



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 6, 1979

MEMORANDUM FOR: Robert E. Jackson, Chief
Geosciences Branch, DSS

THRU: Lyman Heller, Leader *LH*
Geotechnical Engineering Section
Geosciences Branch, DSS

FROM: Owen O. Thompson, Geotechnical Engineer
Geotechnical Engineering Section
Geosciences Branch, DSS

SUBJECT: TRIP REPORT - INSPECTION OF ERODED FOUNDATIONS

PLANT NAME: Vogtle Units 1 & 2
LICENSING STAGE: Post CP
DOCKET NUMBERS: 50-424/427
MILESTONE NO.: R-18
TAC NO.: 5347
RESPONSIBLE BRANCH: LWR-4, C. Stahle, LPM
REVIEW STATUS: Awaiting additional information

On November 20, 1979, I visited the Vogtle Nuclear Plant with I&E Region II inspectors Milton Hunt and Jack Harris. The complete list of attendees is attached to this report (attachment #1).

The visit by Geosciences Branch, NRR, was requested by I&E (through DPM) because recent heavy rains had caused severe erosion in the vicinity of seismic Category I foundations. These conditions caused I&E to issue a stop work order on construction of backfill in and around power block structures and placement of concrete on affected structures (Confirmation of Action letter from J. O'Reilly, I&E Region II, to J. H. Miller, Georgia Power Company, Nov. 15, 1979).

The plant excavation extends from existing grade at about El 220 down to the top of marl at about El 130. Groundwater, at about El 160 prior to construction, is supposed to be controlled by a granular french drain around the base and sides of the excavation. Water is pumped from three sumps on the south side of the excavation. The structures are founded on the marl or on a silty sand (SM to SP) controlled structural backfill.

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At the time of our site visit the excavation was complete and backfilling had progressed to roughly three levels: to about E1 135 in the south part, to about E1 150 to E1 160 in the center, and to about E1 186 in the north part. The principal structures in these areas are:

- a) south part -- nuclear service cooling water towers and basins (emergency heat sink) founded on marl, auxiliary building, founded about 20 ft into marl.
- b) central part -- containment units 1 (east side) and 2 (west side) founded on structural backfill except the reactor foundation which is founded on marl; control building and electrical tunnels founded on structural backfill.
- c) north part -- turbine generator building founded on structural backfill.

The auxiliary building foundations were complete and structural construction was in progress. The tendon gallery for Containment Unit 1 was about 20 ft high. The control building electrical tunnels were partly constructed and part of the foundation for containment unit 2 tendon gallery was in place. Steel for the foundation mat of the turbine generator building was being erected on the mud mat.

The sequence of events leading to the stop work order, as recorded by the licensee, is provided in an interoffice communication from B. Harbin to K. Gillespie, Georgia Power Company dated November 16, 1979 (attachment #2). Heavy rain on or about November 2, 1979, caused severe erosion of the backfill slope on the south side of the turbine generator building, between containment unit 1 and the control building, and around containment unit 2.

Some of the erosion had been temporarily repaired. However, it was apparent that erosion gullies were a number of feet deep, and that loss of support of foundations or mud mats may have occurred along the south side of the turbine generator building, at the southwest side of containment unit 1 tendon gallery, at the southwest side of the control room electrical tunnel, and along the north part of containment unit 2 tendon gallery. There is also a possibility that the northeast corner of the control building could have been adversely affected by the slope above this area (the slope at the edge of the turbine generator building). All of these events of concern are at the edges or corners of existing foundations. Of even greater concern was the presence of seepage from north to south, under the completed (north) portion of containment unit 2 tendon gallery. Both sides of the foundation had been recently covered by temporary fill so we would not see the extent, if any, of piping or erosion under the foundation.

A second, related problem with groundwater was identified during our site visit. Groundwater has been accumulating for some time in the low area north of the auxiliary building and backfilling has not been possible. The licensee informed us that after unsuccessful attempts to lower the groundwater level with french drains, a dewatering contractor, Moretrench American Corporation, has been hired to install a system of well points for dewatering this area, commencing November 26, 1979. We informed the licensee that operating a dewatering system would not be permitted until we had reviewed the proposed program because of the potential for damage to existing foundations.

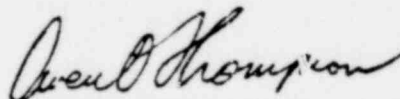
We observed three test pits in the backfill within containment unit 1. Water was standing about 2 ft below the backfill surface. We did not approve the applicants plan to install a temporary drainage system within the containment. We did, however, approve continued backfilling in this area provided that the earthwork specifications were met.

We briefly inspected other parts of the site. The exterior grade around the excavation appeared to be adequately sloped to prevent water from surrounding areas entering the excavation. The low (E1 130 +) area east of the auxiliary building was wet and the licensee indicated that a drain would be installed to dry out the area and carry the water to the perimeter drain. A trench was being excavated in the marl on the south side of the excavation to enhance removal of water from the excavation.

The construction slopes in the fill southeast of the turbine generator building were being treated with fibreglass and asphalt. Other slopes were, in some areas, moderately to severely eroded and the licensee indicated that dressing of all slopes will be done as part of the surface water management and protection program.

The Region II inspectors and I prepared a list of NRC concerns (Attachment 3) which were given to the licensee by the inspectors after I left the site.

During the site visit I took approximately 30 color print photographs.



Owen O. Thompson, Geotechnical Engineer
Geotechnical Engineering Section
Geosciences Branch, DSS

cc: L. Heller
O. Thompson
GB Files

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Meeting Attendance Record

Nov. 20, 1979

<u>Name</u>		<u>Company</u>
Edwin D. Groover	QA Site Supervisor	QA-GPC
Joseph M. Duffy	Civil Contractor	Walsh Co.
B. C. Harbin	Civil P.S.S .	GPC
R. W. McManus	Civil QC Suct. Sup.	GPC
M. H. Googe	Ass.t Mgr. QC	GPC
K. M. Gillespie	Const. Proj. Mgr	Const/GPC
J. E. Mahlmeister	Bechtel Resident Engr	Bechtel
Cecil R. Miles, Jr.	GPC QA Field Supvsr	GPC
J. R. Harris	Reactor Const. Insp.	NRC, I&E
O. O. Thompson	Geosciences Branch	NRC HQ
M. D. Hunt	Project. Inspector	NRC, Reg. II
D. A. Klinger	SR QA Field Rep.	QA-GPC

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POOR ORIGINAL

November 16, 1979

Memo To: Mr. K. M. Gillespie

Subject: Vogtle Nuclear Plant - Units 1 and 2
Erosion Problems Category One Backfill

File No.: X2AP01

Correspondence No.: C-1098

The following is a discription of what has transpired due to heavy rains on November 2 and 10, 1979:

1. Night of November 2, 1979--At about 4:15 p.m., rain began to fall heavily. By Saturday morning, November 3, 1979, a 5-3/4" rain was recorded by site rain gauges. During this period, 3-3/4" rain fell between 8 and 9 p.m. Friday.
2. November 3, 1979--Field Engineer Roger Duncan and Civil Q.C. Inspector Roy Conner noted severe erosion damage to fill slopes between the Turbine Building and Units 1 and 2 Containments. Clean-up operations began by Walsh on Saturday, which consisted of removing standing water and mud from the lower level around the south side of the Auxiliary Building. Cleanup work continued Saturday, Sunday, and into Monday.
3. Saturday, November 3, 1979--Eroded areas were located, flagged, and Nonconformance Report Number CD-595 was issued.
4. Monday, November 5, 1979--NCR's CD-600, CD-601, CD-602, CD-603, and CD-605 were issued.
5. Monday, November 5, 1979--NCR CD-595 was presented to Bechtel for approval. Approval was given and corrective action was taken on November 6, 1979.
6. Tuesday, November 6, 1979--Corrective action was started on other NCR's (CD-600 through CD-603 and CD-605) which consisted of placing sand bags in and around voids under mud slabs to prevent further erosion until permanent corrective measures could be agreed upon.

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7. Wednesday, ~~November 7, 1979~~ ^{October 31, 1979}--Dr. Vas Srinivasan (Bechtel) was on site, and while on site he was asked to review and comment on proposed dewatering backfill plans for areas north of Auxiliary Building and west of Unit 1 Containment. The purpose of the backfill would be to reduce sloping surfaces, therefore reducing erosion. The dewatering plan was reviewed and approved, and trenching was begun on November 4, 1979, to install a drain north and parallel to the Auxiliary Building.

After opening approximately 15 to 20 feet of ditch, six feet deep, movement of the walls in previous backfill in the ditch was observed. This movement and sloughing of the walls was due to the high moisture content of the backfill. Operations were ceased, and NCR CD-610 was issued.

Plans were revised and approved by Bechtel to raise the invert of the drain so that the trench would be only three to four feet deep. On Friday, November 9, 1979, trenching was begun and wall sloughing was observed. A Stop-Work Order was issued on further trenching north of the Auxiliary Building, and the trench was filled with stone to prevent further sloughing.

8. Thursday, November 8, 1979--Roy Kiser (Geologist-Bechtel) arrived on site for marl foundation inspection east of the Auxiliary Building. Mr. Kiser's presence on site was in no way connected with backfill problems north of the Auxiliary Building.
9. Friday, November 9, 1979--Civil Field Operations contacted Mr. Vas Srinivasan, who was asked to return to the site. Mr. Srinivasan and Mr. Robert Bush arrived on site Tuesday, November 13, 1979, and began site inspection.
10. Saturday night, November 10, 1979--Rain began and ended Sunday, November 11, 1979. A 2+-inch rain fell during this period.
11. Monday, November 12, 1979--Cleanup, repair, and erosion operations were continued. An NCR (CD-613) was issued for a washout under a mud slab for Unit 1 Tendon Gallery Access Shaft between the

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Auxiliary Building and Containment Unit 1. Temporary fill was placed to prevent further erosion.

Bush
Srinivasan

12. Tuesday, November 13, 1979--A review was made of site conditions, and a meeting was held to discuss solutions to erosion and saturated backfill north of the Auxiliary Building. (Attendees present is attached.)

13. Wednesday, November 14, 1979--Mr. Jack Harris (NRC) arrived on site and began a site inspection with Chet Sarver (Q.A.).

14. Wednesday, November 14, 1979--Civil Field Operations presented a plan at the Project Review Meeting to de-water the backfill in the power block, which consisted of:

- A. Installation of well points north of Auxiliary Building.
- B. Filter drains east and west of Auxiliary Building and in Units 1 and 2 Containments (if required).
- C. Sump on northeast corner of Turbine Building slab.

(See attachment, Correspondence No. C-1097.)

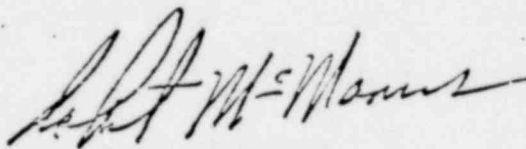
15. Thursday morning, November 15, 1979--Q.A. requested Civil Q.C. to meet with Mr. Jack Harris (NRC). R. W. McManus (Civil Q.C. Section Supervisor), Joe Seagraves (Assistant Civil Q.C. Section Supervisor), Nelson Lankford (Soils Inspection Supervisor), and Barry Fairley (Soils Inspector) met with Mr. Sarver and Mr. Harris. Mr. Harris' questions were directed toward moisture control and certain unclear statements in the field procedures. Mr. Harris did not ask about the problems associated with erosion.

16. Thursday, November 15, 1979--Bechtel and Field Operations continued design of dewatering, erosion control, and repair of eroded areas in the power block. (See attached Bechtel memo BRE-25 and GPC memo C-1097.)

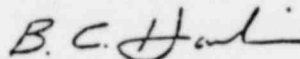
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17. Thursday, November 15, 1979--In the afternoon, received verbal Stop-Work Order from NRC which was confirmed by receipt of DEX copy of the Stop-Work Order.
18. Friday morning, November 16, 1979--Civil Q.C. issued Stop-Work Order for concrete and backfill except concrete operations on Auxiliary Building and NSCW Towers.



Robert W. McManus
Civil Q.C. Section Supervisor



B. C. Harbin
Civil Project Section Supervisor

RWM/BCH/dw

Attachments

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POOR ORIGINALNRC CONCERNS

1. Erosion under slabs for Control Building cable tunnels, South West corner Unit 1 Containment and Unit 2 Tendon Gallery. (Consider the effects of piping).
2. Possible adverse effects on existing foundations of dewatering from well points.
3. Surface drainage and water control as it impacts on the safety related building foundations.
4. Potential safety aspects related to stability of the slope around the North side of the Control Building.
5. Procedures and controls for judging the acceptance of in-place backfill.
6. Monitoring settlement of structures.
7. Monitoring of piezometric levels in fill. (Relating to slopes).
8. Maintenance program for construction slopes.

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