREA DR SMP #2B	3/c #8 (025-09)	POWER	30877B
30	33095	3"ø	S.W. CORNER OF WALLS ON 12A & S - C.T.		✓	SPARE			
31	TEMP. POWER CONSTR.	4"ø	N. OF WALL ON R, BETW. 12A & 12M - C.T.		✓				
32	B3751 (Pull Box)	3-2"ø	6A & 12'N of J	✓ (1 CND)		SEE SHEET 12			
33	30867A	2"ø	8'E of 8A @ M	✓		B3270-NA RAB SMP #3A	3/c #8 (D25-09)	POWER	30867A
34	30406A	2"ø	11'E of 6A / 11'-6 N of K	✓		B3270-NA REAC. DR. TK. P	3-1/c #8 (D25-08)	POWER	30406A
35	35314	2"ø	7'E of 9A / @ K	✓		B3277-NB CAP NR. K/9A (SPARE)	-	-	-
36	38010	2"ø	SOUTH WALL OF CHG. P RM A/B IN PIPE CHASE	✓		B3282-SAB CAP NR. J/3A (SPARE)	-	-	-

BY ______ DATE ______
CHKD. BY ______ DATE ______
OPS NO. ______ DEPT. NO. ______
CLIENT ______
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ITEM NO.		CONDUIT No	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE No
4		B3278-NB					
	*	30865F-NB	2	B3278-NB B3751-NA	3/C #14 (050:04)	CONTROL	30865F
		30883F-NB	2	B3278-NB B3748-NA	3/C #14 (050:04)	CONTROL	30883F
		35086-NB	2	B3278-NB (SP) CAP NEAR K/4A	-	-	-
		30884F-NB	2	B3278-NB B3457-NA	3/C #14 (050:04)	CONTROL	30884F
		35087-NB	2	CAP NEAR J/5A (SP) B3278-NB	-	-	-
		30871F-NB	2	B3749-NA B3278-NB	3/C #14 (050:04)	CONTROL	30871F
		30867F-NB	2	B3278-NB B3447-NA	3/C #14 (050:04)	CONTROL	30867F
		35077-NB	2	CAP NEAR H/4A (SP) B3278-NB	-	-	-

* = CND HAS LEAK

BY ______ DATE ______
CHKD. BY ______ DATE ______
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CLIENT ______
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ITEM NO.	CONDUIT Nº	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE Nº
15	B3279-NB 30441A-NB	2	B3279-NB HLDP DR P	1/c #8 (D25-08)	POWER	30441A
*	33085-NB	2	CAP NEAR J/5A (SP) B3279-NB	-	-	-
	30883B-NB	2	OIL SMP #3B B3279-NB	9/c #8 (D25-09)	POWER	30883B
	30442A-NB	2	B3279-NB HLDP RCRLG P	1/c #8 (D25-08)	POWER	30442A
	30871B-NB	2	B3279-NB BA RM SMP #9B	3/c #8 (D25-09)	POWER	30871B
*	30469A-NB	2	B3279-NB BA COND P "B" (BAC-B)	1/c #8 (D25-09)	POWER	30469A
	33086-NB	2	B3279-NB (SP) CAP NEAR K/4A	-	-	-
	30867B-NB	2	B3279-NB RAB SMP #3B	3/c #8 (D25-09)	POWER	30867B

*= CND HAS LEAK

BY ________ DATE ________ SHEET ____ OF ____
CHKD. BY ________ DATE ________ OFS NO. ________ DEPT. NO. ________
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ITEM NO.	CONDUIT Nº	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE Nº
15	83279 (CONT.)					
	30865B-NB	2	B3279-NB SI RM "AB" SMP # 7B	3/c #8 (D25:09)	POWER	30865B
	* 33532-NB	2	CAP NEAR H/4A (SP) B3279-NB	–	–	–
	30884B-NB	2	B3279-NB DSL OIL STG TK OSMP # 1B	3/c #8 (D25:09)	POWER	30884B

* = CND HAS LEAK

BY ______ DATE ______

CHKD. BY ______ DATE ______

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OPS NO. ______ DEPT. NO. ______

ITEM NO.	CONDUIT Nº	SIZE	FROM/TO	CABLE TYPE	VOLTAGE	CABLE Nº
7	B3753-NA					
	30866E NA	2	B3266-NA / B3753-NA	3/C #14 050-04	CONTROL	30866E
				2/C #14 050-03	CONTROL	30866G
*	30866F-NB	2	B3275-NB / B3753-NA	3/C #14 050-04	CONTROL	30866F
	30866V-NB	2	B3753-NA / B3818-NA	2/C #14 050-03	CONTROL	30866 C, D, G, H, J.

* = SNDS HAVE LEAK ONLY AT THE FLOOR WHERE THEY EXIST. THE MAT. NOT INSIDE THE PULLBOX. (THE PULLBOX IS MOUNTED 3'0 ABOVE THE FLOOR)

BY ______ DATE ______ SHEET 1 OF [illegible]

CHKD. BY ______ DATE ______ OFS NO. ______ DEPT. NO. ______

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ITEM NO.		CONDUIT No	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE No
9		B3770					
	*	30884E-NA	2	B3371-NA	3/c #14 D50-04	CONTROL	30884E
				B3457-NA	2/c #14 D50-03	CONTROL	30884G
		30872E-NA	2	B3271-NA	3/c #14 D50-04	CONTROL	30872E
				B3759-NA	2/c #14 D50-03	CONTROL	30872G
		30883E-NA	2	B3271-NA	3/c #14 D50-04	CONTROL	30883E
				B3748-NA	2/c #14 D50-03	CONTROL	30883G
	*	30867E-NA	2	B3271-NA	3/c #14 D50-04	CONTROL	30867E
				B3442-NA	2/c #14 D50-03	CONTROL	30867G
		30863E-NA	2	B3271-NA	3/c #14 D50-04	CONTROL	30863E
				B3750-NA	2/c #14 D50-03	CONTROL	30863G

* = CNDS HAVE LEAK

EBASCO SERVICES INCORPORATED

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CHKD. BY ______ DATE ______

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ITEM NO.	CONDUIT No	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE No
10	B3371-NA 30872A-NA	2	ED SMP #1A B3271-NA	3/C #8 025-09	POWER	30872A
	30867A-NA	2	B3271-NA RAB SMP #3A	3/C #8 025-09	POWER	30867A
*	30883A-NA	3	OIL SMP #3A B3271-NA	3/C #8 025-09	POWER	30883A
	30863A-NA	2	B3271-NA REAL DR P FL DR SMP #5A	3/C #8 025-09	POWER	30863A
	30884A-NA	2	B3271-NA DSL OIL STG TK Q SMP #1A	3/C #8 025-09	POWER	30884A
	30406A-NA	2	B3271-NA REAL DR TK P			30406A

* = CND HAS LEAK

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DATE

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ITEM NO.	CONDUIT Nº	SIZE	FROM / TO	CABLE TYPE	VOLTAGE	CABLE Nº
23	B3319-5B 30542A-5B	2	P102-5B:3708 MV 2SI-V1529B1 (SI-675)	3/c #8 025-09	PWR	30542A
	38001-5B	2	B3319-5B CAP NR 4Y/7A	-	-	-
*	30526A-5B	2	P102-5B:3708 MV 2SI-V1540B2 (SI-626)	3/c #8 025-09	PWR	30526A
	30541A-5B	2	P102-5B:3708 MV 2SI-V1549A1 (SI-615)	3/c #8 025-09	PWR	30541A MRE 601207 PO N4 V03495
*	30528A-5B	2	P102-5B:3708 MV 2SI-V1544B4 (SI-646)	3/c #8 025-09	PWR	30528A
	30527A-5B	2	P102-5B:3708 MV 2SI-V1547B3 (SI-636)	3/c #8 025-09	PWR	30527A
	38018-5B	2	B3319-5B CAP NR 2207	-	-	-
	30525A-5B	2	P102-5B:3708 MV 2SI-V1545B1 (SI-616)	3/c #8 025-09	PWR	30525A

* = CNDS HAVE LEAK

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BY ______ DATE ______

CHK'D. BY ______ DATE ______

OFS NO. ______ DEPT. NO. ______

CLIENT ______

PROJECT ______

SUBJECT ______

ITEM NO.		CONDUIT Nº	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE Nº
27		B3318-5A 30522B-5A	2	B3318-5A MV 2SI-V1546A2 (SI-627)	9/c #14 050-07	CONTROL	30522B
	*	30516B-5A	2	B3318-5A MV 2SI-V809 (SI-668)	9/c #14 050-07	CONTROL	30516B
		30521B-5A	2	B3318-5A MV 2SI-V1550A (SI-617)	2/c #18ST 083-06	LOW LEVEL	30521M
	*	30524B-5A	2	B3318-5A MV 2SI-V1548A2 (SI-647)	9/c #14 050-07	CONTROL	30524B
		30544B-5A	2	B3318-5A MV 2SI-V1543B2	9/c #14 050-07	CONTROL	30544B
		30523B-5A	2	B3318-5A MV-2SI-V1542AB (SI-637)	9/c #14 050-07	CONTROL	30523B

* = CNDS HAVE LEAK

DATE

BY DATE

OFS NO. DEPT. NO.

CLIENT

PROJECT

SUBJECT

ITEM NO.		CONDUIT No.	SIZE	FROM/ TO	CABLE TYPE	VOLTAGE	CABLE No.
8		B3317-5A 30544A-5A	2	B3317-5A MV2SI-V543B2	3/c #8 025-09	PWR	30544A
	*	30516A-5A	2	B3317-5A MV2SI-V309A (SI-668)	3/c #8 025-09	POWER	30516A
		30522A-5A	2	B3317-5A MV2SI-V1546A2 (SI-627)	3/c #8 025-09	POWER	30522A MEA 6 01207 403495
	*	30524A-5A	2	B3317-5A MV2SI-V548A4 (SI-647)	3/c #8 025-09	POWER	30524A
		30521A-5A	2	B3317-5A MV2SI-V1550A1 (SI-617)	1/c #8 025-08	POWER	30521A
		30523A-5A	2	B3317-5A MV2SI-V1542A8 (SI-637)	3/c #8 025-09	POWER	30523A

* = CNS HAVE LEAK

CK. BY ______ DATE ______ OFS NO. ______ DEPT. NO. ______

CLIENT ______

PROJECT ______

SUBJECT ______

ITEM NO.	CONDUIT No	SIZE	FROM / TO	CABLE TYPE	VOLTAGE	CABLE No
32	B3751-NA 30865B-NB	2	B3279-NB SI-RM "AB" SMP #78	3/c #8 (D25-09)	POWER	30865B
*	30865F-NB	2	B3278-NB B3751-NA	3/c #14 (D50-04)	CONTROL	30865F
	30865V-NA	2	B3751-NA B3820-NA	2/c #14 (D50-03)	CONTROL	30865C, D, G, H, J

* = CND HAS LEAK

ATTACHMENT 2

MEMORANDUM

June 1, 1984
ES-9409-84

TO: J. Houghtaling

FROM: B. Grant [handwritten initials] for B.G.

SUBJECT: LOUISIANA POWER & LIGHT COMPANY
WATERFORD SES - UNIT NO. 3
WATER SEEPAGE FROM PIEZOMETERS IN BASE MAT

Reference: Memo ES-9160-84 of 5-18-84, Grillo to Houghtaling, "WATER SEEPAGE FROM CONDUITS, ELEVATION - 35"

Item 8 of the attachment to referenced memo identifies a leaking 4"ø riser for piezometers, as shown on drawing LOU-1564-G-499509, Detail "X".

Two of the piezometers in this riser are still operating and they should continue in service so long as they give readings. Application of LDSE sealing foam as recommended in the memo will not interfere with continued service.

There is also a piezometer standpipe, No. P-23, which is shown on the same drawing, but which was not included in the referenced memo because it is not a conduit and does not leak.

This standpipe also requires sealing even though it does not leak at present, since its utility is over (it monitors a deep aquifer of no present interest) and in its present configuration (full of water under pressure) represents a potential leak path if it were to be broken by accident or corrosion.

It should be sealed by injection of pressure grout in sufficient quantity to fill it the height of the base mat, and then valved off against any minor seepage through the grout.

It is suggested that this action item be added to the list conveyed by the referenced memo.

BG/tw

cc: J. Costello
J. DeBruin
J. Grillo
R. Esnes
A. Bishara
P.C. Liu
L. Biller
B. Grant
G. Wu
ESSE File P. 63

RESPONSE

ITEM NO: 20 (Revision 1)

TITLE: Construction Materials Testing (CMT) Personnel Qualification Records

NRC DESCRIPTION OF CONCERN:

The Inquiry Team effort included a review of the disposition of the generic problem identified during the LP&L Task Force verification relative to GEO Construction Testing (GEO) documentation for personnel qualifications in the area of CMT.

The utility should conduct a review of supporting documentation for GEO corrective action stated in Attachment 6 of NCR W3-F7-116 (Ebasco W3-6487). This review should focus on the identification of CMT personnel placed in GEO Categories 1, 2, or 3 who were apparently qualified solely on written statements by other individuals attesting to the individuals training and qualifications. For such individuals, the applicant should pursue any new information or evaluations which could provide further assurance in support of the actual past work experience and training referenced by the written statements.

DISCUSSION:

As requested by the staff, LP&L has pursued and obtained additional information on the GEO individuals performing inspections and tests as will be explained in the sections of this response entitled "Collection and Verification of Personnel Data" and "Disposition of Deficiencies". Also, evaluations have been made of work performed by GEO personnel as briefly outlined herein.

A verification program was implemented to review the professional credentials of 100% of the site QA/QC personnel who may have performed safety-related functions at Waterford 3, including supervisors, managers and remaining QA/QC personnel. Assessment of the qualifications of all GEO Construction Material Testing (CMT) personnel, including those identified in Attachment 6 of Ebasco NCR W3-6497 (the NRC reference to Ebasco NCR W3-6487 is apparently a typographical error), was a part of that verification program.

The responses to Issues No. 1 and 10 discuss inspector qualifications for other Waterford 3 contractor personnel.

The program, which is being performed under the overall direction of LP&L, consists of three major elements:

- o Collection and verification of personnel data.
- o Evaluation of qualifications against specified standards.
- o Dispositioning of deficiencies resulting from cases where inspections, tests or data collection were conducted by personnel whose qualifications against the appropriate standards could not be confirmed.

Collection and Verification of Personnel Data

Personnel data were collected from various sources, including site files, contractor home office files, personal contact with individuals or supervisors and a thorough background verification program.

Efforts were made to verify the education and work experience of 100% of the GEO-CMT QA/QC personnel by researching Waterford 3 GEO-CMT records and by contacting schools, former employers and others. While the success rate of the background verification effort for GEO-CMT was good, there were cases where confirmatory information was not obtainable. In such cases, the judgement of the LP&L Review Board, as described below, was used to rule on the reliability of the available information.

Evaluation of Qualifications to Specified Standards

QA/QC personnel data were evaluated in order to classify individuals as either having verified qualifications or not. Training, education and work experience were the qualifications of primary concern. These qualifications were verified against the following criteria:

(1) Inspectors - ANSI N45.2.6-1973

(2) Other QA/QC Personnel - QA Program requirements

Initial qualification determinations for GEO-CMT personnel were performed first by Ebasco and then separately by an LP&L review group. In order to control the consistency of these determinations, approved procedures were utilized. Determinations related primarily to balancing education, experience and training factors.

The LP&L review group qualification determinations were rendered in two categories: "qualified" and "potentially not qualified". "Potentially not qualified" determinations were referred to an LP&L Review Board comprised of senior LP&L QA personnel. The Review Board determinations were further reviewed by a consultant very familiar with inspector qualification and related standards. This process resulted in a final determination for all QA/QC personnel as either "qualified", or "unqualified".

The qualification review process is described in QASP 19.12 and QAI-32. The following points further clarify the process:

1. The meaning of the term "unqualified" must be amplified. In some cases determinations were made that, based on verified data, individuals' backgrounds did not warrant qualification to ANSI N45.2.6-1973. In other cases, however, individuals were considered "unqualified" as an expedient in reaching resolution to the concern. This occurred in cases in which:

   a. Research of records, inquiries to past employers and employees contact with schools and verification of training received was either not possible or could not be concluded in a reasonable period of time.

b. Apparent discrepancies existed between background information provided by some individuals and that obtained in the verification process, and resolution could not be achieved on a timely basis. Minor discrepancies were excused; however, significant discrepancies generally rendered any other significant but unverified data as suspect.

2. In the process used, being judged as "unqualified" to ANSI N45.2.6-1973 did not automatically render the individual's work as invalid. For example, an individual may not have the education and experience qualifications for all inspection work, yet be fully competent through specific training to perform the particular tasks assigned to him, which might have been very simple and repetitive in nature. Such an individual potentially satisfies ANSI requirements, which ultimately require that an individual's qualifications be sufficient to provide reasonable assurance that the individual can competently perform a particular task. Whether or not the individual is technically qualified, the individual's work can be deemed valid.

3. During the construction period, GEO made undocumented judgements with respect to the need for eye examinations for inspection personnel. Such judgements were based on the level of visual acuity or color perception required to achieve competent inspections. Such judgements were also made as part of the verification program and disposition process and will be documented. It is noted that such judgements are specifically suggested in ANSI N45.2.6-1978. This factor was not deemed disqualifying.

4. Some individuals were classified as inspectors but performed no safety related inspections and were otherwise not involved in quality related work. To the extent such individuals were identified, they were excluded from the overall inspector population.

<u>Disposition of Deficiencies</u>

For those individuals found "unqualified" the LP&L review board initiated Corrective Action Request (CAR) EQA84-21S1 to formally disposition the identified deficiencies. Ebasco NCR-W3-6497 has been reopened and when reclosed, will reflect the disposition of that CAR .

Disposition of CAR EQA84-21S1 was accomplished by 3 methods as follows:

1) <u>Assessment of Key CMT tests and of skills required to perform these tests.</u>

The key tests were as follows:

a) <u>Concrete</u> - The most important test is the final cylinder break test as this test serves to confirm the strength of the concrete actually placed in the structure. Other tests on concrete are generally either performed as measures to avoid subsequent replacement of sub-specification concrete or were performed in collecting the concrete for and preparing of the test cylinders. The break test requires minimal skill in setting up and starting a compression device which compresses a pre-molded cylinder to failure. A large gauge records the force required which is easily translated into the data required.

Further confidence in the quality of the as-built material is provided by the fact that improper operator action would tend to degrade test results, i.e., improper testing would cause the concrete to appear less strong than it actually is.

b) Soils - The most important test is the field density test as it measures whether the backfill material has been compacted to specific requirements. The field portion of the work, which was performed by the technician, consisted of digging a small hole and placing the removed soil in an airtight container, positioning a rubber balloon apparatus over the hole, inflating the balloon to a predetermined pressure and reading a volume indicator scale.

Further, confidence in the quality of the as-built material is provided by the quantity of tests conducted. As stated in the engineering report supporting the response to issue 7, to insure control of backfill placement approximately three times as many field density tests were conducted as required by the technical specifications.

c) Cadwelds - There was only one type of test on cadwelds conducted by GEO-CMT and that was the break test. This test is as simple as the concrete break test. The test specimens are secured in a tension device, tension is applied and the failure strength is read from a gauge and recorded.

It has been determined that only minimal training would be required for an unskilled individual to become proficient in performing the above tests. A single demonstration coupled with minimal practice under proper supervision is sufficient. GEO has formally confirmed that "Prior to being assigned to production work, all personnel were trained to perform the work required." On the basis of the above, though not strictly qualified to ANSI N45.2.6-1973, individuals could be considered competent to perform the technician or data collection type functions described.

2) Quality of Testing Performed by Personnel in Question

A detailed analysis was conducted of inspection/testing performed by a large sample of Level I personnel in question. This sample is felt to include the most significant exposure in terms of potential for inferior inspection/testing. Level II and III personnel either performing or directly supervising the performance of the tests described above should be competent to perform such functions.

3) Engineering Evaluation

A statistical analysis was conducted, using industry standard techniques, to evaluate test results for concrete and the class A backfill (Reference 3). In the case of concrete both the overall and within-test coefficients of variation demonstrated excellent control of the product which would not be the case had the tests not been well conducted. Backfill test results also demonstrate good consistency. A review of cadweld data and test results described in Issue 11 indicates reliability of the test data and confirms the adequacy of the cadweld testing. This evaluation verifies the overall adequacy of the work of all levels, Levels (I, II and III) of GEO-CMT QC personnel.

CAUSE:

Implementation of ANSI N45.2.6-1973 allows substitution for education and experience levels by noting that "... education and experience requirements specified for the various levels should not be treated as absolute when other factors provide reasonable assurance that a person can competently perform a particular task." GEO and its predecessor organizations issued certifications of qualifications for testing personnel under successive programs which employed such substitutions and which became more detailed and better documented with time. The program in place since 1978 generally parallels the ANSI Standard for inspector certification. However, the verification program revealed that verification of background data was not adequate or documented, documentation of the justification for substitution of other factors for the requisite degree of training, education or experience was sometimes not provided, lacked depth, was not totally in accord with contractor procedures or the ANSI standard, as currently interpreted.

GENERIC IMPLICATIONS:

This issue has been treated generically. The scope of the verification program included 100% of the QA/QC personnel of all site contractors who may have performed safety-related work, including GEO CMT personnel.

With regard to future work, qualification and certification of inspectors (including NDE personnel) will be administered through strict compliance with LP&L Nuclear Operations Procedures which meet the requirements of Regulatory Guide 1.58 Rev. 1 (ANSI N45.2.6-1978) and SNT-TC-1A-1975, as applicable.

SAFETY SIGNIFICANCE:

The results of the verification program and evaluation of the work performed by "unqualified" GEO CMT personnel provides reasonable assurance that the related installations will perform satisfactorily in service. There is no recognized reason that this issue should constrain fuel load or power operation.

CORRECTIVE ACTION PLAN/SCHEDULE:

On the basis of Reference 3, CAR EQA84-21S1 has been dispositioned.

REFERENCES:

1. QASP 19.12, Review of Contractor QA/QC Personnel Qualification Verification
2. QAI-32, Instructions for Verification of QA/QC Personnel Qualifications
3. Engineering Evaluation of Report on the Review and Analysis of the work of GEO - Construction Material Testing.

ITEM: COLLECTIVE SIGNIFICANCE (REVISION 1)

PURPOSE:

In response to the twenty-three issues identified in the NRC letter of June 13, 1984, LP&L has provided the NRC with a program plan describing the ongoing activities to resolve the NRC's concerns. The twenty-three responses developed in accordance with that program plan have addressed the specific NRC concerns. As part of that effort, the findings of each issue were evaluated to determine the "cause" and "generic implications". That evaluation process was conducted in a manner that allowed commonalities between the various issues to be considered and factored into the generic implications of one or more issues, where appropriate.

The purpose of this assessment of collective significance is to evaluate the overall significance of the findings from the twenty-three evaluations to achieve the following objectives:

- Identify and assess the significance to safety and to the construction program of the findings from the evaluations of the twenty-three issues.
- Identify actions that could have prevented occurrence of the twenty-three issues and thereby identify the lessons learned which, if implemented, would provide reasonable assurance that such deficiencies would be precluded from occurring in the future.
- Review the LP&L operational phase Quality Assurance Program to determine whether the lessons learned are reflected in the Program or whether additional modifications to the Program are warranted.

The conclusions that have been reached in this assessment of collective significance are discussed in the following sections. The principal conclusions are as follows:

- In response to Issue 23, "QA Program Breakdown Between Ebasco and Mercury", LP&L committed to further address areas needing improvement in the QA program in this assessment of the collective significance of the 23 issues. Having completed the assessment, and in consideration of problems related to Mercury in many of the other issues, it is apparent that programmatically the corrective action was not sufficiently thorough. Thus the partial breakdown acknowledged in 1982 with respect to Mercury was not totally corrected. However, overall site performance improved, particularly with respect to the quality of installed hardware, and there was no escalation into an overall breakdown of the QA program.

- The 23 issues have been thoroughly analyzed. The process has involved more than 1000 man-months of effort, exclusive of over 100 man-months expended by the NUS Task Force Support Group. The results, reflecting the general quality of the QA program and of the construction work itself, provide a high degree of confidence that the structures, systems and components as constructed are adequate to protect the public health and safety during operation. Only very limited hardware rework has been undertaken as a result of the twenty-three concerns, and in several cases this rework has been discretionary.

- The lessons learned from the twenty-three concerns provide a reasonable basis to determine whether the operational phase of the Quality Assurance Program adequately addresses the problems which occurred during construction.

- The assessment of the operational phase Quality Assurance Program has provided reasonable assurance that the program is adequate to preclude similar problems.

This process, though extensive, clearly has been valuable to LP&L. The process has identified areas for improvement in the LP&L QA program and has reconfirmed the safety of the as-built plant.

This discussion of collective significance is divided into the following three parts:

1. Assessment of Construction Program and Safety Significance
2. Identification of Lessons Learned
3. Operational Phase QA Program Assessment

ASSESSMENT OF CONSTRUCTION PROGRAM AND SAFETY SIGNIFICANCE

To assess the safety significance of the 23 issues to the as-built plant, the issues have been categorized according to the effort needed to resolve the concern (See Table 1). Four categories have been created as follows:

- Mercury: Those issues involving resolution of work within the scope of Mercury's effort. With the exception of Issue 23, all are also discussed in the following three categories.

- Software: Those issues involving records reviews or limited action such as clarification/correlation of records, engineering evaluation, record analysis, or procedural changes.

- Inspection/Evaluation: Those issues involving reinspections and engineering evaluations for resolution.

- Hardware: Those issues involving physical rework to address the findings.

The significance to the construction program in terms of whether weaknesses have been corrected and the nature of the weakness is treated on a case by case basis.

1. Mercury Work:

Ten of the 23 issues dealt in varying degrees of specificity with the Mercury program. Issue 23 "QA Program Breakdown between Ebasco and Mercury" dealt expressly with the effectiveness of the corrective action program undertaken by LP&L as a result of the problems identified in the Mercury program in 1982. Additional questions as to the effectiveness of the QA review of Mercury work are included in the following NRC concerns:

Issue	Title
1	Inspection Personnel Issues
2	Missing N1 Instrument Line Documentation
3	Instrumentation Expansion Loop Separation
4	Lower Tier Corrective Actions
6	Dispositioning of Nonconformance & Discrepancy Reports
13	Missing NCRs
14	J.A. Jones Speed Letters and EIRs
17	QC Verification of Expansion Anchor Characteristics
22	Welder Qualifications (Mercury) & Filler Material Control (Site Wide)

Analysis of these concerns shows (a) improvement in, but continuing problems with, the control of Mercury efforts during construction, and (b) ultimate success in assuring the adequacy of the work within the Mercury scope.

Improvements in the control of Mercury work are detailed in response to Issue 23. These include a June 1982 LP&L order for Mercury to cease safety related installations until there had been extensive Mercury organizational changes, additional staffing to address quality inspections/reviews, training to provide the guidance/direction needed for quality results, and the establishment of an Ebasco Management team to provide support and management oversight of the Mercury program. Subsequent improvements in control over Mercury included both ongoing administrative and quality program changes, and gradual reductions in the Mercury scope until a full demobilization by November 1983. A review of the post June 1982 work demonstrated a significant improvement in both the quality of installations and the quality of documentation.

Notwithstanding improvements in the Mercury program, problems continued. Most importantly, generic implications of identified problems were not sufficiently addressed. Had they been, many of the problems identified by the NRC would have been identified by LP&L. For example, a significant number of QC inspectors hired by Mercury as part of the 1982 corrective action were apparently not sufficiently qualified to ANSI N45.2.6-1973, and this was not discovered in the QA process. As an indication of the ongoing problem, Mercury did not process NCR-888 to address concerns that QC personnel were not properly qualified. This action could have then resulted in a more effective corrective action to address the Mercury concerns as well as early identification of the issues found in Issues 1, 10 and 20.

While there were continuing problems with control of Mercury, the as-built condition of Mercury work, as determined by LP&L, is adequate to assure the public health and safety. This is demonstrated by reverification and testing activities both as a part of the Mercury corrective action program established in 1982 and as a part of the responses to the twenty three issues. The reverification activities encompass all types of Mercury safety-related work. (See Responses to Issue 1 and Issue 23) As shown in the response to Issue 1, an extensive reinspection of all Nl instrument lines resulted in a small amount of rework, most of which was elective and none of which was significant to safety.

2. Software:

The resolution of six of the twenty-three identified issues was achieved through actions limited to such tasks as reconciliation/ correlation of records, records analysis, records reviews, statistical analysis, engineering analyses, etc. Collectively, the evaluations of these concerns indicate that the past actions to address weaknesses in plant records had shortcomings but that these did not result in problems implying inadequacies in plant hardware.

In responding to Issue 5 "Vendor Documentation - Conditional Releases", a review was performed of the material receiving and control systems as well as other areas with a potential for a similar situation (i.e. concerns noted on Release for Shipment Forms, Ebasco Home Office controlled NCR's, and material received under manufacture, deliver and erect type contracts). It was determined that the problems were limited to the absence of the formal tracking required by existing procedures for conditional certifications in Combustion Engineering documentation packages. There was an undetected violation of procedures but based on a review of CE purchase orders, it was concluded that there would have been no safety consequences if the deficiency had remained uncorrected.

Issues 7 "Backfill Soil Densities" and 11 "Cadwelding" involved analyses of records. For Issue 7, records correlation had not been completed because some were in the Ebasco vaults and some had not yet been obtained from the contractor who, it should be noted, was still onsite and active. The correlation, review and analysis demonstrated that there was good work control, that specification requirements were generally exceeded, and that the backfill was adequate to perform its design function. In Issue 11, the quantity of data did not allow ready analysis to demonstrate the attributes desired. Therefore, LP&L transcribed cadweld data onto computer storage to demonstrate compliance with Regulatory Guide 1.10 and specification sampling frequencies. The review identified three minor discrepancies not identified in the prior NCR and these were evaluated and found to be acceptable.

Issue 8 "Visual Examination of Shop Welds During Hydrostatic Testing", was the result of a checklist that only identified field welds. This concern had been previously identified in June 1983 and dispositioned to demonstrate the adequacy of the visual examination of shop welds and the lack of any safety impact. The review gives no indication of deficiencies.

The records reviews for Issue 13 "Missing NCR's" included site NCR's, Ebasco Home Office NCR's, and Mercury NCR's and demonstrates that, although documentation was not readily available to answer some of the concerns, there was no loss of control over NCR's that would currently imply open questions about the acceptability of installed safety systems. The cause of most of the concerns related to Ebasco NCR's was identified as a change in record keeping in 1979, a temporary practice that allowed NCR numbers to be issued prior to the NCR being written, and the use of a preassigned block of NCR numbers. The review of Mercury NCR's concluded that there was one missing NCR which did not represent an unresolved condition, one superceeded NCR, and three NCR's which had not been processed by Mercury. These three NCR's, one of which is covered by Issue 1, have now been resolved. The cause was Mercury's improper application of their own procedures.

Issue 16 "Surveys and Exit Interviews of QA Personnel" involved an LP&L initiative for obtaining employee feedback on potential safety concerns. The shortcomings of the initial program have been addressed. The exit interview program has been completely restructured and is providing a very useful service in obtaining feedback on individual's concerns. Feedback received prior to the restructuring is being reanalyzed and concerns are being closed through an orderly closure process.

3. <u>Inspection/Evaluation</u>:

Nine of the twenty three issues were resolved by reinspections, engineering evaluation, statistical sampling, or similar efforts but required no changes to the plant hardware. An evaluation of these concerns leads to a conclusion there were weaknesses in plant records but these weaknesses have now been addressed and do not represent a potential hardware deficiency.

Three of the Issues, 1 "Inspection Personnel Issues", 10 "Inspector Qualification - J.A. Jones & Fegles", and 20 "Construction Material Testing (CMT) Personnel Qualification Records" involved a review of professional credential and education/employment checks on 100% of the site QA/QC personnel involved in safety related activities. In this review, QA/QC personnel have been classified using conservative and standardized acceptance criteria as "qualified" and "unqualified". These classifications were reviewed and finalized by an LP&L Review Board of senior QA personnel with the assistance of contractor and consultant support. For "unqualified" inspector personnel, Corrective Action Requests were written to formally track and disposition potential deficiencies. For Mercury, substantial reinspection was initiated, particularly for the Ni tubing installation, and rework is covered in the next section. For most contractors reviewed under Issues 1 and 10, the disposition of deficiencies has not required reinspection. In the case of Issue 20, an engineering evaluation of the work of CMT personnel has established that questions about personnel qualifications have not rendered the work indeterminate. There have been many other methods (e.g. ANI, NDE, prerequisite preoperations/ integrated testing, overinspections, etc.) which provide assurance that quality has been built into the plant. There have been no safety significant hardware changes found and this provides positive evidence as to the adequacy of the overall construction program.

Issue 4, "Lower Tier Corrective Actions Are Not Being Upgraded to NCR's" required an extensive effort to review document packages, based on a statistical sample, to ascertain whether they had been properly upgraded to NCRs, whether the disposition was adequate, and whether proper reporting per 10CFR50.55(e) and 10CFR21 had occurred. The review identified minor weaknesses in the construction program in following procedural criteria for lower tier documents with regard to voiding and upgrading to NCR's. While it does indicate a deficiency in the construction program, it does not indicate that there was a loss of control over non-conforming materials, parts, or components. This conclusion is supported by the results of a statistically justified sampling program.

The resolution of Issue 9 "Welder Certification" identified adequate welder certification but found that the records for seven instrument cabinets were incomplete or missing. The adequacy of the welding performed by J.A. Jones has been reviewed. In cases where welding deficiencies were identified, the welds were dispositioned to be acceptable as is. The missing or incomplete documentation identifies a loss of control in records management but the acceptable dispositioning of the welds and the results of the complete review of the J.A. Jones welding scope demonstrates the overall adequacy of the J.A. Jones welding.

A sampling program of the information request documentation used by contractors was undertaken in order to resolve Issue 14 "J.A. Jones Speed Letters and EIRs". In the case of approximately one third of the contractors, instances were identified where design changes were made by information requests without appropriate documentation. This was determined by taking a minimum 10% random sample of each contractors information requests (for fifty or less such documents, there was a total review) and expanding that sample by 10% increments wherever there was a violation of design control. Approximately 5% of the total IR's evaluated (approximately 6000) involved design control but no rework was required except for that being conducted within the scope of SCD-78 (American Bridge Welding Deficiencies). It was concluded that the lack of control exercised over these contractors was a deficiency in controlling records in accordance with the construction program procedures. There are no remaining open issues.

The response to Issue 17 "QC Verification of Expansion Anchor Characteristics" recognizes a shortcoming in not specifically delineating all characteristics on an inspection checklist although the necessary characteristics were listed elsewhere. The expansion anchors were the subject of several different corrective action programs as part of the overall effort to verify the adequacy of Mercury's work. These corrective actions previously addressed the NRC concern except for several technical questions which have been resolved. A 100% reinspection of Mercury N! instrument installations has been completed and provides further evidence of expansion anchor adequacy. The shortcomings in the original inspection checklist are considered a procedural deficiency in the construction program, but a current lack of safety significance was demonstrated.

Issue 18 "Documentation of Walkdowns of Non-Safety Related Equipment" resulted from the documentation by exception practices used during previous plant "two over one" walkdowns. To resolve this concern, a detailed reinspection under a formal engineering procedure was performed of the instrument air system and two plant areas to provide additional confidence in the original design and walkdowns. This reinspection found no deficiencies and supported a conclusion that the construction program was adequate and there are no unresolved safety deficiencies.

The resolution of Issue 21 "LP&L QA Construction System Status and Transfer Reviews" involved demonstrating adequate control of comments and open items in the system transfer and testing process. As a result of extensive efforts on this matter, including confirmatory field verification of three items, it was determined that no significant comments or open items were untracked and that there was no impact on testing or system operation.

There were two separate issues in Issue 22 "Welder Qualification (Mercury) and Filler Material Control (Site wide)". The first, welder qualifications, was resolved by a thorough review of welder documentation and welder qualification. No significant deficiencies were identified and those minor deficiencies identified were properly dispositioned. Concerns over weld filler metal controls were addressed by a review which showed site practices to be unclear with regard to ambiguities between various code requirements. Further, justification of several past corrective actions was provided where there had been deviations from the site procedure. In both cases, the evaluation demonstrated that, although there were deficiencies in procedural clarity and the control of site practices, no unresolved safety issues exist.

4. Hardware:

Seven of the twenty-three issues involved hardware changes in addition to inspections, evaluations or other software activities to resolve the concerns. A review of these concerns has shown that, if left uncorrected, two of the reworked items presented a potential safety concern. Of these two, one was related to rework on a three foot section of tubing and the second represented a case where the safety significance was not determined. It has been concluded that while construction program deficiencies existed these did not warrant an implication that the corrective action system as currently implemented was inadequate to provide assurance that the plant is safely constructed.

The NI instrumentation walkdown initiated in response to Issue 1, "Inspection Personnel Issues" has identified deficiencies that, if left uncorrected, would not have effected the safety of plant operations. The conclusions on Mercury correction actions were discussed earlier.

A lack of documentation consistent with 10CFR50 Appendix B requirements for local mounted instruments installed to ANSI B31.1 was evaluated in Issue 2 "Missing N1 Instrument Line Documentation". In responding to the concern, 18 installations were identified as having documentation insufficient to meet the objective requirements of Appendix B. Based on documentation reviewed, the as-built installations were considered capable of performing their intended functions. Nevertheless, a decision was made to rework the installations to standardize compliance with ASME code requirements. This records deficiency in the construction program was found to have resulted in no safety significant deficiencies. The rework was performed as part of a conservative corrective action.

Issue 3 "Instrumentation Expansion Loop Separation" identified a procedural implementation deficiency in the construction program occurring when insufficient attention was given by Mercury personnel to specified installation separation criteria. Reinspections of those installations identified by the NRC as well as installations where tubing lines were run in proximity to each other resulted in the identification of additional deviations to the separation criteria. With the exception of one-three foot section of tube track all were found acceptable "as-is". The necessary rework has been completed. It was concluded that this was a deficiency in the Mercury corrective action but was of limited safety significance because of the isolated nature of the rework.

Issue 6 "Dispositioning of Nonconformance and Discrepancy Reports" identified specific Ebasco and Mercury NCRs and Ebasco DRs in which the NRC had concerns relative to dispositioning, lack of supporting documentation, accomplishment of related rework and sufficiency of engineering justification of dispositions. A review of these Waterford 3 records was conducted and no condition was found which, were it to have remained uncorrected would have adversely affected the safety of operations of Waterford 3. LP&L had previously initiated a program in February 1984 to address Ebasco NCRs. This program was expanded to encompass the NRC request and is nearly complete. While some discrepancies were noted and several reinspections performed, rework was performed in only a few cases.

The most significant amount of rework occurred as a result of the findings in Issue 12 "Main Steamline Framing Restraints". In this case it was found that additional rework was identified from the review of American Bridge information requests and the incomplete scoping for open Significant Construction Deficiency 78. Rework was required to replace the framing bolts where documentation was not available and bolt identification could not be readily verified. Upon identification of the concern a conservative management decision was made to replace the bolts in lieu of attempting to test or sample test the bolts in question to determine their usability. Thus no determination was made regarding the safety significance of the existing condition. A rescoping of other significant open SCD's has been conducted to address potential concerns related to scoping practices. Deficiencies were corrected and no further safety concerns remain in this area.

Issue 15 "Welding of "D" Level Material Inside Containment" resulted in a reinspection of the most significant "D" level welds. The findings identify a deficiency in the construction program because no record keeping requirements were specified in the CB&I QA program for these type welds. The reinspection of welds identified weld deficiencies that were evaluated to be acceptable "as is" and a number of arc strikes that required rework (grinding) to demonstrate that no damage to base metal had occurred. It was concluded that the construction program weakness created no significant safety concerns and raised no unresolved implications with regard to the adequacy of the "as-built" plant.

Issue 19 "Water In Basemat Instrumentation Conduit" was evaluated by a walkdown to identify areas of seepage and potential direct paths for ground water. As a result of this walkdown a piezometer standpipe will be pressure grouted prior to fuel load to limit further seepage. This rework was identified even though the evaluation showed that there was no potential for flooding the auxiliary basemat. It was concluded that no construction program deficiencies or safety concerns exist.

4. Conclusions:

The twenty three issues have been assessed and corrective actions have been or are being taken to correct deficiencies found. The safety significance of ongoing activities and completed activities is being assessed for each of the plant systems required by technical specifications to be operable during the various operational modes. Those safety evaluations needed to support any phase of operation will be a prerequisite to LP&L requests for a license to operate in that phase.

The responses to the 23 issues, when assessed together, lead to two generic conclusions: (a) The QA program during the construction phase continued to have shortcomings, but with current corrective action the objectives and criteria of the construction program have now been met. The deficiencies fell primarily into the categories of records management and control of corrective actions. (b) The overall adequacy of the plant in the areas of the 23 issues is confirmed by the extensive re-evaluations and reinspections conducted in response to the 23 issues and by the minimal rework required as a result of the concerns. The plant as-built can be operated without undue risk to public health and safety.

IDENTIFICATION OF LESSONS LEARNED

Lessons learned were developed from the twenty-three issues for the purpose of evaluating the ability of the operational phase Quality Assurance Program to preclude the mistakes made during construction. These lessons learned are intended to define the types of actions which could have been taken to avoid the safety impacts that were identified. Table 2 presents the lessons learned as well as a brief description of the manner in which the operational phase Quality Assurance Program addresses the lessons learned. This approach allows definition of the actions needed to anticipate problems. The need to identify emerging QC problems in a timely manner and to take effective and timely corrective actions is also recognized. The next section provides a more complete description of the operational phase QA program to supplement the lessons learned table and to describe the management oversight, trending and corrective action programs that allow for prompt identification and action on problems.

TABLE 1
ACTIVITIES REQUIRED TO RESOLVE THE TWENTY THREE ISSUES

Concern	Software	Inspection/ Evaluation	Hardware (1)
1			D
2			D
3			L
4		X	
5	X		
6			D
7	X		
8	X		
9		X	
10		X	
11	X		
12			PS
13	X		
14		X	
15			D
16	X		
17		X	
18		X	
19			D
20		X	
21		X	
22		X	

NOTES:

(1) The safety significance of the hardware impacts has been indicated by a "D" where hardware changes were discretionary or in accordance with good practices, a "PS" where the safety significance was not fully evaluated, and an "L" where there was safety significance if left uncorrected but the significance was limited because of the isolated nature or limited extent of the deficiency.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

Issue	PAST Actions Which Could Have Prevented Occurrence (Lessons Learned)	FUTURE Reflection in Operational QA Program
1	This concern could have been avoided if a uniform and conservative standard had been imposed for judging QA/QC personnel qualifications and for documentation of those qualifications.	During the operations phase, LP&L and contractor inspection personnel will be certified to ANSI N45.2.6-1978 and Regulatory Guide 1.58 Rev. 1. Prior to certification a background investigation must be satisfactorily completed documenting a candidate's education and employment experience as described in Section II.D.
2	Recognize that quality records required by 10CFR50 Appendix B sometimes exceed the record keeping requirements of industry codes. The concern could have been avoided if the contractors had been required to supply the proper documentation.	Documentation (objective evidence of acceptance) requirements during normal operations are defined in drawings, specifications, and procedures. Review of specified documentation requirements associated with station modifications is an integral part of the operations phase design process. This review assures the appropriateness and completeness of required documentation. The Station Modification process is described in Section II.H.
3	This concern, which dealt with field run installations, could have been avoided by increased training of design/installation/inspection personnel in order to increase their understanding of generic criteria and their ability to recognize deficiencies.	Under the operations phase QA Program field run items will be minimized and controlled by procedure. The Station Modification Package (SMP) process includes a checklist of generic criteria to be addressed. Additionally, the Detailed Construction Package will contain necessary acceptance criteria to direct the installer and inspector (see Section II.H).
4	The basic causes of this concern (which are not felt to be unique to Waterford 3) relate to the large number of specialty type quality contractors employed during the construction phase, coupled with inherent design/construction interface problems associated with parallel design and construction. The problems in this issue accruing from the above situation could have been avoided had a more definitive and standardized quality deficiency program been developed and implemented.	During the operations phase a uniform program for quality deficiency identification and resolution will be employed. The Condition Identification and Work Authorization (CIWA) will be the primary means of identification and implementation of corrective action at Waterford 3. The quality deficiency mechanisms utilized by LP&L are described in detail in Sections II.B.1.a-e.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

Issue	PAST Actions Which Could Have Prevented Occurrence (Lessons Learned)	FUTURE Reflection In Operational QA Program
5	The concern could have been avoided if it had been recognized that while CE handled certifications differently than other vendors that did not eliminate the requirement to track conditional certifications in order to ensure closure.	Any quality related material received on site with conditional certification is tracked in accordance with the procedures for Discrepancy Notices as described in Section II.B.1.b.
6	a. Some of the concerns could have been avoided by recognizing the need to have a more uniform process (LP&L, Ebasco, and contractors) for the disposition and resolution of deficiencies.	a. Under the operations phase QA Program, in order to provide standardization, hardware deficiencies will be identified through use of the LP&L CIWA (plant identified) or DN (receipt inspection identified) as noted in Section II.G.3.
	b. Some of the concerns could have been avoided by establishment of a routine process for additional verification (including field verification) of the resolution to assess the adequacy of dispositions and corrective actions. More emphasis should have been placed on a QA management overview designed to distinguish generic trends and root causes of deficiencies from isolated significant occurrences or repetitious occurrences of less significance.	b. All quality related deficiencies identified during the operations phase undergo verification review of the corrective action and disposition prior to closing out the deficiency. The deficiency identification and resolution mechanisms are described in detail in Sections II.B.1.a-f. As part of the semi-annual audit of the corrective action process, the QA Program will include a field verification audit of the CIWA closure process. In addition, Operations QA utilizes a QA Trending Programs to identify adverse quality trends and generic quality problems as described in Section II.B.1.a.
	c. Given the need for more consistent engineering judgement, some concerns could have been avoided by the use in training of specific disposition of past problems.	c. During the operations phase, the Quality Assurance Section holds monthly training sessions. Lessons learned or corrective actions as a result of quality deficiencies or undesirable programmatic trends identified at Waterford 3 will be reviewed during these sessions as described in Section II.E.2. Additionally, the QA Section will prepare, for distribution to plant staff performing quality related work, similar briefing materials as a feedback mechanism for current quality concerns.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

Issue	PAST Actions Which Could Have Prevented Occurrence (Lessons Learned)	FUTURE Reflection in Operational QA Program
	d. Recognize the need for ready retrieval/control of records. This would be assisted by processing records as the work is completed through all required reviews, resolutions of comments, and necessary verification and then vaulting the records. This approach would have avoided some of the concerns that arose because of records retrievability.	d. Records are processed upon completion of the activity and verified complete by cognizant supervisory personnel. All Quality records during the operations phase are maintained by LP&L's Project Files. Documents are stored and cross-indexed to facilitate timely retrieval. Records management is further described in Section II.I. The current programs of record management at Waterford 3 are under review by LP&L management to ensure proper discipline and optimum utility exists. This review is expected to be complete, and any necessary programmatic changes will be initiated by November 30, 1984.
7	This concern could have been avoided if, as work was completed, records were retrieved from the contractor, processed through the required reviews, any necessary verification completed and then vaulted.	Records are processed upon completion of the activity and verified complete by cognizant supervisory personnel. Quality records during the operations phase are maintained by LP&L's Project Files. Records management is further described in Section II.I.
8	Shop welds, the subject of this concern, were hydrostatically tested and inspected and, therefore, no deficiency exists.	N/A
9	This concern could have been avoided if, as work was completed, records were verified as complete against the scope of work.	During the operations phase, any change in scope of the contractor's responsibilities would initiate an LP&L review of the applicable portions of the contractor's QA program similarly to what is required for a new contract. Such review would include document generation requirements. Section II.G further discusses the review of contractor QA programs.
10	This concern could have been avoided if a uniform and conservative standard had been imposed for judging QA/QC personnel qualifications and for documentation of those qualifications.	During the operations phase, LP&L and contractor inspection personnel will be certified to ANSI N45.2.6-1978 and Regulatory Guide 1.58 Rev. 1. Prior to certification a background investigation must be satisfactorily completed documenting a candidate's education and employment experience as described in Section II.D.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

	PAST	FUTURE
Issue	Actions Which Could Have Prevented Occurrence (Lessons Learned)	Reflection in Operational QA Program
11	This concern could have been avoided if, in addition to in-process analysis conducted, a means to track the completion and correlation of data/records needed to verify compliance with specifications had been implemented.	This concern relates to bulk construction and is not applicable to the operations phase.
12	This concern could have been avoided if it had been recognized that scoping of complex corrective actions (e.g. multiple contractors, complex drawings, and construction interferences) required commensurate care in assuring that the scoping of the corrective action is accurate and tracked to assure completion.	Multiple levels of pre- and post- implementation review of corrective actions occur during the operations phase. Corrective action must be implemented and tracked through one of the deficiency identification mechanisms described in Sections II.B.1.a-e. Broad scope and complex corrective actions will be cause for development of a Special Procedure as described in OP-005-001, "Instructions, Procedures and Drawings", in order to control scoping and interfaces, and to establish a tracking mechanism to ensure completion and closure.
13	Some concerns could have been avoided through the use of a rigidly controlled tracking system to control special purpose hardware deficiency documents that have characteristics such as: multiple interfaces; require tracking during processing; and/or are needed to control quality related questions in a timely manner.	The operations phase QA Program provides for different means from the construction phase to identify, track, and resolve quality problems. The quality deficiency identification mechanisms, all of which provide for a controlled tracking system, are discussed in Sections II.B.1.a-e.
14	This concern could have been avoided if procedures regarding information requests had been standardized and controlled. The procedures should have been the subject of training to ensure a proper understanding and awareness of the procedure and limitations of the IR instrument. Audits could have been more comprehensive to assure that the program and procedures were being properly followed.	Plant modifications during the operations phase are accomplished through the Station Modification Program (SMP) described in Section II.H. Work is directed by the Detailed Construction Package (DCP) assembled under the Program. For cases where work cannot be done in accordance with the DCP, changes may be allowed only upon approval of a change to the Station Modification Package or, for minor changes, through approval of a Detailed Construction Package Change (DCPC). All work documentation, including DCPCs, is included in the CIWA post implementation review described in Section II.B.1.a, as well as the SMP closure review described in Section II.H.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

Issue	PAST Actions Which Could Have Prevented Occurrence (Lessons Learned)	FUTURE Reflection in Operational QA Program
15	The concern could have been avoided if contractors had been required to ensure adequate inspection documentation for Seismic Category I work outside the ASME Code jurisdictional boundaries.	Documentation (objective evidence of acceptance) requirements during normal operations are well defined in drawings, specifications and procedures. Review of specified documentation requirements associated with station modifications is an integral part of the operations phase design process. This review assures the appropriateness and completeness of required documentation. The Station Modification process is described in Section II.H.
16	This concern could have been avoided if the program had been auditable, if more formal training had been provided to the interviewers, and if more detailed followup had occurred.	The LP&L Quality Team has been constituted to allow any individual to express quality concerns on a confidential basis, and be assured of: (1) investigation of the concern, (2) substantiation of the concerns and (3) correction of the concern. The Quality Team program is described in detail in Section II.A.11.
17	The concern might have been avoided if, during the preparation of construction/inspection procedures, more care was taken to explicitly list the characteristics necessary to ensure proper verification of installation in the inspection sections and checklists.	The FSAR and the LP&L QA Manual require that inspection procedures, instructions and checklists contain acceptance and rejection criteria. Prior to implementation, there is an appropriate review to assure that necessary acceptance criteria are adequately transposed from the design disclosure documents to the inspection procedures, instructions and checklists.
18	The two-over-one problems uncovered in the previous inspections were documented on an exception basis. The concern over the adequacy of those inspections could have been avoided by a requirement to ensure adequate and more auditable documentation of the inspections.	Under the operations phase QA Program the Station Modification Package process includes a checklist of all generic criteria to be addressed during the design and verification stage. This process is described in Section II.H.
19	There is no path for groundwater to flow in sufficient quantity to flood the auxiliary building basement and, therefore, no deficiency exists.	N/A

TABLE 2
OPERATIONAL READINESS ASSESSMENT

Issue	PAST Actions Which Could Have Prevented Occurrence (Lessons Learned)	FUTURE Reflection in Operational QA Program
20	This concern could have been avoided if a uniform and conservative standard had been imposed for judging QA/QC personnel qualifications and for documentation of those qualifications.	During the operations phase, LP&L and contractor inspection personnel will be certified to ANSI N45.2.6-1978 and Regulatory Guide 1.58 Rev. 1. Prior to certification a background investigation must be satisfactorily completed documenting a candidate's education and employment experience as described in Section II.D.
21	During the system transfer and testing process, Waterford 3 had several groups with generally discrete responsibilities for identifying and resolving quality related issues. This resulted in the achievement of optimum hardware quality however full understanding of the day-to-day coordination between those groups of the open items and their status could have been enhanced by better documentation and training on that process.	During the operations phase LP&L will retain control and responsibility for new and existing systems. No system transfer outside of LP&L will occur.
22	a. Concerns could have been avoided if records had readily allowed the hierarchy of welder position and process qualifications to be demonstrated for audits and verification of compliance with requirements.	a. As a result of this issue, LP&L is evaluating the Waterford 3 welding program to identify areas of potential improvement. As part of this evaluation, welder records will be configured to readily allow the hierarchy of welder position and process qualifications to be demonstrated.
	b. Recognizing the need to provide clear justification when there are apparent conflicts with code requirements could have avoided this concern.	b. Deviations from applicable codes and standards may not be taken under the operations phase QA Program unless evaluated in accordance with 10CFR50.59.

TABLE 2
OPERATIONAL READINESS ASSESSMENT

	PAST	FUTURE
Issue	Actions Which Could Have Prevented Occurrence (Lessons Learned)	Reflection in Operational QA Program
23	a. This concern could have been avoided by recognizing that delegation to Ebasco of the routine QA auditing overview of Mercury without adequate LP&L involvement inhibited the timely recognition by LP&L of quality problems.	a. LP&L retains and exercises responsibility for the operational phase QA Program. The QA Program of contractors/vendors performing work for Waterford 3 during the operations phase must meet all applicable requirements of the LP&L QA Program (see Section II.G). The Engineering and Systems Development QA Group conducts audits and surveys of off-site contractors, vendors, and quality related suppliers. The Operations QA and Plant Quality Groups conduct on-site audits and surveillances of quality related activities as described in Sections II.F.1 and II.F.2.
	b. More emphasis should have been placed on a QA management overview designed to distinguish generic problem trends and root causes of audit findings from isolated occurrences.	b. Operations QA utilizes a QA Trending Program to identify adverse quality trends and generic quality problems. This is discussed in detail in Section II.B.2.a. The yearly audits schedule is approved by the full Safety Review Committee (SRC). Operations QA audits are reviewed by an SRC Subcommittee and results reported to the full SRC as described in Section II.A.1.
	c. Staffing levels should have been higher.	c. During the operations phase LP&L retains direct control of its QA Program. This resulted in a significant increase in staffing over that employed by LP&L Construction QA. The current staffing levels of selected Waterford 3 groups including the operations phase QA organization is described in Section II.C.

OPERATIONAL PHASE QA PROGRAM ASSESSMENT

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OPERATIONAL PHASE QA PROGRAM ASSESSMENT

The individual responses and the prior discussions in this analysis of "collective significance" establish that, with respect to the 23 issues, the plant as-built is adequate to assure public health and safety during operation. At the same time, the review identified various areas in which the construction phase QA Program could have been improved. While the construction phase is essentially complete, the operations phase will shortly commence. In this light, it is appropriate to review the Waterford 3 operations phase QA Program with a focus on the lessons learned from the 23 issues.

LP&L has established a comprehensive program for quality assurance during the operating phase of Waterford 3. The Nuclear Operations Quality Assurance Program is applied to activities affecting the quality of those items which prevent or mitigate the consequences of postulated accidents which could cause undue risk to public health and safety. Those activities include plant operation, maintenance, repair, modification and refueling.

The QA Program is described in Chapter 17.2 of the Waterford FSAR and in the Quality Assurance Manual. Section I of this assessment provides an overview of the QA Program, not a detailed discussion. In Section II selected aspects of the QA Program will be covered in detail in counterpoint to the issues raised in the 23 NRC concerns.

I. QA Program Overview

A. Organization

LP&L retains and exercises responsibility for the QA Program at Waterford 3. The Senior Vice President Nuclear Operations, who reports to the President of LP&L, is responsible for defining quality assurance policy. Reporting to him are the Plant Manager-Nuclear, Nuclear Services Manager, Project Manager-Nuclear, Corporate Quality Assurance Manager, and the Safety Review Committee (the members of which are appointed by the Senior Vice President Nuclear Operations). The corporate organization for implementation of the QA Program is shown in Figure 17.2-1 of the FSAR.

While quality is a concern of all Nuclear Operations personnel, the Quality Assurance and Plant Quality Groups within Nuclear Operations deserve special mention. The Quality Assurance (QA) organization is responsible for developing, coordinating, and assuring implementation of the LP&L QA Program. Although most quality related activities are performed by personnel outside the QA organization, an overview of the performance of these activities relative to QA Program compliance is accomplished by QA personnel through reviews and audits.

QA is divided into two groups. The Engineering and Systems Development QA Group conducts surveys and audits of contractors and vendors, maintains the Qualified Suppliers List, reviews procurement packages, and conducts surveillance of quality related suppliers. The Nuclear Operations QA Group assures that the QA Program at the site is being effectively implemented.

Operations QA is a relatively new organization. It became a functional quality management tool with its first audit in January, 1982 of the system turnover process. In fact, it was as a direct result of this audit that the problem with Mercury (Issue #23) was first identified and reported to the NRC. Its responsibilities include the audit, monitoring, review and quality trending programs for Waterford 3.

The Plant Quality Department reports to the Plant Manager-Nuclear. This Department has direct responsibility to implement the requirements of the QA Program related to onsite-initiated activities including review, inspection, verification and surveillance requirements

B. QA Program Scope

As described in the LP&L QA Manual, the QA Program is applied to all quality related areas of plant operation. For safety-related items, all applicable portions of the QA Program (i.e. Appendix B) criteria are applied. The QA Manual also provides a separate section of Special Scope QA Policies, defining application of selected 10CFR50 Appendix B criteria as necessary. Currently, such areas as fire protection, radiological environmental monitoring, the Availability Improvement Program, computer software, radiation protection and emergency preparedness are covered as special scope policies. Special scope policies will be issued to cover additional areas such as security and radioactive waste management.

C. Quality Training

Training is fundamental to quality. As a result, indoctrination and training programs are established for Nuclear Operations personnel performing quality related activities. The programs are designed to ensure that personnel are knowledgeable in quality assurance procedures/requirements and have the necessary proficiency to implement the requirements. The Quality Assurance Section assists with the development and conduct of quality assurance indoctrination and training with the Corporate Quality Assurance Manager reviewing and concurring with the program content.

D. Inspection/Audits

Monitoring of quality program implementation is performed through inspection and surveillances during operation, maintenance, modification, repair, material receiving, and storage activities. Maintenance and modification instruction, and work plans are reviewed by Plant Quality personnel to assure the inclusion of inspection requirements and to verify that methods and acceptance criteria are defined. Inspections are performed by qualified Plant Quality personnel. For quality related activities (e.g. surveillance testing) where direct inspection is not utilized, the Plant Quality Group surveil the activities in accordance with established procedures.

Audits are conducted by the Quality Assurance Section to provide a comprehensive independent verification and evaluation of quality related procedures and activities. Additional audits are performed as required to verify and evaluate supplier and contractor Quality Assurance Programs, procedures, activities, and interface controls.

E. Corrective Action Implementation and Verification

For deficiencies identified by plant staff or identified during the inspection/audit process, multiple means exist to implement corrective action. For each means of deficiency identification there exists a process to implement, track, and verify as complete the appropriate corrective action. Furthermore, through various trending programs the generic significance of individual deficiencies taken as a whole is identified, assessed and corrective action implemented. Such trending programs exist for the areas of programmatic, systematic and hardware deficiencies.

II. Selected Aspects of the Operations QA Program

The 23 NRC issues have dealt with possible quality problems during the construction phase of Waterford 3. During the review of these issues LP&L has identified various lessons learned that, in retrospect, would have led to changes in the construction QA Program. It is natural, therefore, to examine the operational phase QA Program for Waterford 3 in light of the construction phase lessons learned. The discussions which follow are intended to amplify on selected aspects of the operational phase QA Program which reflect incorporation of the major lessons learned from the construction phase. It should be noted that the Operations QA Program was developed independently of the construction QA Program in order to meet the needs of an operating plant. With minor exceptions, the Operations QA Program was not changed as a result of the lessons learned from the 23 NRC concerns, but rather anticipated and already encompassed those areas of concern.

The following discussions are divided into nine major areas:

A. Management Oversight
B. Quality Deficiency Identification and Resolution
C. Staffing
D. Certification of Inspection Personnel
E. Quality Assurance Indoctrination and Training
F. Audit/Review Programs
G. Control of Contractor Quality-Related Activities
H. Station Modification Program
I. Records

A. Management Oversight

Maintaining a high level of quality at an operating nuclear power plant requires continuous management involvement in the QA Program. LP&L management has structured the operational QA Program to ensure management oversight and control of all aspects of quality at Waterford 3.

The Plant Manager, reporting directly to the Senior Vice President Nuclear Operations, is responsible for the primary implementation of quality related measures during the operation activities at Waterford 3. The Senior Vice President Nuclear Operations, the Plant Manager, and other utility executives employ a number of management tools to implement and validate the operational QA Program.

1. Safety Review Committee

The Waterford 3 Safety Review Committee (SRC), of which the Plant Manager is a member, reports directly to the Senior Vice President Nuclear Operations through monthly reports of SRC activities. It is primarily responsible for the management level overview of the operation of the Waterford 3 plant to assure that the plant is operated in accordance with the Technical Specifications and to review significant safety issues.

One of the key functions of the SRC is to review the audit program as defined by the plant Technical Specifications. At Waterford 3 the SRC has established a subcommittee responsible for reviewing all QA audits specified by the Technical Specifications as well as reviewing any special audit or additional audits performed by the QA organization. The SRC Charter requires a minimum of quarterly reviews of the results of the audits performed. As a matter of practice, the audit subcommittee generally has review meetings scheduled concurrent with the monthly meetings of the full SRC. These subcommittee meetings include a review of the results of all audits performed since the last subcommittee meeting. Significant issues raised in these audits are brought to the attention of the full SRC. In addition to reviewing the individual audits and their findings, the subcommittee reviews the schedule of audits as prepared by the Operations QA Group to assure that it is in conformance with the requirements of the Technical Specifications and to ensure that audits are being conducted on a timely basis in accordance with that schedule.

Because the SRC is concerned with an overview of plant operation, and identification and review of significant safety issues, the SRC review of the operational QA audits serves to provide an additional review of root cause, generic implications, and safety significance of the findings in those audits. In addition, the SRC receives regular reports by the Corporate Quality Assurance Manager of significant issues and occurrences in the QA area. The combination of an overview of the QA program and the QA audit findings provides an opportunity to assess the quality of the audits in determining and evaluating QA issues at a management level.

2. Yearly Management Audits of the QA Program

Audits of the Quality Assurance Program are conducted as specified in the QA Manual, Chapter 18.7, and in the FSAR, Section 17.2. These audits are currently scheduled in accordance with QA procedure QASP 18.12.

Management audits are conducted by an independent audit team from the Middle South Services Quality Assurance group. Members of the audit team are qualified to appropriate standards. The review topics cover all activities associated with the administration and execution of LP&L's QA Program. Findings are reported to the Senior Vice-President level and assigned to the appropriate LP&L QA managers for corrective action. Findings are tracked using approved procedures and forms. Audit findings are reviewed for underlying causes to determine corrective action to prevent recurrence. Those deficiencies requiring long term action to correct, or which have the potential for recurrence, are reinspected in follow-on management audits to determine the effectiveness in addressing identified problems.

It is anticipated that the yearly management audit of the QA Program will be an effective management tool in assessing and maintaining the adequacy and effectiveness of the operations phase QA Program.

3. QA Trending Program Quarterly Reports

The Operations QA Group administers a QA Trending Program intended to identify adverse programmatic quality trends and initiate corrective action. While other mechanisms exist to identify and correct individual quality concerns, the QA Trending Program will allow management a tool to identify underlying "common mode" sources of quality deficiencies. The QA Trending Program is described in detail in Section II.B.2.a.

Trend analysis reports will be issued quarterly by the Corporate QA Manager to the Safety Review Committee and the Senior Vice President Nuclear Operations. It is expected that the QA Trending Program will prove a valuable senior management tool for assessing and controlling the level of quality at Waterford 3.

4. Quality Assurance Program Status Summaries

Summaries of QA Program activities at Waterford 3 are provided to the Senior Vice President Nuclear Operations on a weekly and monthly basis.

a) Weekly Report - provides a status as of the last day of the week reviewed for various QA Program subjects of interest which include Audits & Reviews, NRC Site Activities, and QA Training. These reports are posted in all QA office locations.

b) Monthly Report - presented to the Chief Executive Officer and Senior Vice President Nuclear Operations during the monthly Program Review meeting. It provides a summary of site-related QA activities similar to the weekly report and includes statistical studies where applicable.

5. Plant Operations Review Committee

The function of the Plant Operations Review Committee (PORC) is to advise the Plant Manager on all matters related to nuclear safety. In fulfilling this function the PORC reviews, among others, plant procedures that affect the public health and safety, proposed hardware modifications that affect nuclear safety and all reportable events. The PORC provides the Plant Manager, prior to implementation, with written recommendations and 10CFR50.59 safety evaluations with respect to the acceptability of procedural and hardware changes. The minutes of each PORC meeting, documenting the results of all PORC activities performed under the provisions of the Technical Specifications, are provided to the Plant Manager, Senior Vice President Nuclear Operations, and the Safety Review Committee.

6. Quality Inspection Activities Status Reports

The Plant Quality Department will provide quarterly reports to the Plant Manager-Nuclear. Included in the reporting is an analysis of quality trends with respect to deficiencies identified during processing of Discrepancy Notices, Quality Notices, and Plant Quality Department reviews/inspections of CIWAs, procedures and procurement documents. Reporting in this area has recently commenced. The frequency, format, and categories reported in the Quality Inspection Activities Status Reports are expected to change to fulfill the needs of the Plant Manager in detecting adverse trends in quality related activities on site.

7. Licensee Event Reports

LP&L has established a permanent onsite Event Evaluation Committee (EEC) for the purpose of coordinating the evaluation, reporting and closure of corrective actions associated with reportable events described in 10CFR50.73. The EEC is responsible to the Plant Operations Review Committee (PORC) and the Plant Manager.

Any individual identifying a reactor trip, transient, safety related equipment failure or malfunction, radiological event, security event, violation of a technical specification, or other events deemed to be potentially reportable, are responsible for initiating a potential reportable event (PRE) report. Following any necessary immediate corrective actions and/or modifications, the EEC ensures that a prompt, thorough PRE investigation is conducted. During the investigation, the cause of the event is identified and corrective action initiated to prevent recurrence. Generally, corrective action is documented and tracked via one of the deficiency identification mechanisms discussed in Section II.B.1.a-e. In addition to the standard closure verification processes, the EEC independently tracks and confirms adequacy of corrective action.

The EEC provides the PORC with a report of the completed investigation and recommendations. Following PORC review the Plant Manager is responsible for approving disposition of PREs as Licensee Event Reports for transmittal to the NRC.

8. Availability Improvement Program Reports

The Availability Improvement Program (AIP) is currently under development by LP&L for implementation during the operations phase at Waterford 3. Quality related problems, as described later in this submittal, will be periodically reported to senior management. Whereas the QA Trending Program will provide management input as to adverse programmatic trends, the AIP will provide adverse trend information on the system/hardware level.

9. Independent Safety Engineering Group

One of the functions of the Independent Safety Engineering Group (ISEG) is to prepare and conduct independent reviews of plant activities which may result in recommendations to plant staff and corporate management. These recommendations include corrective actions such as procedure revisions, equipment modifications and additional training necessary for improving overall quality assurance and plant safety. Evaluations of plant operations, maintenance and modification are documented through ISEG reports. These reports, as well as any action item resulting from them are logged by the ISEG group for purposes of tracking and resolution. To keep management appraised of ISEG activities, an ISEG Monthly Summary is provided to the Senior Vice President Nuclear Operations and the Engineering and Nuclear Safety Manager listing evaluations performed that month and areas of ongoing review.

10. Operations Assessment and Information Dissemination Group

The Operations Assessment and Information Dissemination Group (OA&ID) is responsible to the Nuclear Safety Supervisor for screening, evaluating, and disseminating operational experience information. A significant management overview function that the OA&ID group will provide is the detailed evaluation of selected LP&L Licensee Event Reports (LERs). This evaluation will explore generic implications or special aspects of the event which are outside the scope of normal LER evaluation and review. Periodic status reports will be provided to management.

11. Quality Team

The LP&L Quality Team offers concerned individuals the opportunity to voice quality concerns on a confidential basis. Reporting directly to the Senior Vice President Nuclear Operations, the Quality Team has been empowered with the authority to conduct investigations of any quality concerns brought to their attention; investigate instances of intimidation and harassment of individuals providing information to the Quality Team; and maintain strict independence and confidentiality. Following preparatory work the Quality Team was staffed and began full operation at the beginning of August, 1984.

The Team acquires quality concern information through the following methods:

a. Local and toll free hotline telephones are established to receive quality concern calls. The numbers are published widely to project personnel. Quality Team personnel man the phones during working hours, while calls are recorded at other times.

b. All personnel terminating employment from Waterford 3 exit through Quality Team headquarters. Personnel are afforded the opportunity to express quality concerns on a confidential basis. Any individuals who terminate employment off site or during other than working hours are sent a letter requesting any quality concerns they may have.

c. All Waterford 3 personnel can "walk in" the Quality Team headquarters at any time to discuss quality concerns.

d. Concerns received by the Quality Team from sources external to Waterford 3 are documented and processed in the same manner as internal concerns.

e. The Quality Team is re-evaluating all interviews conducted prior to the present Team configuration (see NRC Concern #16).

Regardless of how the quality concern was identified, each is addressed in the same manner. An initial review is conducted for reportability and safety significance requiring immediate corrective action. An Investigative Plan, intended to resolve each concern identified, is then developed and a Quality Team investigator assigned for completion. Once the investigative actions are completed and the concern is resolved all documentation is retained as an auditable file. The specific procedural steps are contained in QASP 19.11, "Quality Team Operating Procedure".

Substantiated quality concerns are documented for corrective action and verification on a Quality Team Deficiency Report (QTDR). The QTDR is very similar in form and handling to the Corrective Action Report (CAR) discussed in Section II.B.1.d. The Quality Team reviews the results of implementing the QTDR findings and, where the corrective action is unsatisfactory and/or attempts at resolution have been unacceptable, the Quality Team notifies the Senior Vice President Nuclear Operations by letter requesting resolution and action(s) to prevent recurrence. Final reports for all concerns are directed to the Senior Vice President Nuclear Operations with copies to appropriate senior managers.

The Quality Team is committed to investigate concerns in a manner that focuses on determining root cause and complete implementation of corrective action. To support root cause determination the Quality Team maintains a trending program categorized by type of quality concern (e.g. unqualified personnel, inadequate training) and means of identification (e.g. hotline, "walk-in"). The basic elements of the trending program center around data retrievability and sorting to suit management needs. The key attributes are:

a. Concern categorization and coding
b. Statistical data gathering
c. Evaluation and analysis.

The Senior Vice President Nuclear Operations, and other appropriate senior management, are provided with timely Quality Team information to assist in their assessment of the status of the QA Program. The Quality Team transmits, among others, the following reports:

a. Weekly Status Report of the Quality Team Program Activities
b. Quality Team Monthly Status Report
c. Quality Team Deficiency Trends Status Report (weekly)

B. Quality Deficiency Identification and Resolution

In maintaining and improving quality a comprehensive program must exist to identify and correct quality deficiencies. Two components are important for successful implementation of such a program. First, sufficient means and opportunity should be available to identify and correct individual quality concerns as they occur. Secondly, a capability should exist to assess the identified deficiencies as a whole to determine whether they are isolated occurrences or due to underlying common causes. The LP&L QA Program incorporates provisions for both components of quality deficiency identification.

1. Isolated Quality Deficiencies

LP&L employs a hierarchical system for identification of individual quality deficiencies. At the first level of the hierarchy it is intended that adverse quality conditions will be identified by plant staff using CIWAs (Condition Identification and Work Authorization), DNs (Discrepancy Notices) and QNs (Quality Notices). The second level of detection includes CARs (Corrective Action Request) and AFRs (Audit Finding Reports) issued by the Operations QA Group during monitoring and audits. Finally, at the third level are NRC Inspection Reports.

Upon identification of the quality problem, specific action is necessary for effective resolution: 1) cause is identified either explicitly or as part of the trending program, 2) appropriate corrective action is implemented, 3) a means of tracking the deficiency and corrective action(s) to completion is available, and 4) verification of completion and effectiveness of corrective action is documented. These steps are included for the deficiency identification mechanisms at Waterford 3 and are described in the discussions which follow.

a. CIWAs

PURPOSE: The Condition Identification and Work Authorization (CIWA) is the primary vehicle through which abnormal plant conditions are identified, evaluated and corrected, as well as the means for implementing routine maintenance.

ORIGINATION: If, during the course of inspection, testing or operation, a condition adverse to quality is identified by any Waterford 3 personnel, it is required that a CIWA be generated. Routine maintenance must also be performed via a CIWA.

CORRECTIVE ACTION IMPLEMENTATION: Except in cases requiring immediate attention, corrective maintenance may not commence without a processed CIWA in accordance with UNT-5-002. Any maintenance or adverse quality condition involving the basic power plant is forwarded to the Control Room Supervisor (CRS)/Shift Supervisor (SS) for review. The CIWA is then forwarded to Planning and Scheduling Department (P&S) for evaluation, dispositioning and work planning. CIWAs are evaluated as nonconformances when the adverse quality condition is determined to be a departure from specified requirements and, (1) is not the result of normal wear or, (2) is not a secondary effect due to failure of another component, or (3) is not identified as a routine part of the work process and will be corrected as a continuing part of the work process, or (4) is dispositioned as "repair" or "use-as-is", or (5) is a suspected generic problem. If the CIWA is dispositioned as "repair" or "use-as-is", it must obtain concurrence from Plant Engineering. Plant Engineering performs a technical evaluation in such cases (including a Safety Evaluation, if necessary) to determine cause and corrective action and documents the results on the CIWA. If a design change is necessary, a Station Modification Request number is entered on the CIWA. When the CIWA has been dispositioned, a copy is forwarded to On-Site Licensing for a 10CFR21 evaluation.

The CIWA is then processed as a work package by the appropriate discipline. The CIWA work package is reviewed and approved prior to commencement of work by the responsible Maintenance Supervisor and Plant Quality Group (for quality related work packages) to ensure inclusion of accurate and complete work instructions and/or inspection Hold Points. Subsequent changes which change the scope of work or acceptance criteria are reviewed by the same review organizations.

Upon completion of work, the responsible department Supervisor reviews the work package for completeness and forwards the CIWA work package to P&S for closure on the MTS (Master Tracking System). The MTS identifies all archived and active CIWAs at the plant site. Tight administrative controls are instituted to assure proper input and extraction of data to/from the MTS.

CORRECTIVE ACTION VERIFICATION: Post closure review by the Plant Quality Group and Plant Engineering consists of an overall review of the adequacy of the CIWA and corrective action. All CIWAs identified as Non-Conformance are periodically analyzed by Operations QA for adverse quality trends. The Nuclear Safety Section of the Project Management Department also provides an independent review of non-conformances, dispositions, and close-outs.

b. DNs

PURPOSE: The Discrepancy Notice (DN) is the mechanism through which discrepancies are identified during receipt inspections of quality related parts, material, and components by LP&L Plant Quality personnel at Waterford 3.

ORIGINATION: Upon receipt of quality related items, Stores personnel notify the Plant Quality Group and initiate a Material Receipt Inspection Report. For those items specified in the procurement package as requiring tailored or Special Receipt Instructions, a "Special Receipt Instruction Sheet" will be initiated by Plant Quality personnel. The inspector examines incoming materials in accordance with approved inspection instructions. In the event a discrepancy is identified during the inspection, a DN is issued by Plant Quality which maintains a log and status of all DNs. The DN is also forwarded to Licensing for 10CFR21 evaluation.

CORRECTIVE ACTION IMPLEMENTATION: A "hold tag" is attached to the discrepant item(s) inspected which is then placed in a segregated area. A Material Review Board (MRB) exists to ensure proper disposition of discrepant material. Representatives to the MRB, which is chaired by the Plant Quality Manager, include personnel from Maintenance, Plant Engineering and Purchasing. Upon completion of review and concurrence with the final disposition, members of the MRB sign and date the DN. If the discrepancy can be corrected after installation, the item may be released for installation on a "Conditional Release" (CR) basis subsequent to approval of the "Request for Conditional Release" (RCR). Once the RCR is approved and granted, the CR is sequentially numbered and logged in the CR Log and stated as such on the CR tag and the RCR. The "hold tag" will be removed from the item in exchange for a "CR tag". The original RCR stays with the DN and a copy is attached to the CIWA with special instructions (limitations) for installation. Conditionally released items may not be placed in-service until the DN is satisfactorily closed. Closure of the CR is a pre-condition for closure of the DN. In those cases where a design change was necessary to close the CR, a Plant Engineering representative has joint approval responsibility.

CORRECTIVE ACTION VERIFICATION: The Plant Quality Manager is ultimately responsible for approval of DNs through inspection/reinspection, as applicable. DNs are periodically analyzed by the Operations QA Group for quality trends. The Nuclear Safety Section of the Project Management Department will also provide an independent review of non-conformances (DNs), dispositions, and close-outs.

c. QNs

PURPOSE: Conditions adverse to quality which are due to a lack of, or a breakdown in, administrative controls are documented with a Quality Notice (QN). This document identifies non-conformances indicating a breakdown or substantial departure from required procedures or instructions to the extent that a loss of control is evident.

ORIGINATION: Any Waterford 3 employee may initiate a QN and request a sequential number from Plant Quality who maintains the log and status of each QN. Within 30 days of the identification of a QN, the responsible department is required to report the actions taken or proposed to cover the following:

a) the cause of the condition,
b) correction of the conditions identified,
c) action to prevent recurrence, and
d) schedule of implementation.

CORRECTIVE ACTION VERIFICATION: The Plant Quality Group is responsible for verification of corrective actions committed to in the 30-day response supplied by the affected discipline(s). The Licensing Group reviews QNs for reportability under 10CFR21. QNs are periodically analyzed by the Operations QA Group for quality trends. The Onsite Safety Review Subgroup of the Project Management Department provides an independent review of non-conformances, dispositions and close-outs.

d. CARs

PURPOSE: The purpose of a Corrective Action Request (CAR) is to provide a mechanism through which the Operations QA Group can document deficiencies based on monitoring of plant activities or conditions, and present such findings to the affected Manager for a timely and effective resolution of the concern.

ORIGINATION: A CAR originates as the result of monitoring or observation of a quality affecting activity or condition which could be detrimental to the safe operation of the plant and/or safety of personnel. QA personnel assess the cause and significance of the deficiency to determine if an immediate corrective action is required. Where such a determination is made, a "Stop Work Order" may be initiated, or other steps taken for immediate implementation. The CAR includes a description of the identified deficiency, and a requirement that corrective action, underlying cause and action to preclude recurrence be documented by the responding organization.

CORRECTIVE ACTION IMPLEMENTATION: The delivery date of the CAR to the affected organization is the start of the 30-day period during which the cognizant group must resolve the deficiency, or define steps to be taken to effect resolution and provide a schedule for completion.

CORRECTIVE ACTION VERIFICATION: If the resolution and corrective action are considered acceptable, the QA Representative indicates so on the CAR and recommends approval and closeout of the CAR. The original CAR is given to the applicable QA Supervisor for final approval and filing. If the resolution and corrective action are not considered applicable, the cognizant Group Head will be so informed and a schedule arranged for satisfactory disposition. The action taken will be filed in the Open CAR File. If corrective action and the schedule for resolution are acceptable, but such action has not yet been taken, the QA Representative may accept the proposed resolution on the original CAR and maintain it in the Open CAR File. After satisfactory resolution and closeout, as attested to by the applicable QA Supervisor's signature, the original CAR will be maintained.

e. AFRs

PURPOSE: The Audit Finding Report (AFR) is the Operations QA mechanism for documenting deficiencies identified during audits of organizations performing quality related activities at Waterford 3. These AFRs are then forwarded to appropriate levels of management.

ORIGINATION: An audit is structured around a checklist prepared by the auditor and concurred with by the supervisor. The checklist is used during the audit to compare the audited organization's mode of operation against procedures, standards and other documents which govern its domain of operation.

CORRECTIVE ACTION IMPLEMENTATION: The audited organization is required to complete the following actions upon receipt of the audit report:

a) Review and investigate the condition described in each audit finding,
b) Schedule appropriate immediate corrective action to correct the deficiency and to prevent recurrence, and
c) Respond to all findings within (30) days after acknowledging the audit finding. The response must clearly state the corrective action implemented and/or the scheduled date targeted for the completion.

CORRECTIVE ACTION VERIFICATION: The QA Audit Supervisor assures that corrective action is being accomplished in a timely manner by maintaining a tracking system of all unresolved items. The Lead Auditor confirms through personal observation or verification, that corrective action is accomplished as scheduled. The verification review also assures that the corrective action is adequately identified and implemented for each finding, including considerations for:

a) Similar conditions
b) Corrections as to cause
c) Software aspects
d) Hardware aspects
e) Schedule
f) Completeness

f. NRC Inspection Reports

ORIGINATION: These reports are transmitted to LP&L by the NRC Region IV office. A summary of NRC inspected areas of operations, maintenance, administrative controls, and license activities are contained therein and may identify open items, unresolved items, and/or Violations/Deviations.

CORRECTIVE ACTION IMPLEMENTATION: The Nuclear Services Manager and the Nuclear Support and Licensing Manager are responsible for the coordination of reviews and preparation of responses to NRC Inspection Reports. This task is performed by the Onsite Licensing Unit of the Licensing Section.

The specific task is performed by the Licensing Engineer (LE) through the development of a Licensing Action Plan (LAP). This plan may necessitate input from other departments and is transmitted to them through the use of a Licensing Information Request (LIR) form. The LIR is responded to and certified by the respective departments via the Task Review And Certification (TRAC) form. The response is reviewed by the LE for consistency with the LAP, LP&L commitments, completeness and the FSAR. Inspection Report responses are reviewed by the Plant Manager, Licensing Manager, and the Nuclear Support and Licensing Manager prior to transmittal to the NRC.

CORRECTIVE ACTION VERIFICATION: This is accomplished through receipt of signed off TRAC forms from responsible departments as well as a confirmatory review by the LE. LIRs are tracked from inception through completion by the LE via the computerized Licensing Commitment Tracking System. Responses to the NRC pertaining to Inspection Reports and 10CFR21 are further validated by the Operations QA group via QASP 19.13 prior to transmittal to the NRC.

2. Generic Quality Deficiencies

There may be cases where correcting individual quality deficiencies is insufficient to assure overall quality. Such cases occur where there are underlying causes common to more than one deficiency. Therefore, LP&L has established programs to provide timely identification and correction for such generic deficiencies. The following three sections will discuss the QA Trending Program, the Availability Improvement Program, and Hardware Trending.

a. QA Trending Program

Recognizing the need for early identification and correction of generic quality problems the Operations QA Group initiated a Quality Trending Program in May, 1984 with the publication of procedure QASP 16.1.

Data Reduction

The Operations QA Group collects and analyzes quality data for the purpose of identifying adverse trends. Responsible organizations initiate corrective action for Waterford 3 programmatic deficiencies.

Documents to be incorporated into the trend analysis include, but are not limited to:

- CIWAs (Condition Identification and Work Authorizations)
- QNs (Quality Notices)
- DNs (Discrepancy Notices)
- AFRs (Audit Finding Reports)
- CARs (Corrective Action Reports)
- NRC Inspection Reports

For each document the assigned QA representative will review and identify any deficiency in the effectiveness of the QA Program. The identified deficiency will then be categorized according to the following scheme:

- Equipment Control
- Training and Qualification
- Design Control
- Maintenance and Modification Control
- Procedure Adherence
- Plant Records Management
- Control of Purchased Materials and Services
- Identification and Control of Materials, Parts and Components

Control of Special Processes
Inspection
Test Control
Control of Measurement and Test Equipment
Surveillance Testing and Inspection Schedule
Plant Security
Corrective Action

As experience is gained in the trending program, categories will be added and deleted as necessary.

Trend Analysis

The Operations QA representative will evaluate the trend reports to determine if a possible adverse trend exists based on the following:

a. A significant increase in the number of occurrences of a specific adverse condition category is noted as compared to the previous reporting period.

b. A continuing and significant rise in the overall trend of adverse conditions for a responsible organization over the last three months is noted.

Further investigation to confirm possible adverse trends may be indicated and accomplished by monitoring the specific activity or program in question.

Corrective Action

Corrective action will generally be in the form of issuance of a Corrective Action Request (CAR) to the Manager of the responsible organization. Future trending reports will be used (in addition to standard QA confirmatory actions) to verify the adequacy of the corrective actions.

Reporting

The trend analysis report will be issued on a quarterly basis in the form of graphs and summary reports (including summaries of CARs and corrective actions) to the Safety Review Committee and to the Senior Vice President Nuclear Operations through the Corporate QA Manager. The reports will be formatted in a manner to facilitate the identification of trends in programmatic deficiencies.

Management Overview

The trending program provides a valuable senior management tool for assessing the effectiveness of the quality program at Waterford 3. Trends whose root cause may lie in the areas of staffing, corporate philosophy, management deficiencies, and the like, can most appropriately be resolved through the Senior Vice President Nuclear Operations following his quarterly review of the trending reports.

Current Status

The trending program has been recently initiated at Waterford 3 with the first quarterly report to the Senior Vice President issued in October, 1984.

b. Availability Improvement Program

The Availability Improvement Program (AIP) for Waterford 3 will be implemented to improve overall plant reliability. In so doing, quality related problems will be identified to management and corrective action implemented on a system/component level. While the QA Trending Program will identify generic programmatic deficiencies, it is expected that problems identified by the AIP will be predominately in the hardware area.

The AIP centers around a computerized model of the Waterford 3 plant. The plant will be divided into generic functions, which will be further subdivided into subfunctions, equipment systems, and, finally, equipment items. The model database will be regularly updated to reflect actual plant performance data, enabling the calculation of reliability/availability for any hierarchical level of the computer model. Availability goals will be set initially based upon industry performance of similar plants. As the AIP proceeds, and the database is extended, plant-specific availability goals will be utilized.

When an unusual characteristic affecting some measurement of availability is identified, or a problem is recommended for investigation, a Unit Availability Investigation (UAI) will be undertaken. The UAI will focus on a group, or individual piece, of hardware as appropriate. A root cause analysis will be performed to determine the reasons for abnormal performance. The analysis may make use of plant personnel interviews, vendor interviews, consultant interviews, investigation of environmental conditions, special testing, etc.

Upon determination of the root cause of the problem, corrective action will be implemented as necessary and tracked to completion. Verification of effectiveness of the corrective action will be evidenced through improved availability performance under the AIP.

Periodic reports of the results of the AIP will be provided to Nuclear Operations management, including the Senior Vice-President Nuclear Operations. Such reports will identify adverse availability trends, the root cause of such trends, corrective action taken, and confirmation of effectiveness of the corrective action.

As with any trending program, an operational database is required prior to effective implementation of the AIP. LP&L expects the AIP to be fully implemented within two years.

c. Hardware Trending

The purpose of the Maintenance History System (MHS) is to identify potential improvements in the preventive maintenance program, to suggest improvements to corrective maintenance procedures, to identify equipment requiring upgrade, and to provide a tool for assessing adequacy of spare part inventory levels. After completion of a plant modification, repair or maintenance, a MHS form is filled out on the affected component describing the nature of the work performed. The MHS form is attached to the CIWA before routing for closure review. These forms are used for data entry into the MHS computer system. The MHS data base is currently under extensive review to update and verify accuracy and adequacy of input data. This data base will provide a complete preventive and corrective maintenance history of all plant system components. This will enable LP&L managers to detect equipment trends in systems under their control. Once operating time is accumulated on plant systems the Plant Maintenance Superintendent will select key systems to review the frequency and scope of preventive maintenance for changes as necessary to improve system operability.

Pump and valve testing performed under the requirements of the ASME Boiler and Pressure Vessel Code is another source of trending information. A list of Section XI tests performed on safety related equipment under this Code for which data must be recorded to identify failure trends has been established at Waterford 3. This list includes such equipment as the Emergency Diesel Generator, Charging Pump, Containment Spray Pump, Reactor Coolant System (RCS) Pumps, RCS Instrumentation, MSIVs and containment isolation boundary valves. This trend information will provide plant management with advance notice sufficient to take the necessary corrective actions to prevent failure of such equipment vital to nuclear safety.

In programs of this magnitude it is inevitable that changes will be necessary. As LP&L gains more experience in quality trending, program refinements will be made to support the program purpose of identifying adverse quality trends. It is also important to note that the effectiveness of any trending program is a direct function of its database. The identification of trends requires a detailed previous history. By initiating the trending program at this time LP&L expects it to become a useful management tool going into commercial operation.

C. Staffing

The organization, staffing levels and personnel qualifications for Waterford 3 are described in Chapter 13.1 of the FSAR. Staffing of key areas of plant operations and quality include:

Staff	Authorized Staffing Level	Actual Level as of 9/84
Plant Operations and Maintenance	211	191
Plant Technical Services	96	92
Plant Training	31	28
Plant Quality	13	13
Quality Assurance	46	42

The operations phase QA organization is divided into two main groups - Nuclear Operations QA and Engineering/System Development QA each of which is further subdivided into 3 sections. QA staffing for the operations phase is detailed below:

Staff	Authorized Staffing Level
Nuclear Operations QA Manager	1
- QA Audits	9
- QA Support	6
- QA Analysis	9
- Total	25
Engineering/System Development QA Manager	1
- Audit/Surveillance	5
- System Development	7
- Engineering/Procurement	4
- Total	17
QA Management	4

D. Certification of Inspection Personnel

Inspection personnel during the operations phase of Waterford 3 including those provided by contractors are certified in accordance with QI-10-001, "Qualifications of Inspection Personnel". Certification for Level I, II and III qualifications is done in accordance with ANSI N45.2.6-1978, and Regulatory Guide 1.58 Rev. 1. Prior to certification a background investigation must be satisfactorily completed verifying a candidate's education and employment experience. Recertification is performed every two years.

E. Quality Assurance Indoctrination and Training

1. Plant Staff Quality Related Training

An indoctrination and training program has been established for the Nuclear Operations Department personnel performing quality related activities. It is designed to ensure that personnel involved are knowledgeable in quality assurance procedures/requirements as well as the overall functional responsibilities in the plant, and have the necessary proficiency to implement the requirements. The scope, objective, and method of implementing the indoctrination and training program are documented in procedures developed by the Training Department. The Quality Assurance Training and Indoctrination Program requires that:

a) Personnel responsible for performing activities that affect quality are instructed on the purpose, scope, and implementation of quality related manuals, instructions, and procedures;

b) Personnel performing activities that affect quality are trained and qualified in the principles, techniques, and requirements of the activity being performed;

c) Proficiency and requalification of personnel performing activities requiring certification are maintained by retraining, re-examination, and/or recertification on a periodic basis;

d) Proficiency tests be given to those personnel performing and verifying activities affecting quality, and acceptance criteria developed to determine if individuals are properly trained and qualified;

e) Certificates of qualification clearly delineate (1) the specific functions personnel are qualified to perform and (2) the criteria used to qualify personnel in each function; and

f) Documentation concerning training and qualification programs which describes the content, who attended, and results of tests as required by the training program are maintained.

2. Quality Assurance Section Training

QA Procedure QASP ..10 directs the development, implementation and documentation of the QA Section training program to reasonably assure that LP&L QA personnel have sufficient knowledge and experience to perform assigned tasks at Waterford 3. Training is implemented through:

- Completion of a QA required reading list;

- Formal classroom training (onsite and offsite) in specific topical and procedural areas to enable and enhance performance and effectiveness;

- Performance of on-the-job training assignments by individuals at their supervisor's discretion where formal courses cannot provide the level of training necessary for a particular quality related task;

- Special training where unique skills are needed for performance of specific functions such as monitoring of NDE, welding and fire protection;

- Periodic training such as the monthly QA Section training sessions or group sessions on an as-needed basis where changes, revisions or new requirements from LP&L QA Program documents, regulatory codes and standards are brought to the attention of QA personnel. Lessons learned or corrective actions as a result of quality deficiencies or undesirable programmatic trends identified at Waterford 3 and other nuclear generating facilities will be reviewed during these sessions.

The Quality Assurance Section Training Committee was formed on 12/16/83 to review the goals, objectives, effectiveness, and implementation of the training program for the Quality Assurance Section. It is composed of supervisory members from Engineering/Systems Development, Nuclear Operations, and Nuclear Construction QA Groups to act as a steering committee to provide management with an overview for evaluating the effectiveness and future direction of the QA Training Program.

An evaluation of the 1983 QA Training Program by this "ad hoc" group stressed three areas of concern for additional improvement: presentation and preparation of training lessons, attendance, and attitude and participation during training. As part of an effort to remain innovative and improve the skills of QA personnel two new training formats emphasizing professional development and corporate awareness were introduced. Under professional development, college professors and outside consultants provide instruction in stress management, leadership, oral communication, technical writing, time management, problem solving and negotiating skills. To enhance corporate awareness, representatives from various organizations within LP&L and the Middle South System will occasionally present their group's workscope to provide better understanding among QA personnel of company operations.

The success achieved by the Quality Assurance Section in meeting their training goals is evidenced in a Good Practice noted by INPO during a recent corporate assistance visit (December 1983). While evaluating senior corporate management attention and support of programs for developing experienced, trained, and qualified personnel required for the operation and support of Waterford 3, INPO stated in Good Practice 2.5A-1:

> "An excellent continuing professional training program has been developed for the Nuclear Operations Quality Assurance Group. This program is intended to enhance the inspecting, interviewing, and general management skills of QA personnel and has been well received by QA personnel."

3. Contractor Training

Contractors supplying quality related services to LP&L for which they conduct their own quality inspection and surveillance functions, are responsible for training their inspection personnel and documenting their qualifications under their own QA programs. These programs must meet or exceed the requirements of LP&L's QA Program, including training, before such vendors can be placed on the Qualified Suppliers List and enter into contract agreements with LP&L. QA program assessments of QSL vendors are made through Annual Evaluations and Triennial Audits (refer to Section II.G.1). Additionally, whenever contract personnel are performing quality related work onsite, implementation audits of vendor activities are conducted by Operations QA personnel (refer to Section II.G.3).

Contract personnel who perform quality related work under LP&L's QA Program must be trained in accordance with LP&L Procedures. LP&L managers directly supervising these personnel are responsible for ensuring they receive the proper QA training. Contract personnel performing inspection and monitoring functions are periodically evaluated by LP&L. Evaluation documentation is retained in individual training files in LP&L Project Files.

F. Audit/Review Programs

1. Nuclear Operations QA Audit/Monitoring Programs

a. Audit Program

As part of its charter to assure that the QA Program at Waterford 3 is adequate and being effectively implemented, the Operations QA Group administers an audit program of on-site quality related activities.

The QA Audit Supervisor, within the Operations QA Group, maintains a yearly audit schedule. Audit subject and frequency are based upon 10CFR50 Appendix B, the LP&L QA Manual, Technical Specification 6.5.2.8, Regulatory Guide 1.33, Rev. 2-1978, paragraph C.4, and Regulatory Guide 1.144, Rev.-1980, paragraph C.3. These documents establish minimum requirements which are generally exceeded. For instance, whereas the Technical Specifications require audits of Appendix B criteria to be conducted at least once per 24 months, such audits are presently scheduled on a yearly basis.

The annual audit schedule is updated every six months to incorporate any changes since the previously issued schedule. For example, when an unscheduled audit is performed it is added to the schedule as a record of the audit having been performed.

In revising the schedule, the QA Audit Supervisor considers the need for redirection of auditing efforts in response to problems identified as a result of the audit program, regulatory inspection findings, Site QA Reviews, Safety Review Committee direction, etc. Regularly scheduled audits are supplemented by scheduling additional audits for reasons such as:

a. Significant changes are made in functional areas of the QA Program such as significant reorganization or procedure revisions;

b. A systematic, independent assessment of program effectiveness is considered necessary; or

c. Verification of implementation of required corrective action is necessary.

The Corrective Action Audit, which is performed twice annually, includes items of noncompliance previously identified to the NRC between the two preceding Corrective Action Audits. Those items are also included within the audit checklist of the Corrective Action Audit conducted one year later to ensure that the corrective action for those items remains in compliance with commitments made to the NRC.

The overall scheduling and audit of unit activities is performed under the management cognizance of the Safety Review Committee (SRC) as previously described in Section II.A.1. In addition to periodic reports of audit activities from the SRC, the Senior Vice President Nuclear Operations receives the audit reports within 30 days of completion of the audit by Operations QA.

The audit process is described in detail in QA Procedure QASP 18.10 "Conduct of On-Site Internal and External Nuclear Operations Quality Assurance Audits".

b. Monitoring Program

Monitoring of plant activities is carried out by the Operations QA Group in order to provide additional observation of various aspects of plant quality related activities.

Monitoring may be initiated for a variety of reasons. For example, the QA Trending Program may identify an adverse quality trend; audit personnel may note a potential quality problem area outside the scope of their audit; or, during the course of review of CIWAs or procurement documents, QA personnel may identify areas of questionable quality.

Deficiencies identified during monitoring activities are documented through the use of a Corrective Action Report (CAR). The origination, tracking and verification of corrective actions for CARs has been previously described in Section [illegible].B.1.d. The overall monitoring process is covered in QA Procedure QASP 18.9 "Conduct of Nuclear Operations Quality Assurance Monitoring of Quality Activities".

2. Plant Quality Group Review and Verification Process

The Plant Quality Group has responsibility to review and verify implementation of the quality requirements related to Waterford 3 on-site activities.

a. Plant Quality Inspection

Quality inspections are performed at designated inspection Hold Points. Quality and Technical Reviews are performed by the responsible department head and Plant Quality Group on all quality related maintenance, modification and testing procedures and work packages. This review ensures that the procedure or work package addresses applicable NRC requirements, Technical Specifications, applicable quality requirements and commitments made to the NRC. As a result of these reviews, Hold Points are designated in the procedure/work package, during which a Plant Quality Inspector:

1) Ensures necessary test and inspection equipment is properly calibrated before use,

2) Checks that the procedure is applicable to the work being performed,

3) Performs inspection in accordance with the work procedure,

4) Reinspects items found unacceptable during previous inspection,

5) Documents the results on the work instructions, attached data sheets or Quality Inspection Report, and

6) Writes or directs a CIWA be written to correct an unacceptable condition unless the item can be reworked.

Completed work packages/CIWAs are reviewed by the Plant Quality Group to ensure that inspections/verifications were properly performed and documented. In the unlikely case that an inspection required by an established Hold Point is missed or not documented, then a Quality Notice (QN) is initiated. The work package will remain incomplete until the QN is verified as closed by rescheduling and completing the inspection, or producing valid documentation of the inspection, or obtaining approval to delete the Hold Point.

b. Hold Points

Inspection Hold Points are required whenever there is a reasonable possibility that an undetected deviation could occur that affects plant safety. In determining probability for an undetected deviation, post-maintenance testibility, complexity, criticality, and uniqueness of the work being performed are considered. Information concerning Inspection Hold Points is obtained from related design drawings, specifications, codes, standards and controlled documents.

The following are examples of activities which would normally require Inspection Hold Points:

1) Activities which could affect the integrity of the reactor coolant pressure boundary of safety/quality related components (e.g., installation and/or setting of pipe or component hangers; bolt-up and torquing of closure studs; installation of locking devices; welding, including fit-up and welding/welder qualifications; heat treatment; and hydrostatic testing.)

2) Nondestructive examination.

3) Cleanliness and foreign material exclusion, including cleanliness of components with tight clearance, such as control rod drive mechanism internals and major pump seals, and system or component closure following maintenance.

4) Characteristics of electrical components or circuits such as cable routing, splicing, lugging and potting, tightness of connections, and penetrations and fire stop installation which cannot be verified by post-maintenance and/or modification testing.

5) Characteristics of materials or components, such as surface finish, hardness, dimensions, leveling, alignment, torque, and clearance when such characteristics are critical to safety and when they will not be verified in subsequent tests or inspections.

c. Quality Instructions

Quality Instructions (QIs) are provided for those quality related activities of the Plant Quality organization outside of maintenance, modification and testing procedures/work packages that require quality inspection/review. Some of the key instructions are:

1) Quality Review of Procurement Documents - The Quality Reviewer (QR), as designated by the Plant Quality Manager, conducts a quality review of purchase and contract requisitions which include: Local Emergency Orders, Spare Parts Equivalency Reports, Major Changes, Major Exceptions and Transfer Requests. The QR verifies during his review that the procurement document:

   a) Meets the guidelines of the Purchase Requisition Quality Review Guide,

   b) Has a review by the Requirements Engineer to ensure the technical requirements are included and meet or exceed previously imposed specifications,

   c) Contains applicable references,

   d) Contains a statement concerning vendor requirements, 10CFR50 Appendix B requirements, QA Program requirements, 10CFR21 Reporting, Right of Access and Nonconformance Reporting, and

e) Confirms that the recommended vendor is on the Qualified Suppliers List.

Reviews which result in comments are documented on a Purchase Requisition Review Comments sheet and tracked on the Outstanding Plant Quality Review Comments Sheet until resolved.

2) Materials Receipt Inspection - Quality related materials received on site are controlled through the use of a Materials Receipt Inspection Report (MRIR) initiated by Plant Stores personnel. A plant Quality Inspector will verify on the MRIR that:

a) Identification and markings are in accordance with codes, specifications, purchase orders and drawings,

b) The manufacturer documented fabrication and testing requirements,

c) Protective covers and seals are in place,

d) Coatings and preservatives meet specifications,

e) Dessicants are in place and unsaturated,

f) No physical damage exists,

g) Cleanliness has been maintained, and

h) Other checks including weld preparations, workmanship, insulation resistance checks and dimensional checks have been conducted as appropriate.

Items passing review are affixed with a RELEASE tag. Discrepant items are identified with HOLD tags. Discrepancies are documented by Discrepancy Notices which are logged and tracked by the Plant Quality Group until resolved or dispositioned by the Material Review Board (MRB) as described in Section II.B.1.b.

3) Material Storage Inspection - This instruction provides Quality Inspectors with detailed procedures for verifying proper classification, packing, storage, cleanliness and segregation of materials received.

4) Cleanliness Inspections - This instruction provides for cleanliness verification of materials, equipment and components as required by work package instructions.

5) Housekeeping Inspections - This instruction provides for the use of Quality Inspection checklists to verify prescribed standards of cleanliness in various plant areas for the purposes of personnel safety, morale, contamination- ation control, fire prevention and degradation of plant operability. Discrepancies are noted on the Quality Inspection Checklists and tracked and resolved through the Inspection Comments/Resolution Sheet.

d. Plant Quality Surveillances

In addition to Quality Inspections, Quality Surveillances provide for observations of quality related activities. These surveys are documented on Quality Surveillance Report (QSR) forms. When deficiencies are noted during the Surveillance, a QN shall be written requiring corrective action. Plant Quality Surveillances provide sampling of a portion of station activities, whereas Quality Inspections provide for checks of specific quality affecting activities.

e. Stop Work

The Plant Manager or Plant Quality Manager may issue verbal stop work orders (SWOs) to halt unsatisfactory work and to control the processing, delivery, or installation of nonconforming material at Waterford 3. A verbal SWO is followed up with a written SWO which is documented on an SWO form, and logged for tracking. Notification of the SWO is made to the Senior Vice President Nuclear Operations, Corporate QA Manager, Safety Review Committee, Control Room Supervisor, individual company involved, Plant Manager, applicable department supervisor, and the Plant Operations Review Committee. When the deficiency is corrected, or sufficient steps have been taken to ensure that further noncompliance will not occur, a Stop Work Order Release (SWOR) form is issued by the Plant Quality Manager to allow work to resume. A SWOR form notes the corrective action taken and the reason for release.

G. <u>Control of Contractor Quality Related Activities</u>

1. Evaluation of Supplier's Quality Assurance Program

Suppliers providing safety related material or services must be on the LP&L Qualified Suppliers List (QSL). Before a vendor can be placed on the QSL, that vendor must be evaluated for acceptability by the LP&L Engineering/Systems Development QA Group.

An initial evaluation of a prospective contractor is performed by reviewing the contractor's:

a. Current quality assurance program manual, procedures and records;

b. Capability to conduct quality activities as revealed through examination of the facilities for performing such work and ability of the supplier's personnel;

c. Past performance based on experience that LP&L and other users have gained using identical or similar products and services.

Based on results of the above evaluation process, a supplier is classified:

a. Acceptable - no questions/concerns were raised during evaluation, or questions/concerns have either been resolved or have an insignificant impact on the item/service to be provided.

b. Unacceptable - the supplier's program doesn't meet procurement document requirements, or is not adequately implemented and review questions not satisfactorily addressed/resolved.

c. Conditionally Acceptable - only certain portions of a supplier's program are acceptable and purchase activities are limited to restrictions as imposed by the Engineering/System Development QA Group and noted on the QSL and are to be reflected in procurement documents. Full acceptability will be based on satisfactory supplier resolution of questions/concerns.

Once a contractor is on the QSL, a documented evaluation of the supplier will be performed annually and kept in that vendor's file.

While an audit is not necessary for a satisfactory annual evaluation, an audit must be performed every three years for a vendor to remain on the QSL.

2. Conduct of Contractor Quality Assurance Audits

a. Off-Site QA Audits

The Engineering/Systems Development group is responsible for ensuring all QSL listed contractors' offsite activities are audited to requirements of 10CFR50 Appendix B and LP&L's QA Program. Either they themselves will audit these contractors, or a vendor audit group will be contracted which has been qualified to LP&L's QA Program to conduct these audits. Audits will be conducted triennially per NRC Regulatory Guide 1.44.

b. On Site Auditing and Monitoring of Contractors

The Nuclear Operations Quality Assurance Manager directs audits of those organizations not within LP&L that are performing quality-related services at Waterford 3. These type of contractor audits are designated as "On-Site External Audits" and are conducted as previously described in Section II.F.1.a.

Periodic monitoring of on-site contractor activities is done through the use of Monitoring Reports as assigned by the QA Analysis Supervisor under the Operations QA program previously described in Section II.F.1.b.

3. Deficiency Reporting by Contractors

All vendor personnel performing on-site quality inspections of their company's work under LP&L's QA Program are required to report deficiencies identified for inclusion on a CIWA. This includes deficiencies discovered outside the scope of work being performed. A CIWA, which documents a deficiency and its corrective action/rework, is approved and tracked by LP&L management as described in Section II.B.1.a. Corrective action verification is provided by post closure review of the CIWA by the Plant Quality Group.

H. <u>Station Modification Program</u>

The purpose of the Station Modification program is to provide a mechanism through which design modifications to Waterford 3 are controlled and tracked. The Station Modification Package serves as a comprehensive, stand alone design change document which has undergone the appropriate interdisciplinary reviews. The process assures that no changes are made to the plant structures, systems and components which may introduce an unreviewed safety question per the criteria delineated in 10CFR50.59.

Any individual with the concurrence of the department head may request a design modification. Reasons for the change could include enhancement of the plant structures, systems, or components as a result of engineering preference, regulatory requirements, licensing commitments, ALARA, Human Engineering Design considerations, etc. Upon management approval of the request, a Station Modification Package (SMP) is assembled and receives appropriate interdisciplinary review. During the course of the design and review process checklists are used to ensure that, among other things, generic criteria such as separation, failure effects, fire protection, etc., are taken into account. The LP&L Quality Assurance Program requires that documentation appropriate to satisfy 10CFR50 Appendix B will be generated and retained.

Typical SMP Contents include:

1. Summary Functional Description

2. List of Attachments
   a) Purchase Orders/Requisitions
   b) Recommended Spare Parts
   c) New or Revised Drawings/Description Documents/Tech Manuals/Equipment Specification/System Description
   d) Vendor Information
   e) Design Calculations/Analyses
   f) Work Procedures

3. List of References

4. Bill of Material

5. Installation Instructions

6. Examinations (e.g. NDE requirements, PSI/ISI surveillance requirements)

7. Testing (including acceptance criteria)

8. Nuclear Safety Evaluation checklist (10CFR50.59 review)

Modification is performed via the Condition Identification and Work Authorization (CIWA) process described in Section II.B.1.a. Detailed Construction Packages (DCPs) are prepared for work activities. Pertinent design and reference information (e.g. isometric drawings, engineering instructions, code type testing requirements, installation procedures) is included in the DCP as well as instructions for implementation documentation. Acceptance criteria/tests/checks are developed and included as part of the DCP prior to implementation.

With the exception of minor changes, alterations (or field changes) to the DCP may not be made without approval of a revision to the SMP. For minor changes, the Action Engineer may authorize a Detailed Construction Package Change (DCPC) in which case a detailed description of the change is documented prior to implementation of the change. All DCPC documentation is retained as part of the work package and subject to post-implementation review.

Verification of implementation is first performed by the Station Coordinator and the Action Engineer who had the responsibility for developing the package. The Action Engineer assures that all work was accomplished according to the SMP and that acceptance criteria are met. Control Room controlled drawings are redlined to reflect the change. The Action Engineer then initiates a Modification Project Closeout Review Form, and forwards it to the SM Coordinator

(SMC). The SMC forwards a Work Completion Notice to all affected disciplines so that appropriate documents are revised. Completed Document Update Forms are returned to the SMC to certify that all affected drawings, procedures, programs, and/or training plans have been revised and approved. At this time the CIWA is closed and the SM Closeout Review form initiated and sent to the Systems Engineering Department Head for review and approval of the Modification Project Closure Review form. See Section II.I.3 for quality review and storage of SMPs.

I. Records

1. Project Files

Project Files is the focal point for storage and maintenance of uncontrolled records and documents. The filing system used is a computerized document retrieval system. Completed records forwarded to Project Files are indexed on the computer, then microfilmed and stored by Film Access Number. This number indicates the roll and frame number of a particular document or its hard copy location. Records are thus effectively filed under document number, record type, date, title, vendor, subject, equipment number, etc., allowing a user to retrieve documents in a timely manner.

Records processed by Project Files are received under a standard transmittal form which lists the contents forwarded. The records transmitted are inspected to ensure that all of the records on the transmittal form are present, complete, and validated. If the records are complete and agree with the transmittal form, then the form is signed by the package reviewer, filed, and a copy sent to the originator.

Unlimited access to Project Files is granted only to personnel assigned to the Project Files Group. This minimizes the possibility of lost/misplaced records by personnel who have not been indoctrinated in the proper procedures for control of documents. The Project Files Supervisor may authorize temporary access when individual requirements cannot be handled by the Project Files personnel. QA records may be accessed by request for work/review, but may only be reviewed in designated controlled areas.

2. Document Control

Document Control is the organization responsible for processing controlled documents such as approved drawings, specifications, technical manuals, FSARs, SMPs and some procedures. This process includes receiving, recording, distributing, updating and retrieval of those documents affecting quality to ensure only the latest applicable revision is used for operation and maintenance at Waterford 3. Controlled issue is maintained by the use of transmittal forms which must be signed and returned by assigned copy holders or established distribution lists. Direct access to files maintained by the Document Control is limited to group personnel and their supervisors.

3. Records Quality Review

Quality-related Station Modification Packages (SMPs) are reviewed by the Operations QA group before final closure and transmittal to Project Files. A Quality Reviewer (QR) completes a QA Review Checklist on the SMP to ensure that records establishing proper review and other necessary records are retained. The QR review scope ensures that documents required by the SMP index and controlling procedures are included, proper review and approval is indicated on the records, applicable codes and quality standards are identified, test and inspection requirements are documented, and safety evaluation and design verification is performed.

Comments from this review are tracked and closed out on a standard Procedure Review Comments sheet, ensuring completeness of the SMP. The Checklist, comments sheet and any additional records generated by the QR's review are filed for storage.

Similarly, quality related documents generated by the Plant Quality and Quality Assurance groups in the performance of their duties are reviewed and retained in Project Files. These records include audit reports, nonconformance reports, receipt inspection reports, CIWAs, QNs, DNs, Stop Work Orders, QC surveillances, QC Inspector certification, hold tags, conditional release tags, various NDE documents, calibration records, and NDE personnel qualification and training records.

(NOTE: Some aspects of Records Quality Review, particularly records storage, are not yet fully implemented due to their recent adoption by Waterford 3.)

4. Status

During the construction phase, records management was primarily handled by the architect/engineer. As a result, although current records are handled and processed as described above, there remains a backlog of construction phase records to process through the LP&L Records System. Additionally, to assure continued high quality in records storage and retrieval, LP&L management is evaluating the current records management process for Waterford 3 to identify any areas needing improvement. It is expected that appropriate recommendations of this evaluation will be initiated by November 30, 1984.