Figure 2.4-65 thru Figure 2.4-67 Are Not Used

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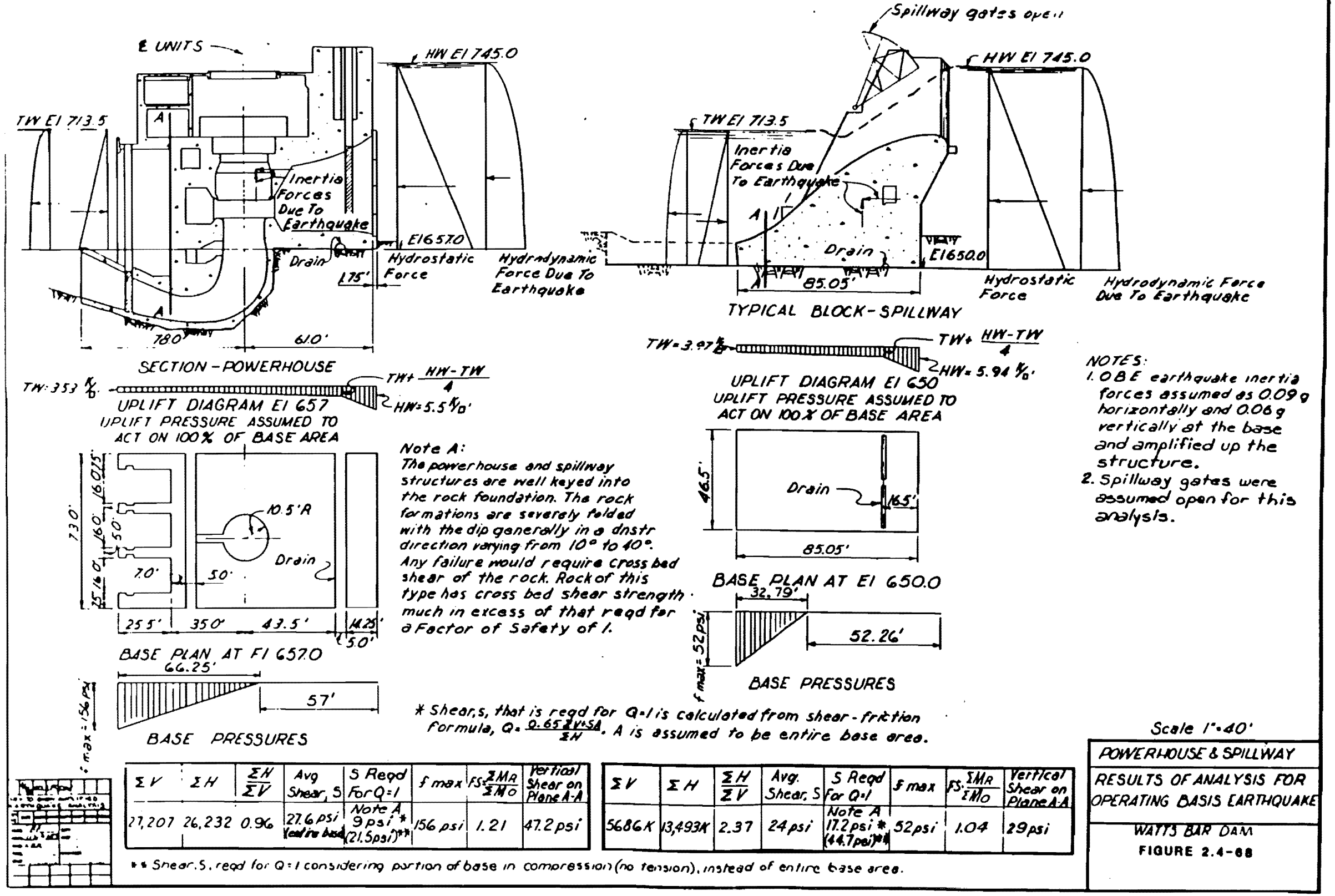


Note A:
The powerhouse and spillway structures are well keyed into the rock foundation. The rock formations are severely folded with the dip generally in a dnstr direction varying from 10° to 40°. Any failure would require cross bed shear of the rock. Rock of this type has cross bed shear strength much in excess of that reqd for a Factor of Safety of 1.

NOTES:
1. OBE earthquake inertia forces assumed as 0.09 g horizontally and 0.06 g vertically at the base and amplified up the structure.
2. Spillway gates were assumed open for this analysis.

* Shear, S, that is reqd for Q=1 is calculated from shear-friction formula, $Q = \frac{0.65 \Sigma V + SA}{\Sigma H}$. A is assumed to be entire base area.

ΣV	ΣH	ΣH/ΣV	Avg Shear, S	S Reqd For Q=1	f max	FS: ΣMR/ΣMO	Vertical Shear on Plane A-A
27,207	26,232	0.96	27.6 psi (cell in base)	Note A 9 psi * (21.5 psi)**	156 psi	1.21	47.2 psi

ΣV	ΣH	ΣH/ΣV	Avg. Shear, S	S Reqd for Q=1	f max	FS: ΣMR/ΣMO	Vertical Shear on Plane A-A
5686K	13,493K	2.37	24 psi	Note A 17.2 psi * (44.7 psi)**	52 psi	1.04	29 psi

** Shear, S, reqd for Q=1 considering portion of base in compression (no tension), instead of entire base area.

Scale 1" = 40'

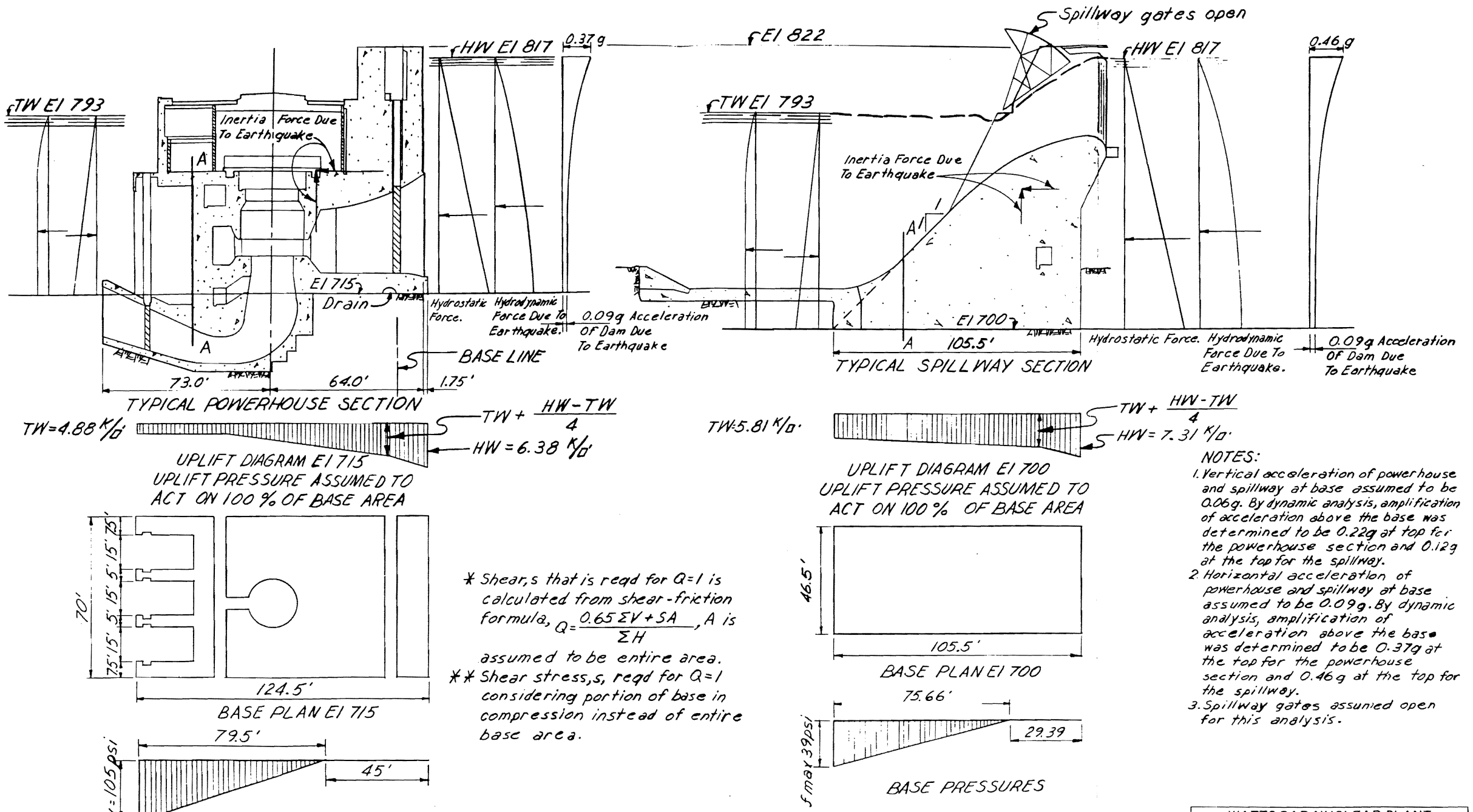
POWERHOUSE & SPILLWAY
RESULTS OF ANALYSIS FOR OPERATING BASIS EARTHQUAKE
WATTS BAR DAM
FIGURE 2.4-68

Amendment 63

Figure 2.4-68 Powerhouse & Spillway Results of Analysis For Operating Basis Earthquake - Watts Bar Dam

Figure 2.4-69 Deleted by Amendment 108

Figure 2.4-70 Deleted by Amendment 83



* Shear, s that is reqd for Q=1 is calculated from shear-friction formula, $Q=\frac{0.65\Sigma V+SA}{\Sigma H}$, A is assumed to be entire area.

** Shear stress, s, reqd for Q=1 considering portion of base in compression instead of entire base area.

NOTES:

1. Vertical acceleration of powerhouse and spillway at base assumed to be 0.06g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.22g at top for the powerhouse section and 0.12g at the top for the spillway.
2. Horizontal acceleration of powerhouse and spillway at base assumed to be 0.09g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.37g at the top for the powerhouse section and 0.46g at the top for the spillway.
3. Spillway gates assumed open for this analysis.

ΣV	ΣH	ΣH/ΣV	Avg shear	S reqd for Q=1	f max	F.S.=ΣMR/ΣMo	Vertical shear on plane A-A
22,762K	22,541K	0.99	24.2psi (entire base)	8.3psi * (14.6psi)**	105psi	1.18	26 psi

ΣV	ΣH	ΣH/ΣV	Avg shear	S reqd for Q=1	f max	F.S.=ΣMR/ΣMo	Vertical shear on plane A-A
19,488K	14,382K	0.75	20psi (entire base)	2.38psi * (3.30psi)**	39psi	1.26	17psi

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
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POWERHOUSE & SPILLWAY
RESULTS OF ANALYSIS FOR
OPERATING BASIS EARTHQUAKE
Fort Loudoun Dam
Figure 2.4-71

Figure 2.4-71 Powerhouse & Spillway Results of Analysis For Operating Basis Earthquake - Fort Loudoun Dam

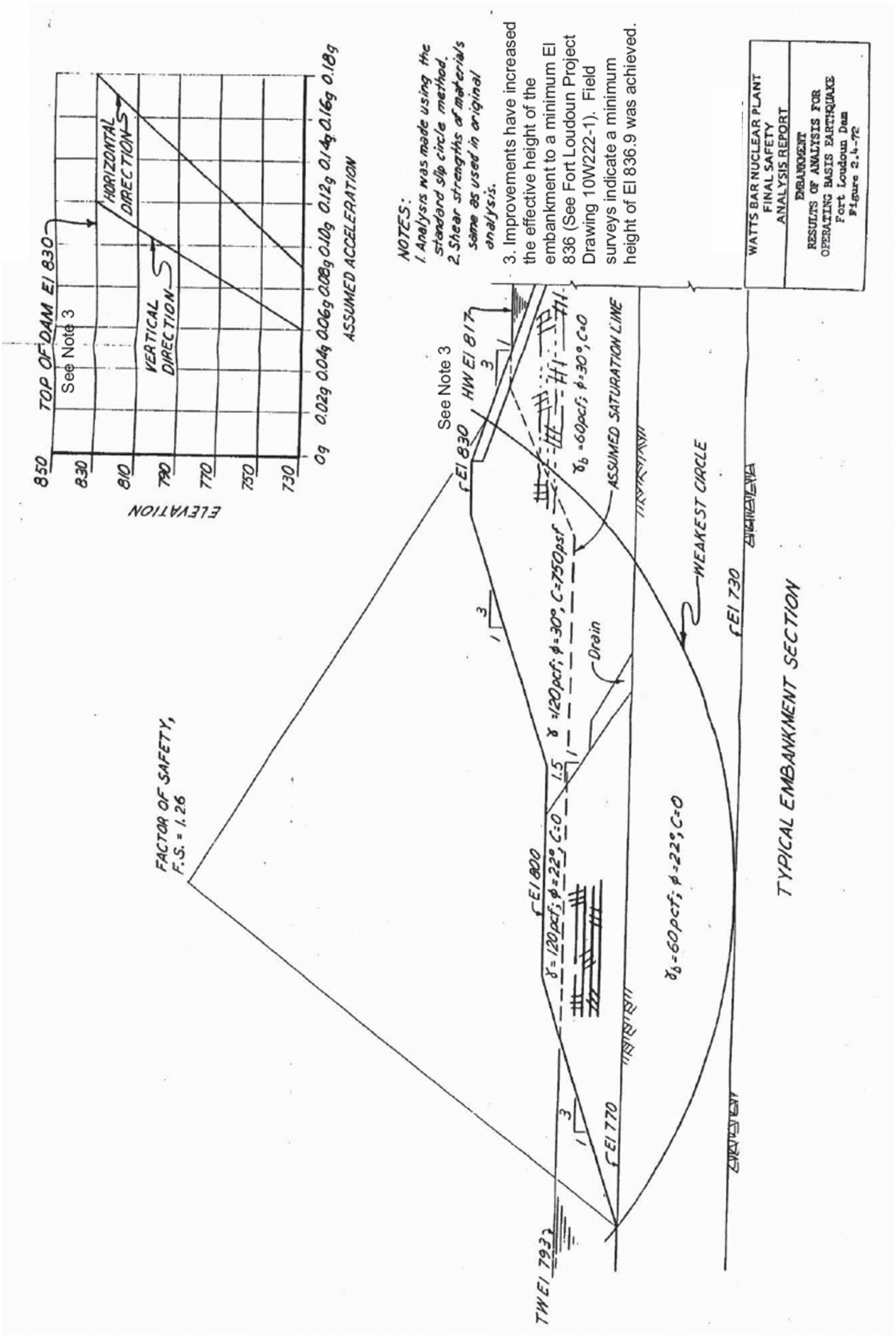


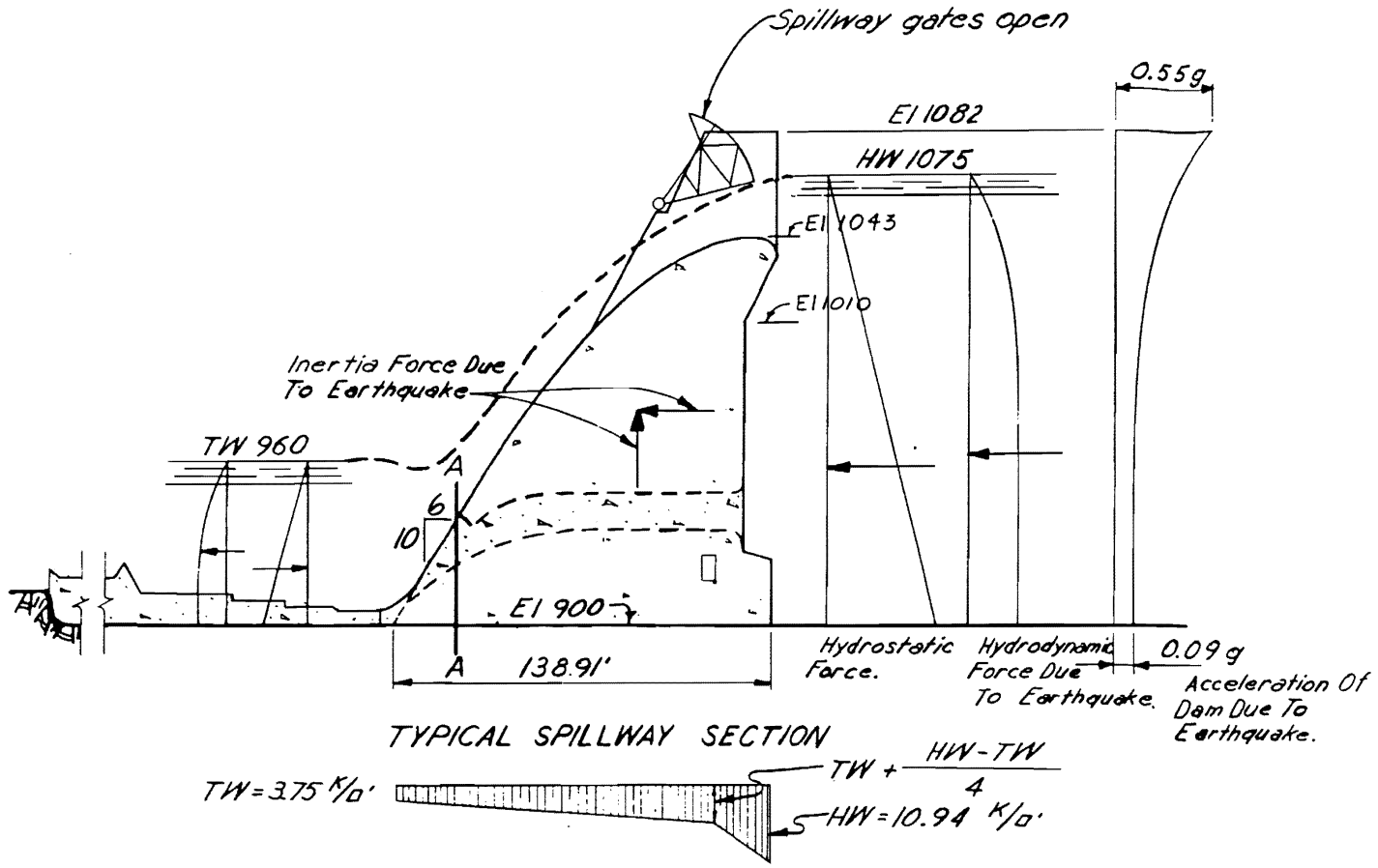
Figure 2.4-72 Embankment Results Of Analysis For Operating Basis Earthquake - Fort Loudoun Dam

Figure 2.4-73 Deleted by Amendment 103

Figure 2.4-74 Deleted by Amendment 108

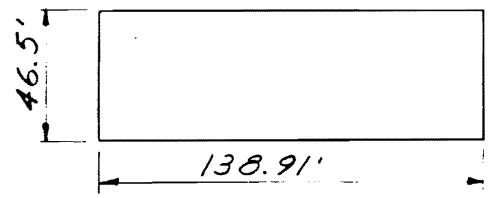
Figure 2.4-75 Deleted by Amendment 103

Figure 2.4-76 Analysis For OBE & 1/2 PMF Assumed Condition of Dam After Failure Norris Dam

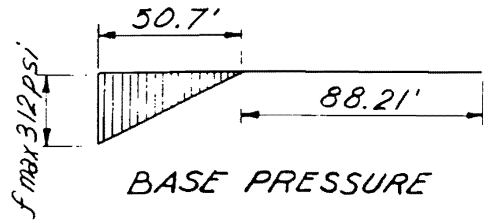


TYPICAL SPILLWAY SECTION

UPLIFT DIAGRAM El 900
UPLIFT PRESSURE ASSUMED TO ACT ON 100 % OF BASE AREA



BASE PLAN AT El 900



BASE PRESSURE

* Shear, s, that is reqd for Q=1 is calculated from shear-friction formula, $Q = \frac{0.65\Sigma V + SA}{\Sigma H}$, A is assumed to be entire area.

** Shear stress, s, reqd for Q=1 considering portion of base in compression instead of entire base area.

ΣV	ΣH	ΣH / ΣV	Avg Shear, S	S Reqd For Q=1	f max	F.S. = ΣMR / ΣMo	Vertical Shear on Plane A-A
53,007K	57,276K	1.08	61 psi (entire base)	25psi * (67psi)**	312psi	1.13	173 psi

NOTES:
1. Vertical acceleration of the spillway at the base assumed to be 0.06g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.11g at the top.
2. Horizontal acceleration of the spillway at the base assumed to be 0.09g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.55g at the top.
3. Spillway gates assumed open for this analysis.

WATTS BAR NUCLEAR PLANT
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[illegible] NO. [illegible]
[illegible] Cherokee Dam
[illegible]

Figure 2.4-77 Spillway & Nonoverflow Results of Analysis For Operating Basis Earthquake -Cherokee Dam

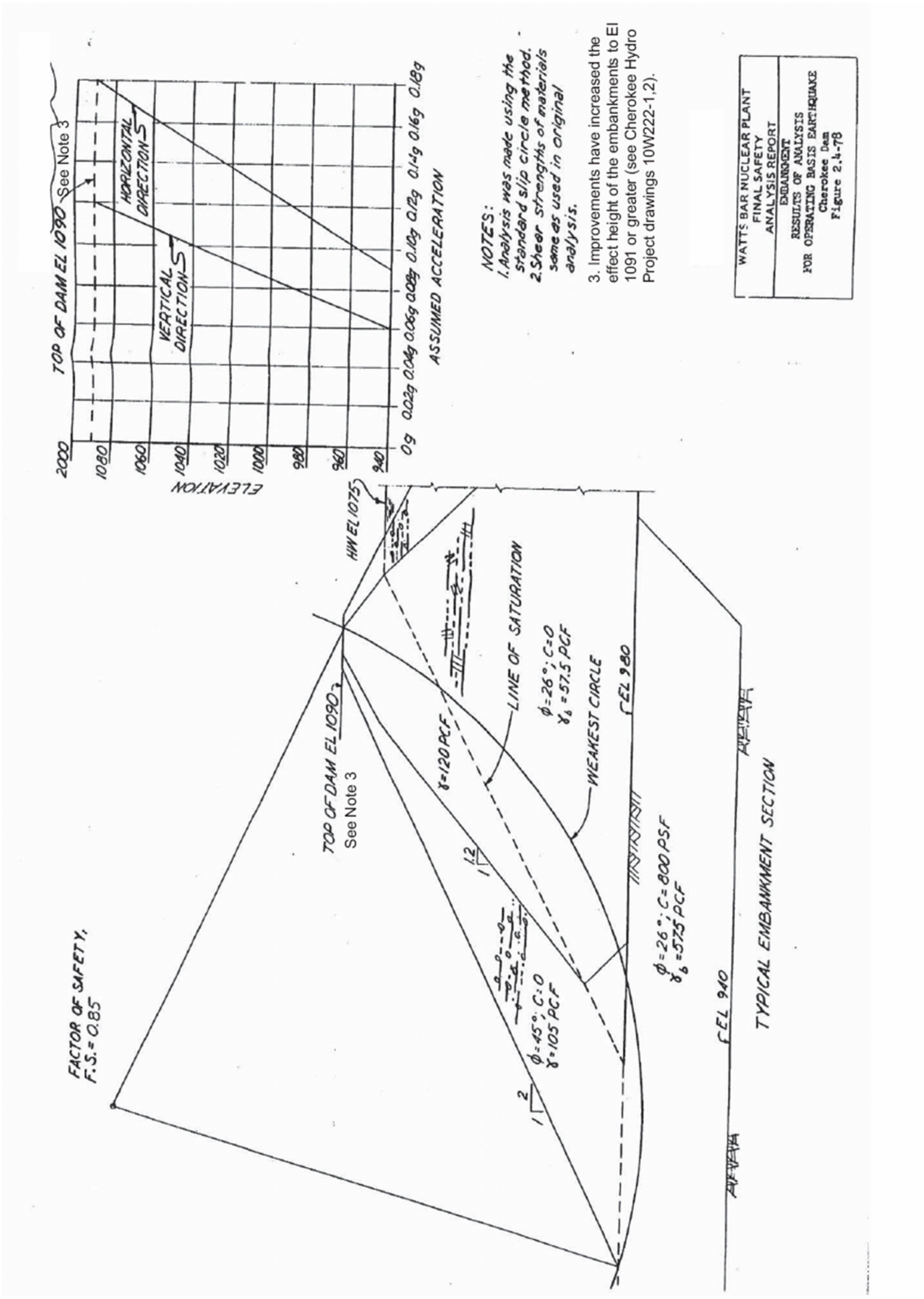
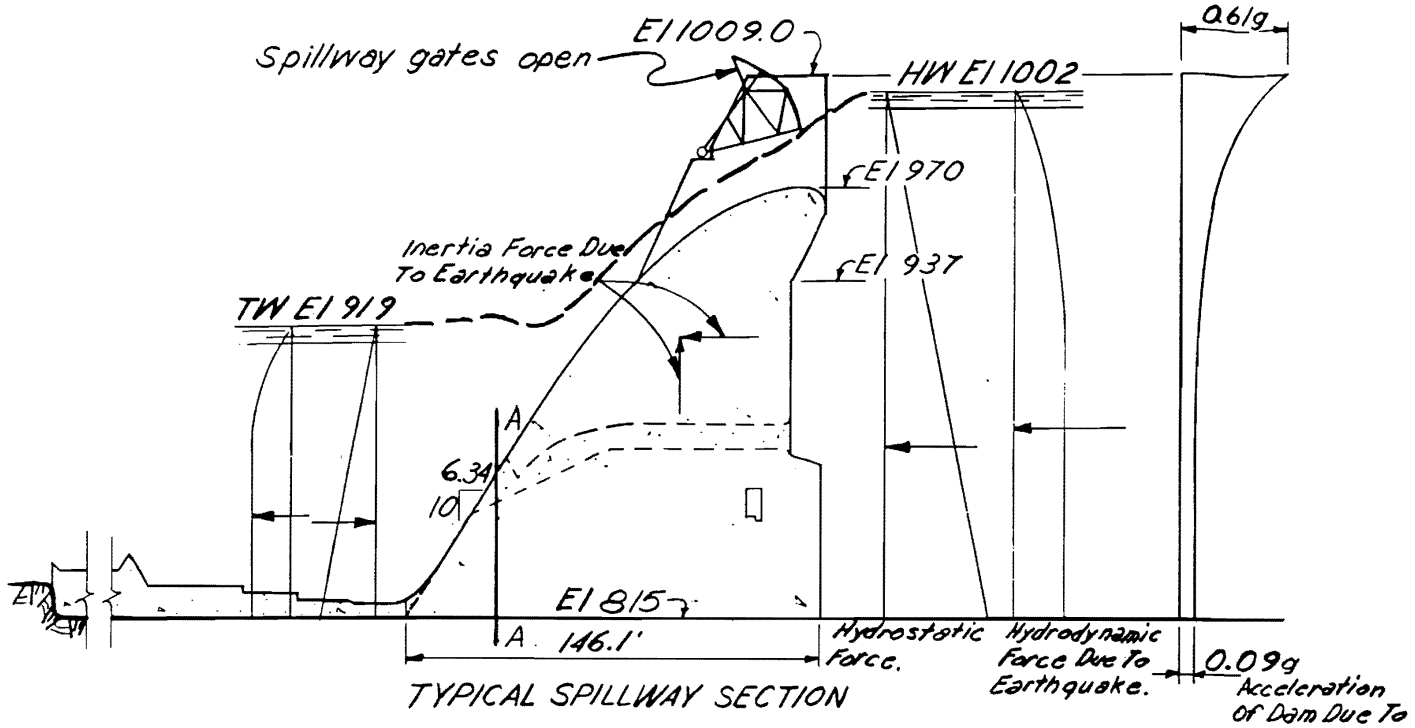
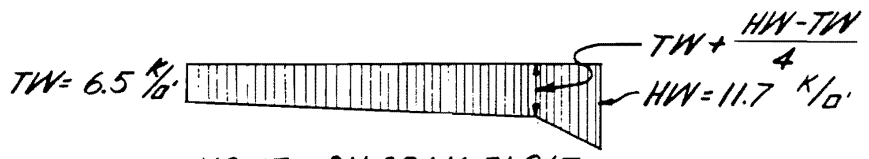


Figure 2.4-78 Embankment Results of Analysis For Operating Basis Earthquake - Cherokee Dam

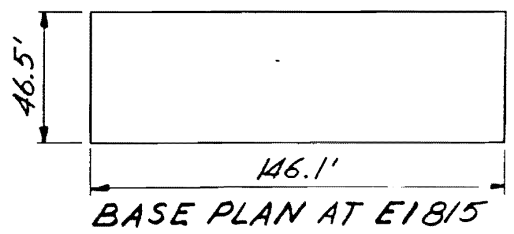
Figure 2.4-79 Assumed Condition of Dam After Failure PBE And 1/2 Probable Max Flood - Cherokee Dam



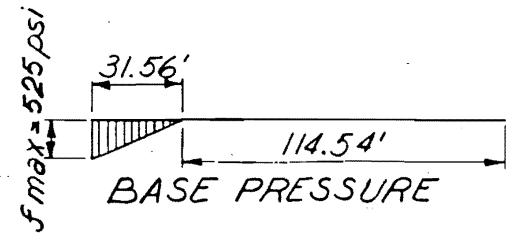
TYPICAL SPILLWAY SECTION



UPLIFT DIAGRAM EL 815
UPLIFT PRESSURES ASSUMED
TO ACT ON 100 % OF BASE AREA



BASE PLAN AT EL 815



BASE PRESSURE

* Shear, s, that is reqd for Q=1 is calculated from shear-friction formula, $Q = \frac{0.65\Sigma V + SA}{\Sigma H}$, A is assumed to be entire area.

** Shear stress, s, reqd for Q=1 considering portion of base in compression instead of entire base area.

ΣV	ΣH	ΣH/ΣV	Avg Shear, S	S Reqd For Q=1	f max	F.S.=ΣMR/ΣMo	Vertical Shear on Plane A-A
55,483K	60,245K	1.09	61.6 psi (entire base)	25psi* (170psi)**	525psi	1.06	156 psi

NOTES:
1. Vertical acceleration of the spillway at the base assumed to be 0.06 g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.13 g at the top.
2. Horizontal acceleration of the spillway at the base assumed to be 0.09g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.61g at the top.
3. Spillway gates assumed open for this analysis.

WATTS BAR NUCLEAR PLANT
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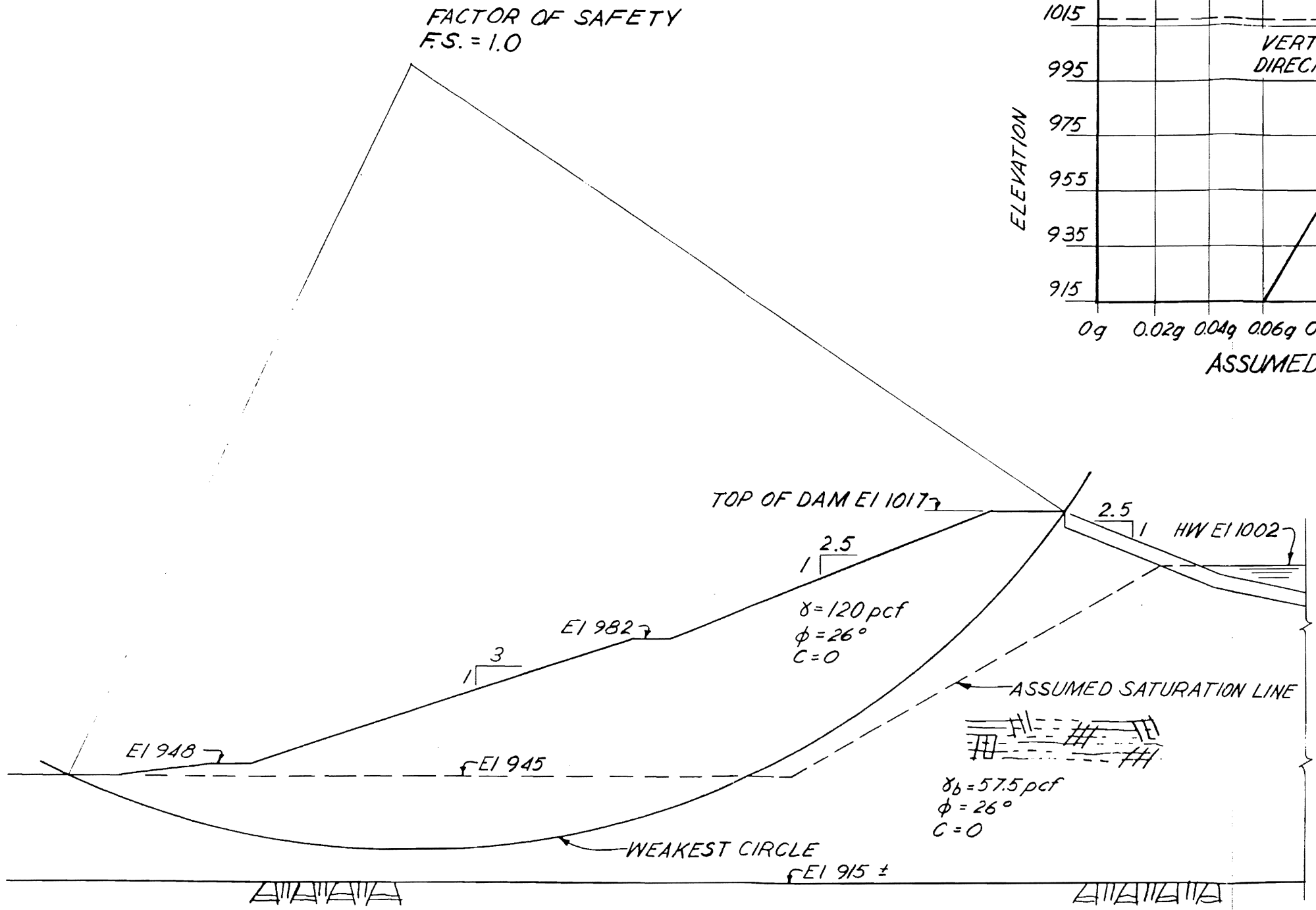
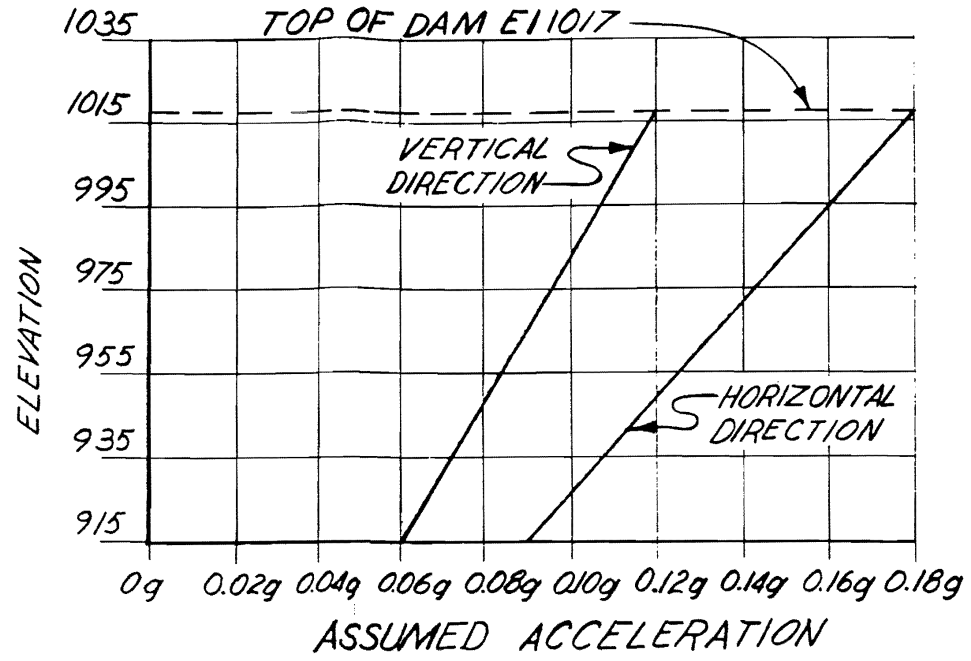
ANALYSIS REPORT

SPILLWAY & NONOVERFLOW
RESULTS OF ANALYSIS FOR
OPERATING BASIS EARTHQUAKE
Douglas Dam
Figure 2.4-80

Figure 2.4-80 Spillway & Nonoverflow Results of Analysis For Operating Basis Earthquake - Douglas Dam



SADDLE DAM No. 1



NOTES:
1. Analysis was made using the standard slip circle method.
2. Shear strengths of materials same as used in original analysis.

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
SADDLE DAM NO. 1 RESULTS OF ANALYSIS FOR OPERATING BASIS EARTHQUAKE Douglas Dam Figure 2.4-81

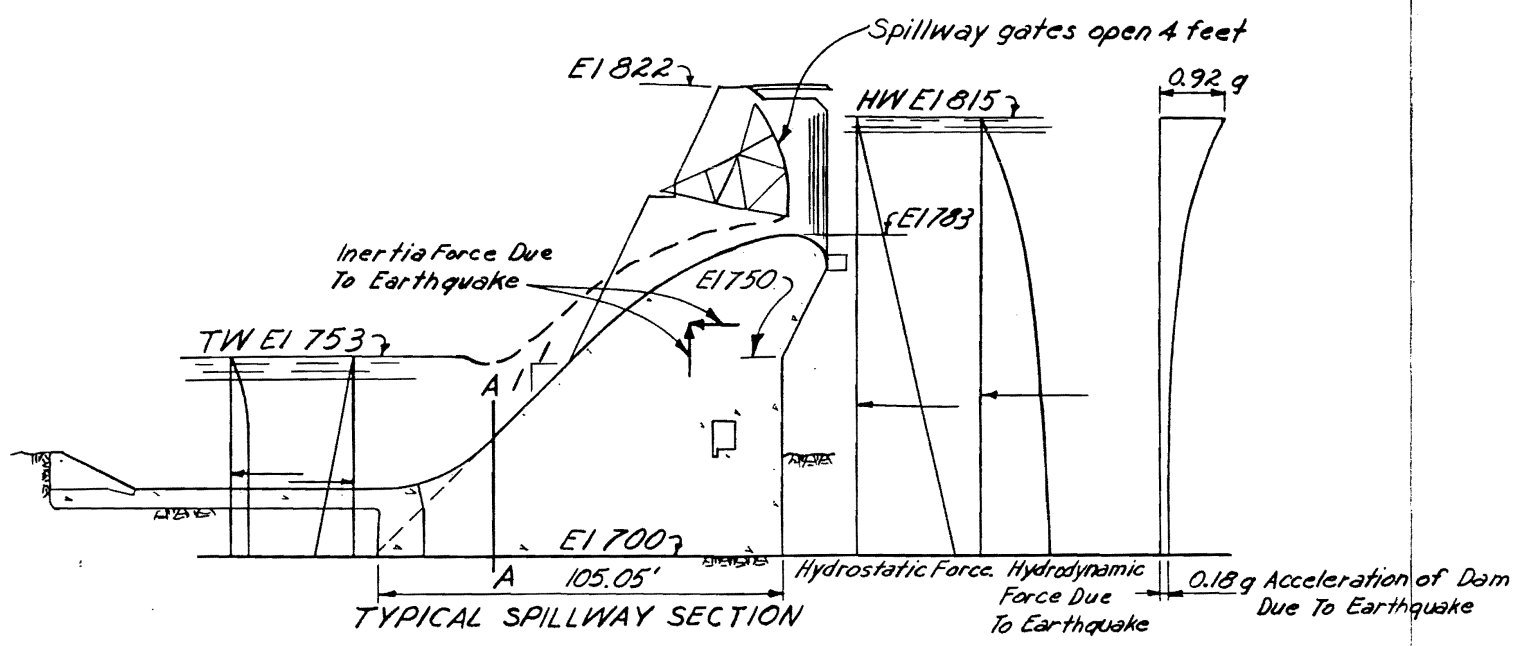
Figure 2.4-81 Saddle Dam No. 1 Results of Analysis For Operating Basis Earthquake - Douglas Dam

Figure 2.4-82 Douglas Dam Assumed Condition of Dam After Failure aBE And 1/2 Probable Maximum Flood - Douglas Project

Figure 2.4-83 Fontana Dam Assumed Condition of Dam after Failure OBE And 1/2 Probable Maximum Flood

Figure 2.4-84 Deleted by Amendment 63

Figure 2.4-85 Deleted by Amendment 63



NOTES:
1. Vertical acceleration of spillw at base assumed to be 0.12g By dynamic analysis, amplification of acceleration above the base was determined to be 0.24g at to
2. Horizontal acceleration of spillway at base assumed to b 0.18g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.92g at to
3. Spillway gates assumed ope 4 feet for this analysis.

* Shear, s, that is reqd for Q=1 is calculated from shear-friction formula, $\frac{0.65\,\Sigma V + SA}{\Sigma H}$, A is assumed to be entire area.

** For base at EI 700 resultant falls outside base under DBE.

BASE PRESSURE**

ΣV	ΣH	Σ H / Σ V	Avg shear	S reqd for Q=1	f max	FS ΣMR / ΣMo
18,254 K	29,534 K	1.62	42 psi (entire base)	25psi*	* *	0.9

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
SPILLWAY RESULTS OF ANALYSIS FOR SSE EARTHQUAKE Fort Loudoun Dam Figure 2.4-86

Figure 2.4-86 Spillway Results of Analysis For SSE Earthquake Fort Loudoun Dam

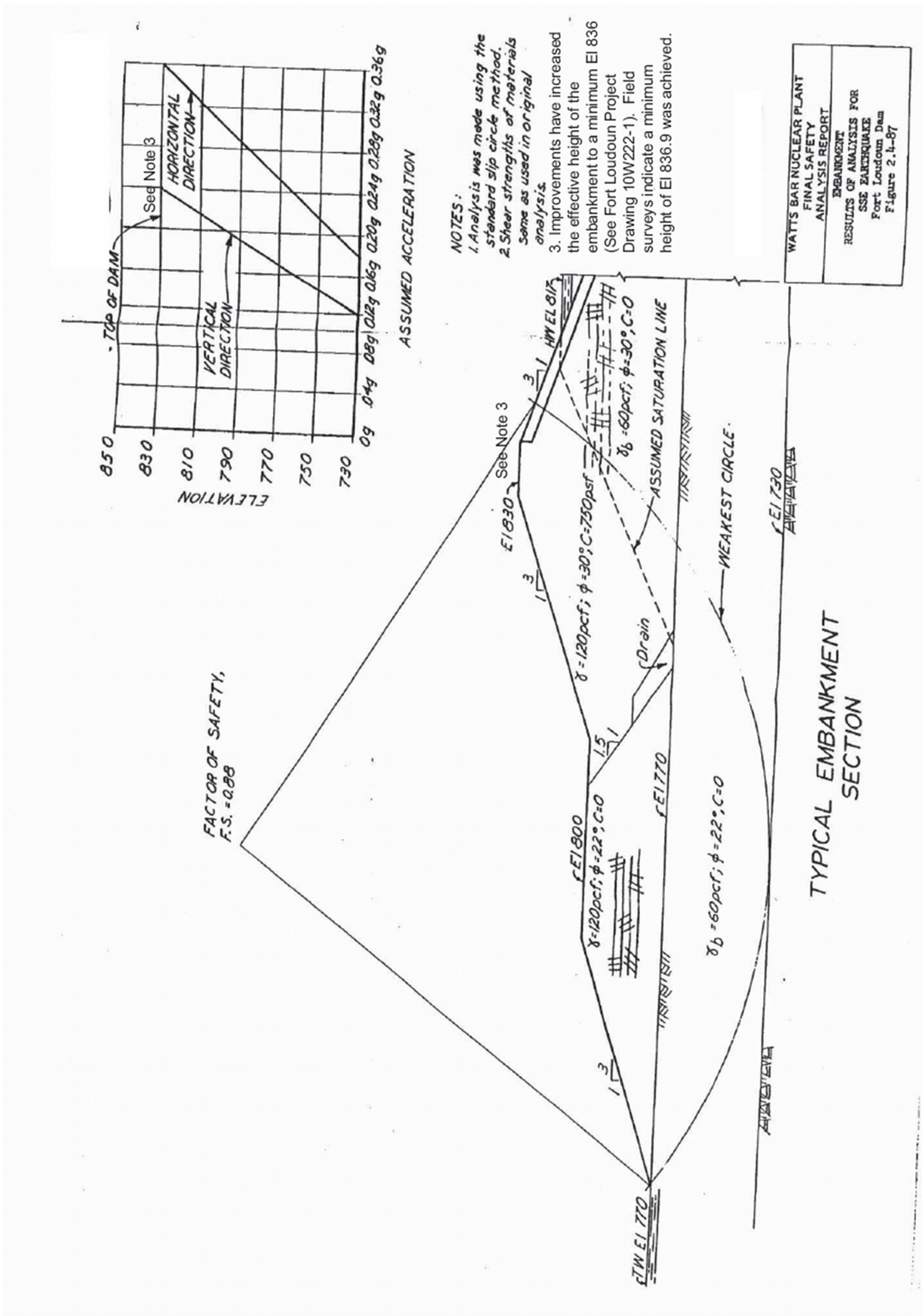


Figure 2.4-87 Embankment Results of Analysis For SSE Earthquake Fort Loudoun Dam

Figure 2.4-88 Fort Loudoun Dam Assumed Condition of Dam After Failure SSE Combined With a 25 Year Flood - Fort Loudoun Dam

Figure 2.4-89 Tellico Dam Assumed Condition of Dam After Failure SSE Combined With a 25 Year Flood Tellico Project

Figure 2.4-90 Norris Dam SSE + 25 Year Flood Judged Condition of Dam After Failure - Norris Dam

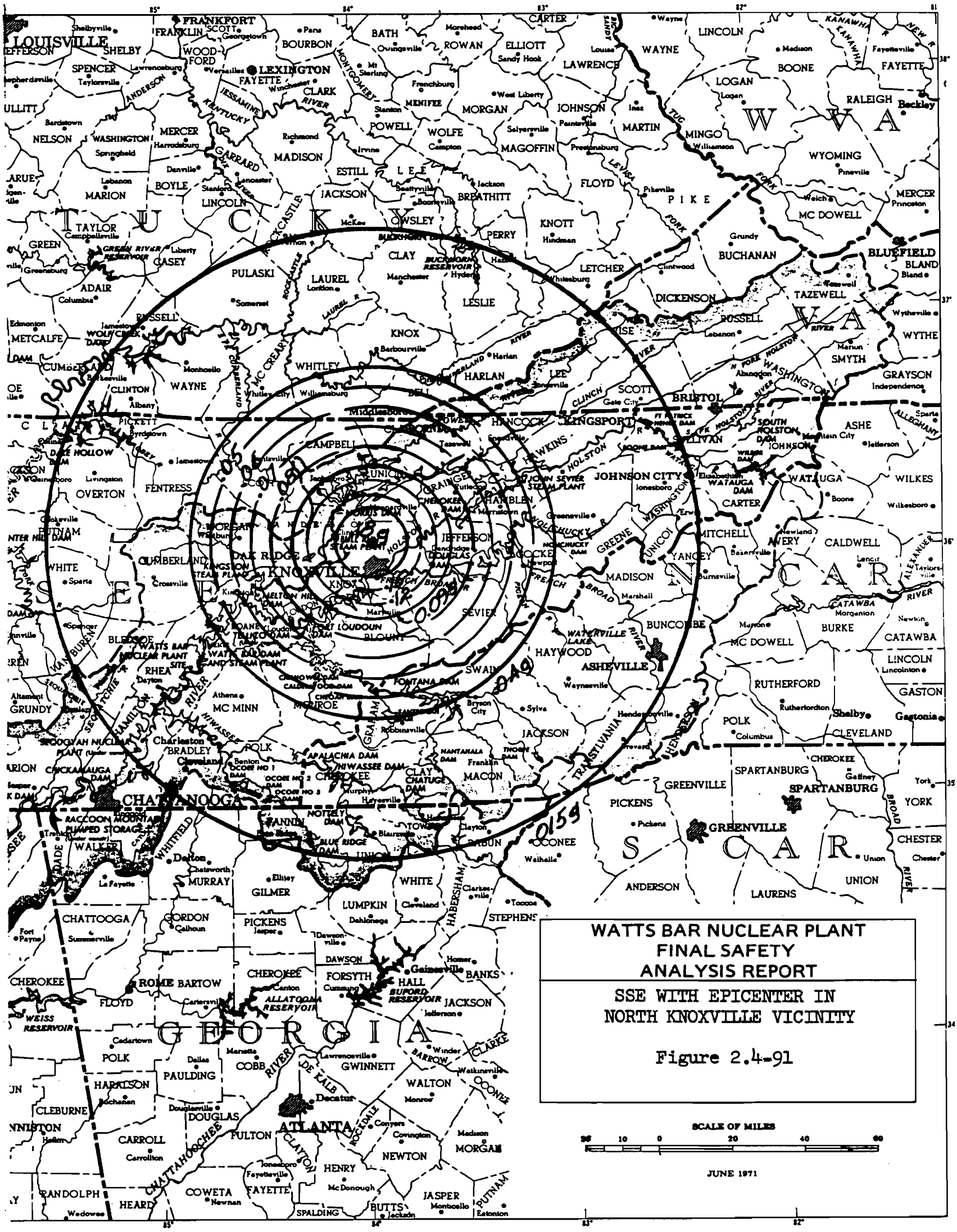


Figure 2.4-91 SSE With Epicenter In North Knoxville Vicinity

Figure 2.4-92 Deleted by Amendment 103

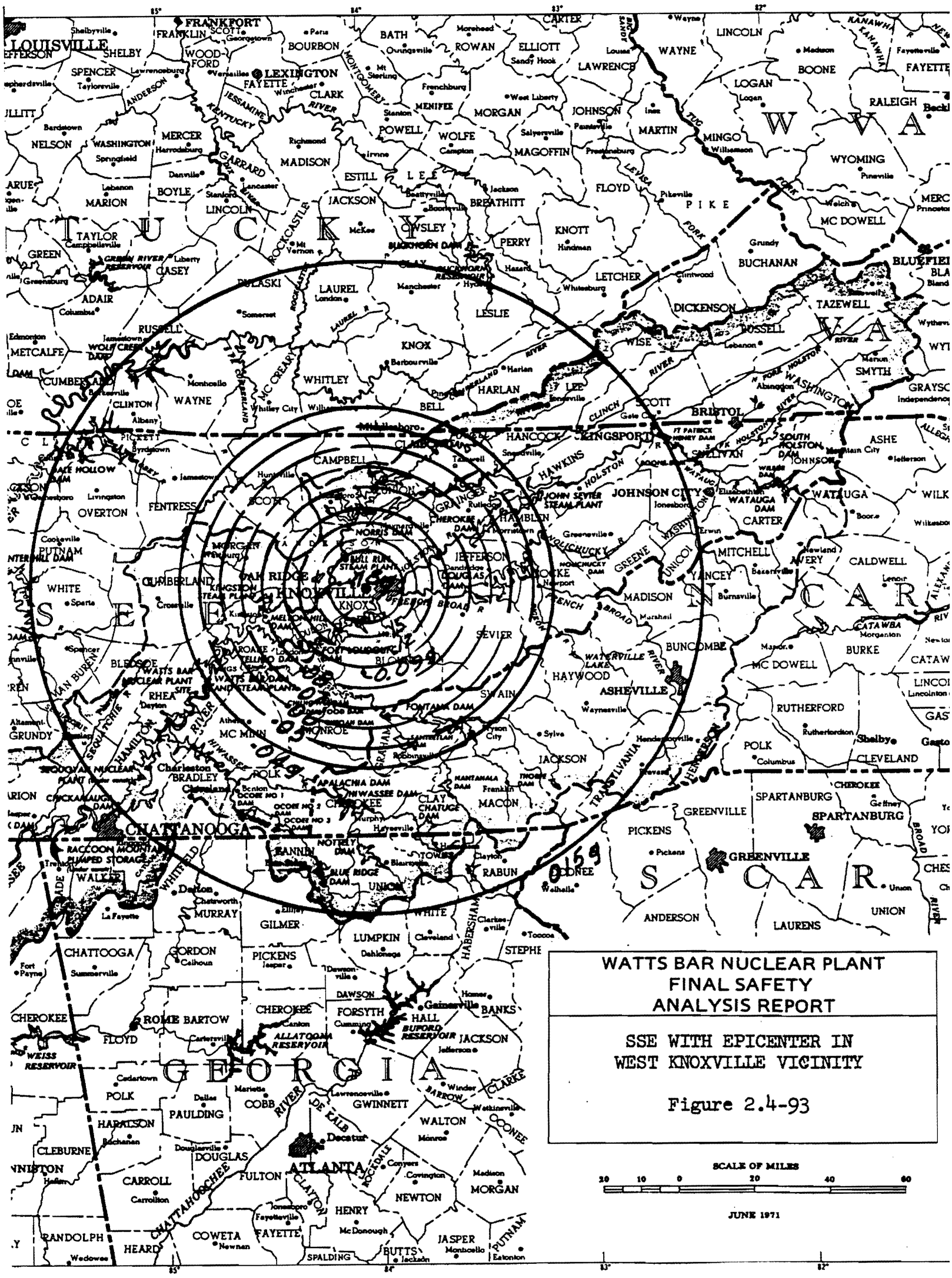


Figure 2.4-93 SSE With Epicenter In West Knoxville Vicinity

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

LOCATION OF THE SSE FOR
SIMULTANEOUS FAILURE OF THE
DOUGLAS AND FONTANA DAMS

Figure 2.4-94

BOUNDARY OF TENNESSEE RIVER WATERSHED

Figure 2.4-94 Location of SSE For Simultaneous Failure of The Douglas and Fontana Dams

Figure 2.4-95 Deleted by Amendment 103

Figure 2.4-96 Deleted by Amendment 103

Figure 2.4-97 Deleted by Amendment 103

Figure 2.4-98 Not Used

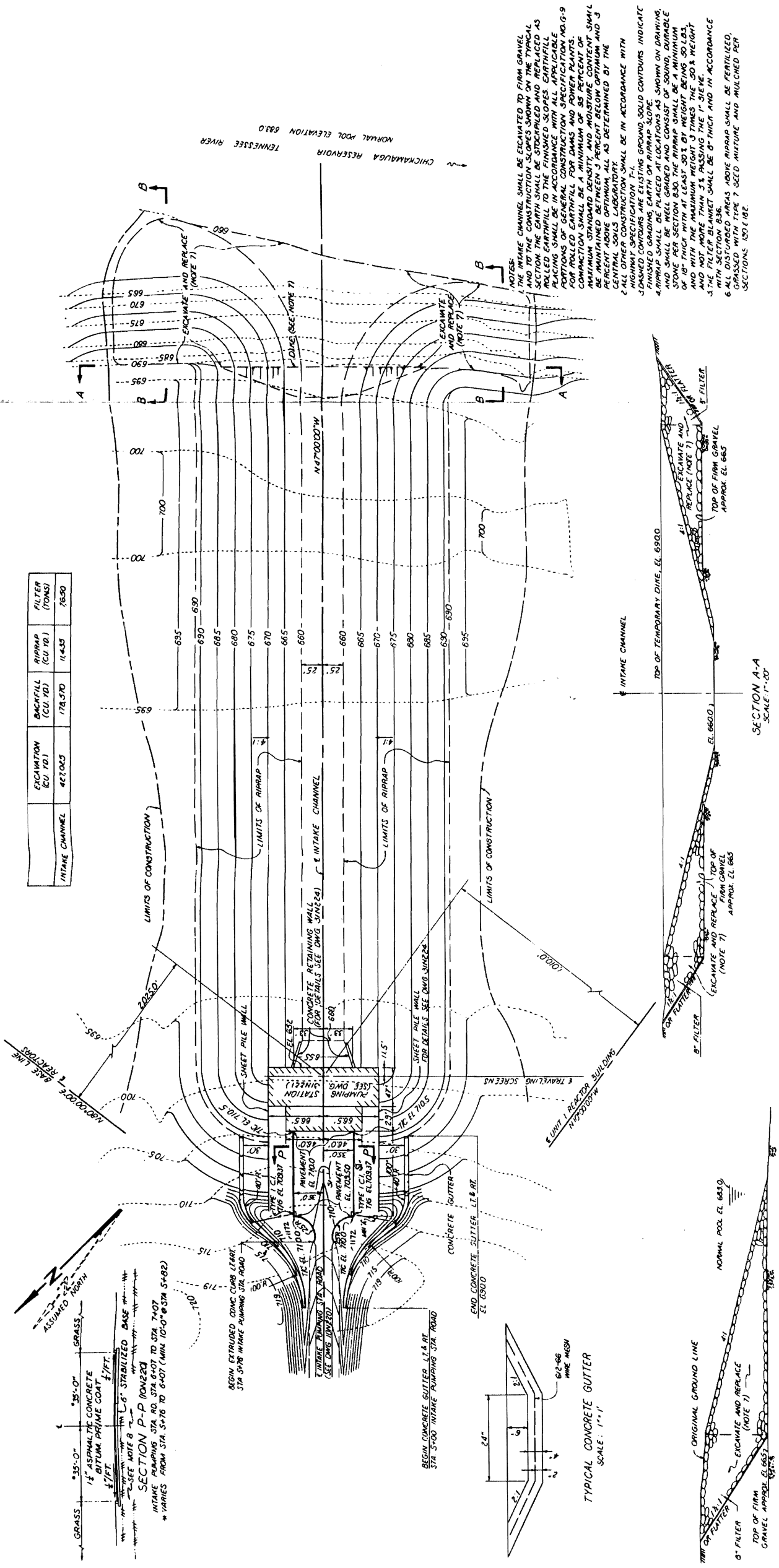
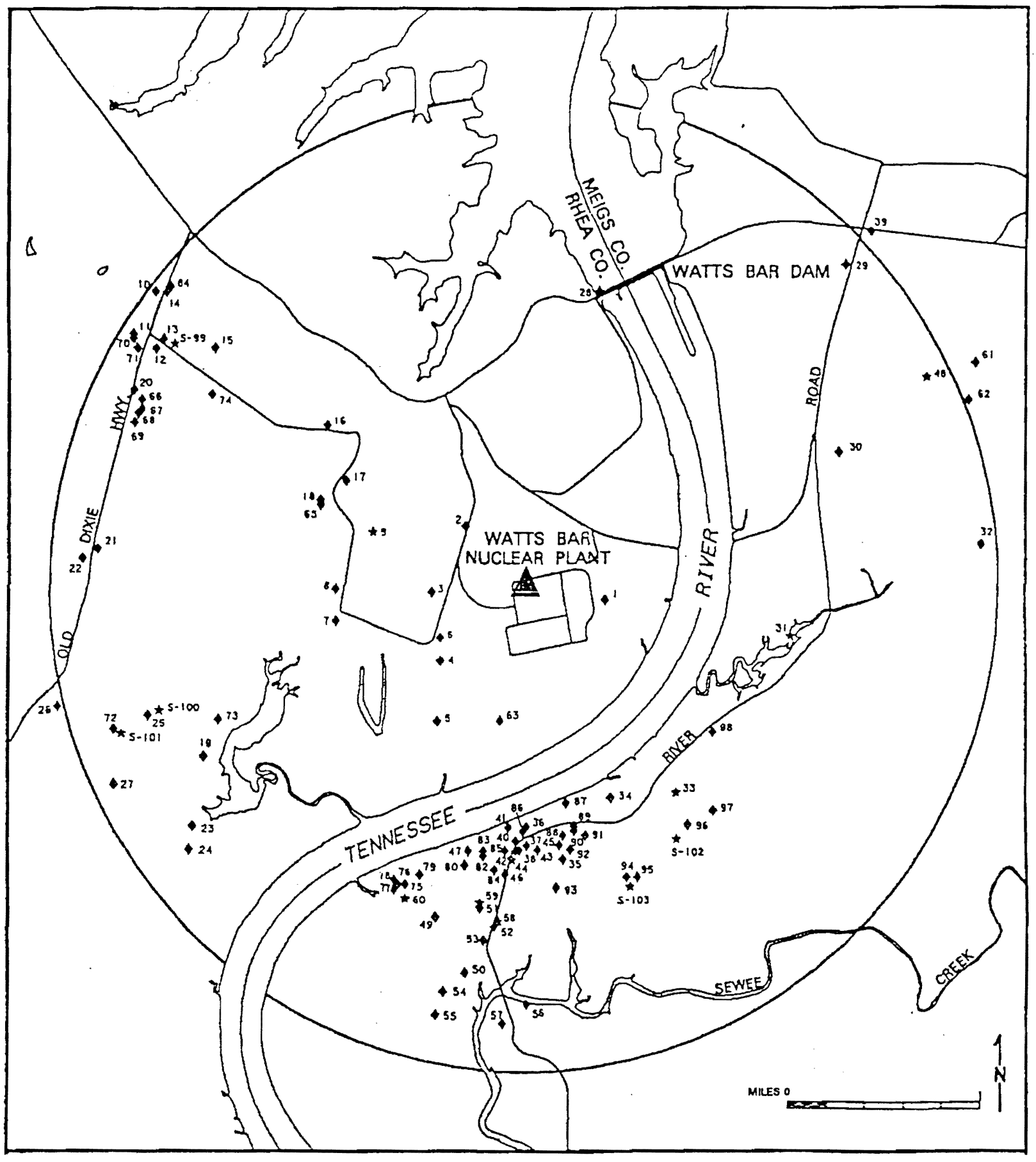


Figure 2.4-99 Grading Plan Intake Channel

Figure 2.4-100 Deleted by Amendment 83

Figure 2.4-101 Deleted by Amendment 33



LEGEND

- ♦ WELL
- ★ SPRING
- — ROADS
- ○ 2 MILE RADIUS OF PLANT SITE

AMENDMENT 83

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

WELL AND SPRING INVENTORY
WITHIN 2 MILE RADIUS OF WATTS BAR
NUCLEAR PLANT SITE
FSAR FIG 2.4-102

Figure 2.4-102 Wells And Spring Inventory Within 2-Mile Radius of Watts Bar Nuclear Plant Site

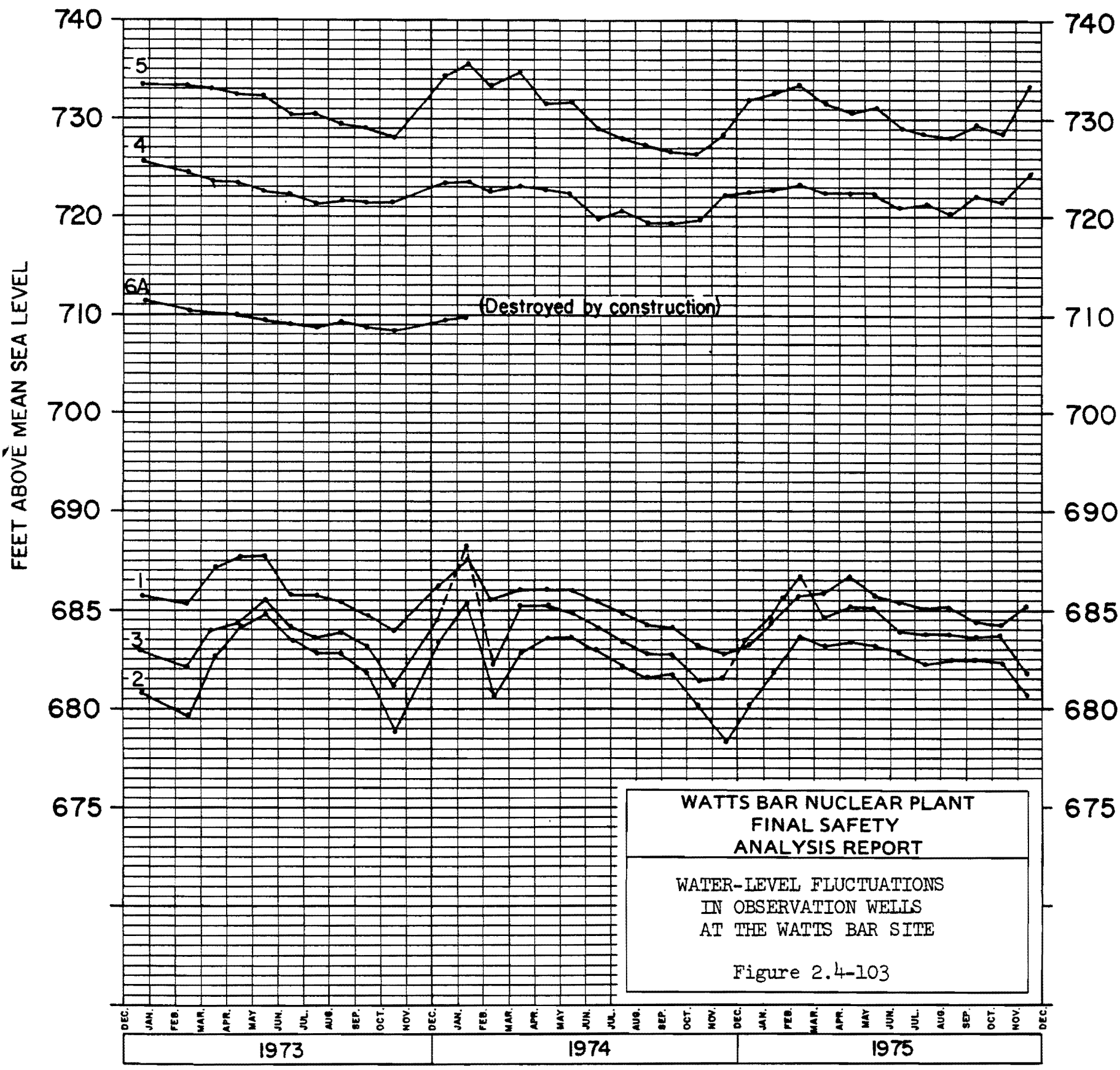
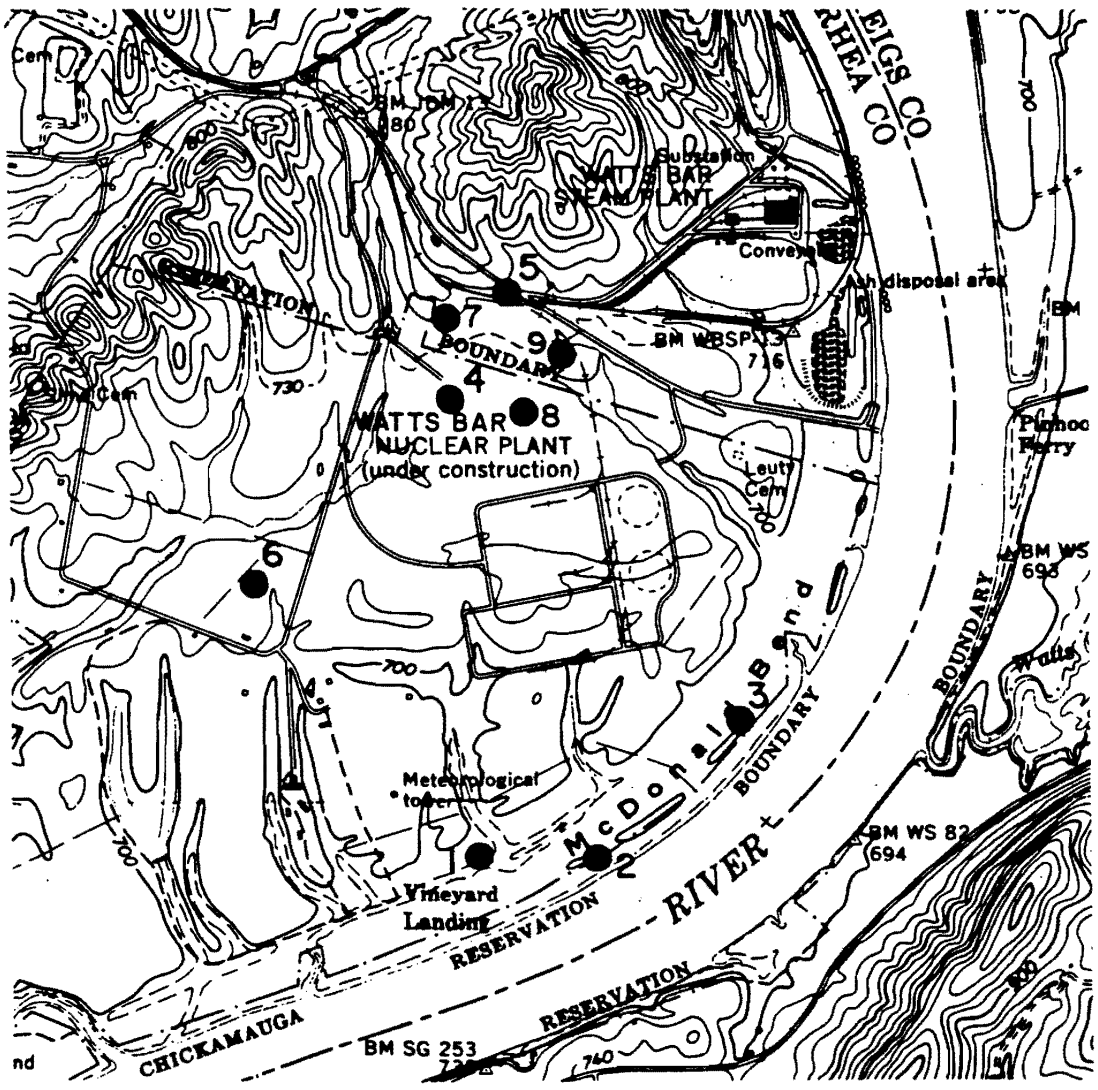


Figure 2.4-103 Water-Level Fluctuations In Observation Wells at The Watts Bar Site



NOTE:

Topographic base from U.S.G.S - T.V.A. 7.5 minute quadrangle, Decatur, Tenn., 118-SE, Contour interval 20 feet.

LEGEND:

●^{2} — Ground-water observation well showing number.

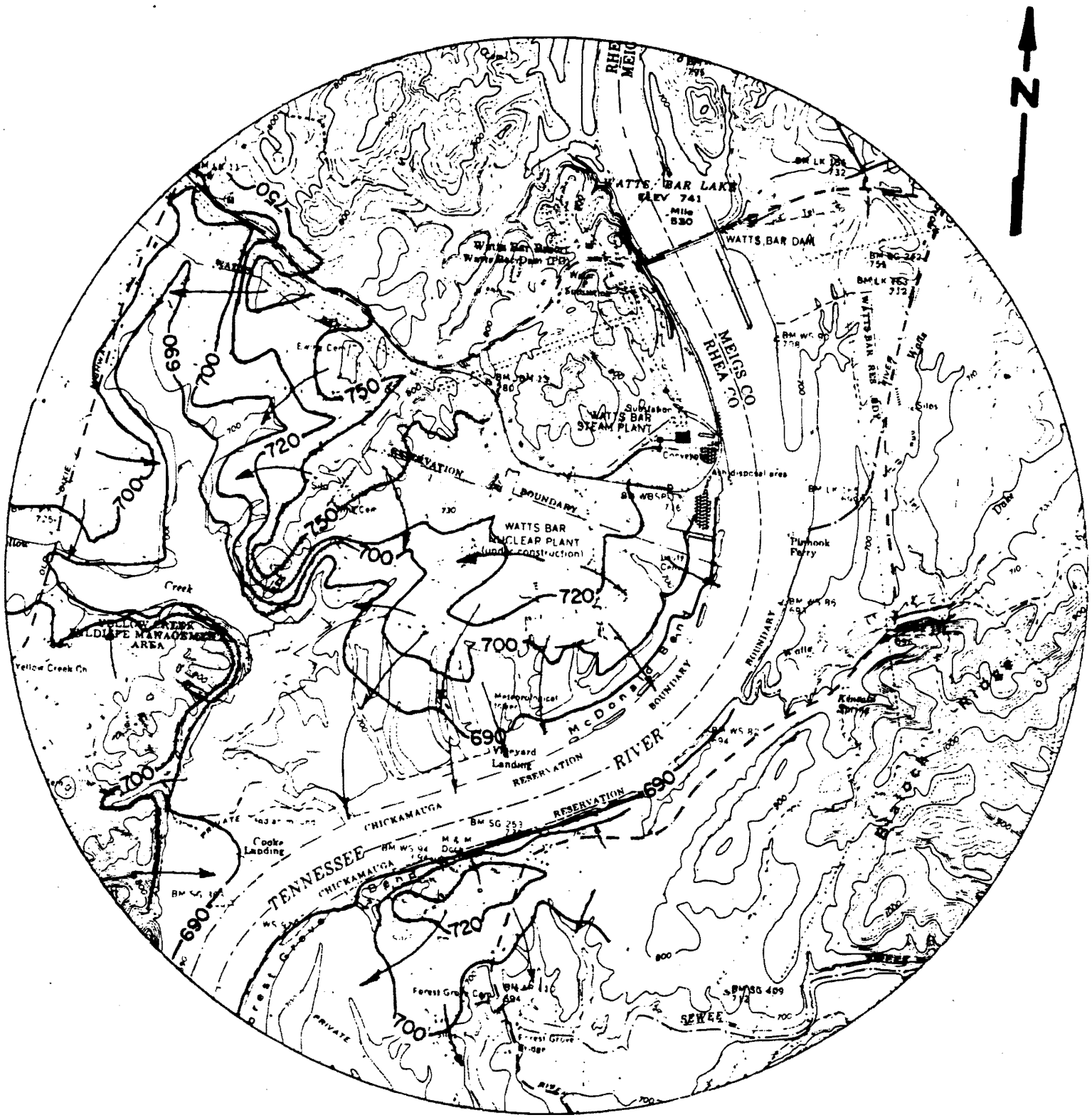
SCALE:

1000 0 1000 2000 Feet

Revised by Amendment 50

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
LOCATIONS OF GROUND - WATER OBSERVATION WELLS FIGURE 2.4-104

Figure 2.4-104 Locations of Ground - Water Observation Wells



EXPLANATION:

700 — Water table contour, in feet above mean sea level.

— General direction of ground-water movement.

SCALE:

2000 0 4000 Feet

Revised by Amendment 50

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
GENERALIZED WATER-TABLE CONTOUR MAP Figure 2.4-105

Figure 2.4-105 Generalized Water-Table Contour Map January 1972

Revised by Amendment 50

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
MECHANICAL-FLOW DIAGRAM FUEL POOL COOLING AND CLEANING SYSTEM
47W855-1 R13 FIG. NO. 2.4-106

Figure 2.4-106 Mechanical - Flow Diagram Fuel Pool Cooling and Cleaning System

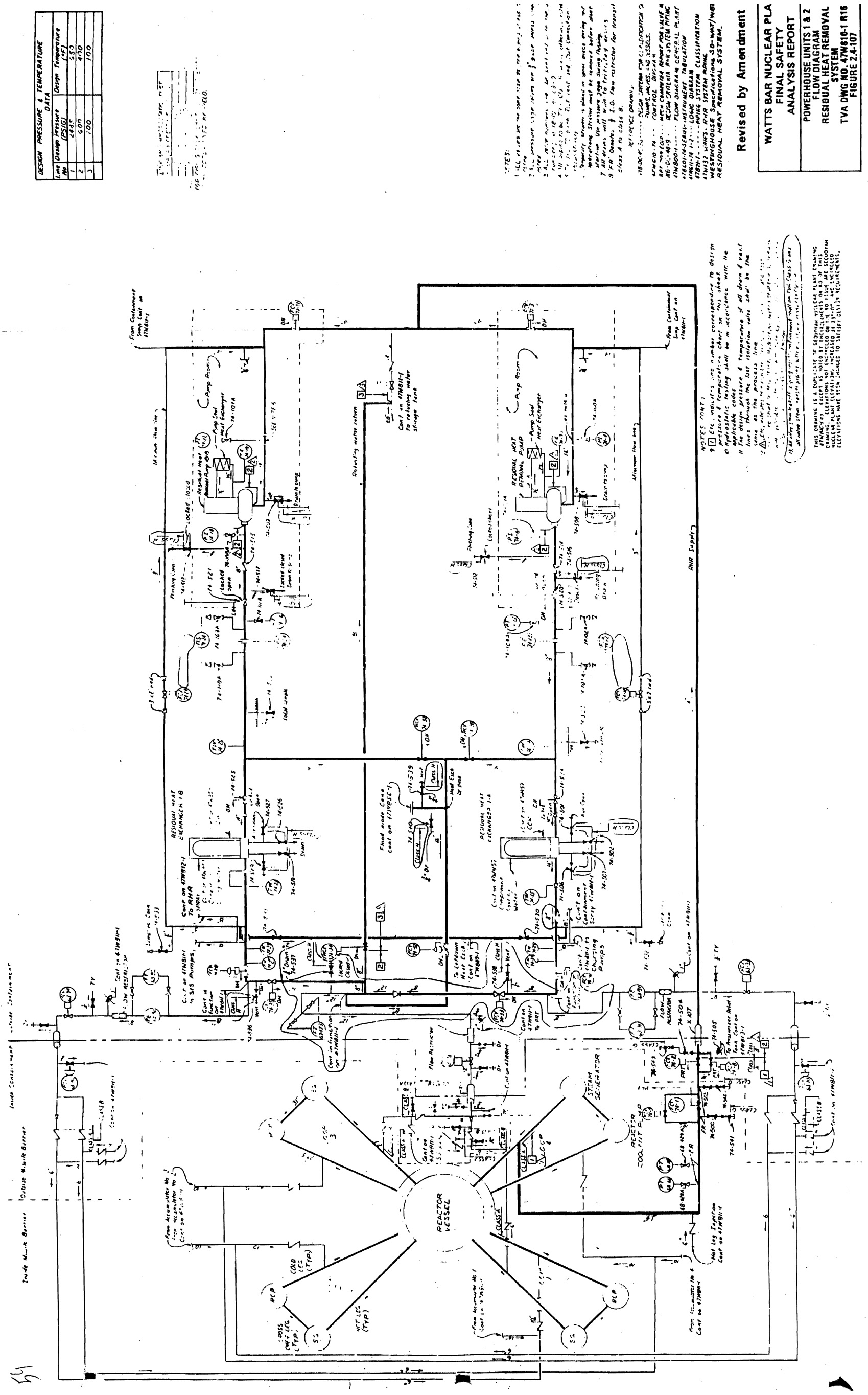
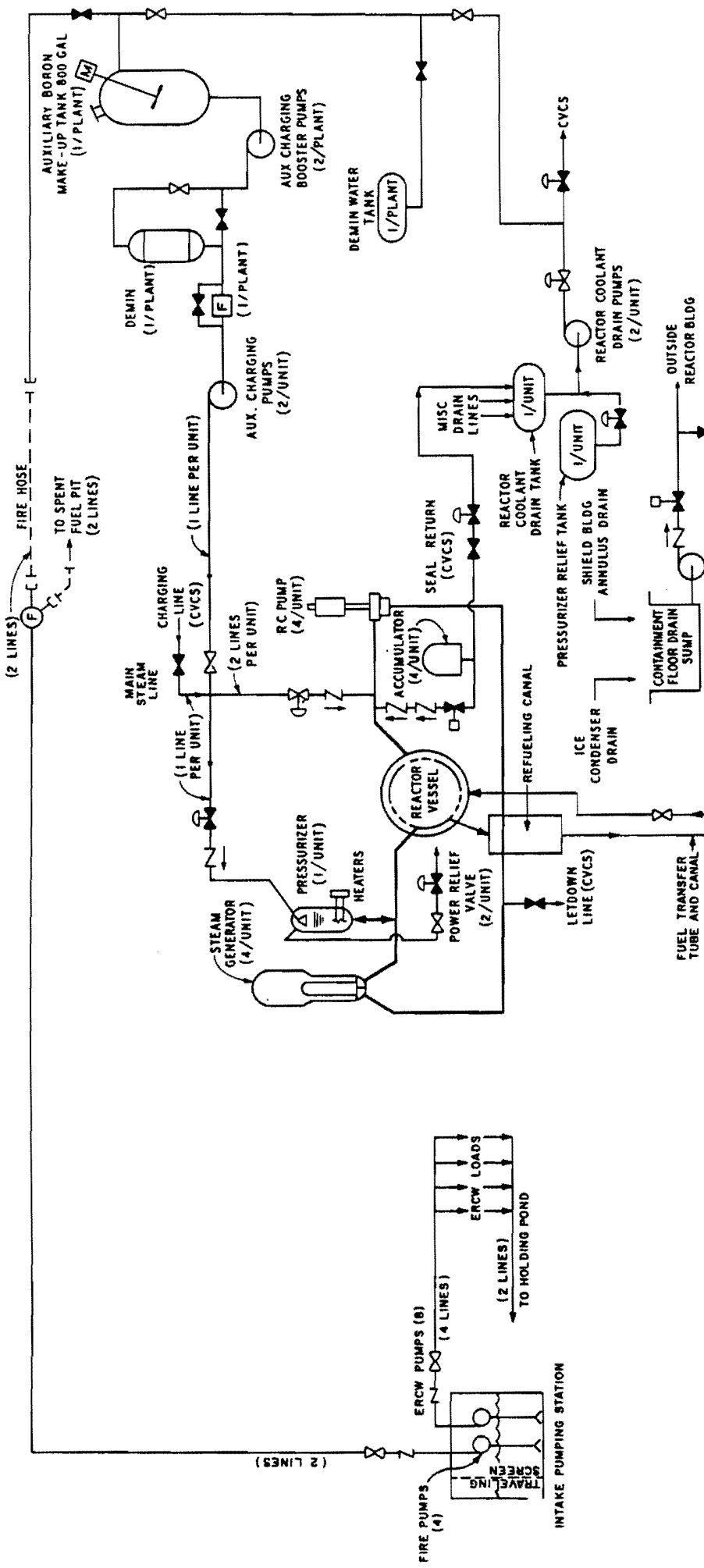


Figure 2.4-107 Powerhouse Units 1 & 2 Flow Diagram - Residual Heat Removal System

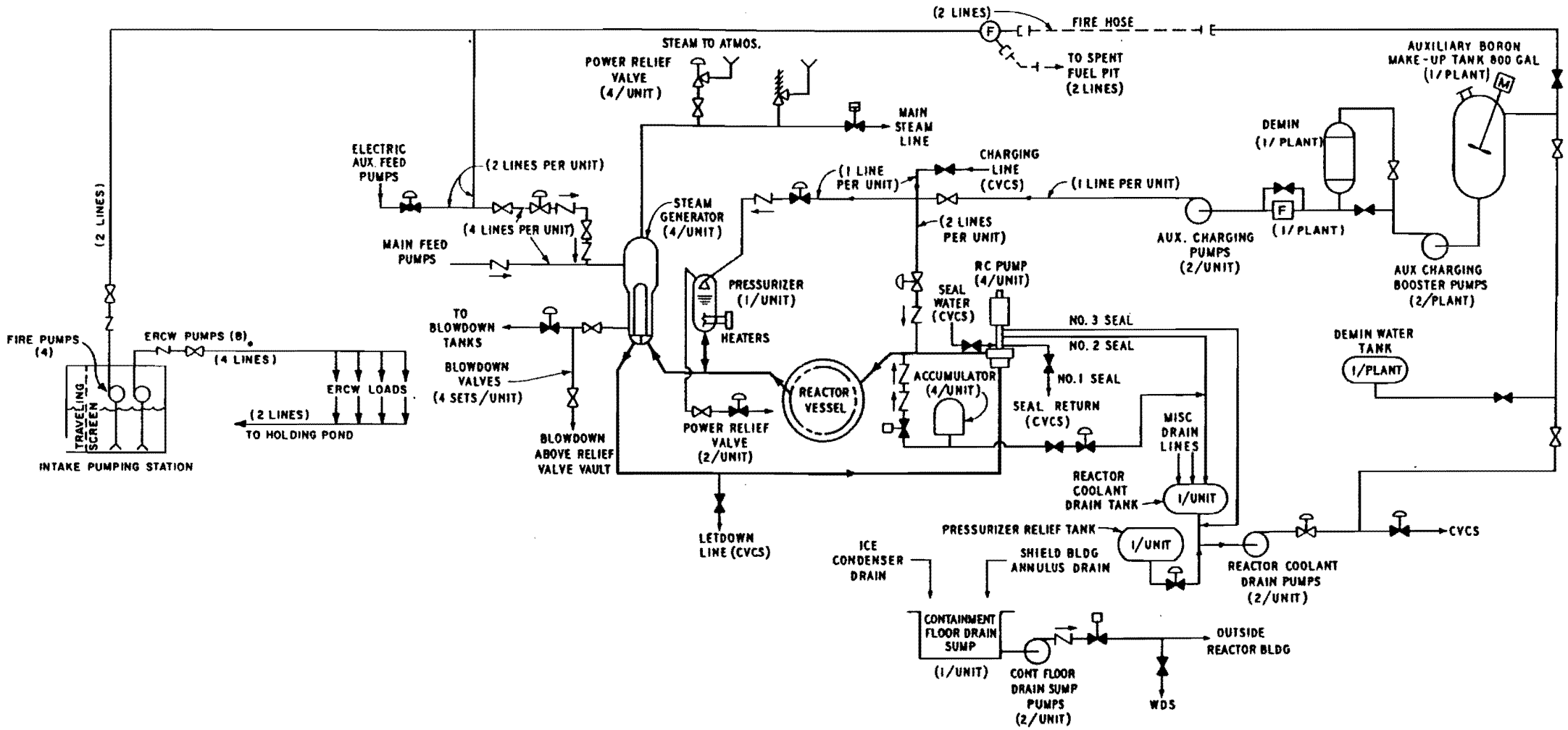


WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

SCHEMATIC FLOW DIAGRAM
FLOOD PROTECTION PROVISIONS
OPEN REACTOR COOLING
(unit 1 shown, unit 2 similar)
Figure 2.4-108

NOTES:
DRAWING DOES NOT INCLUDE:
VENTILATION SYS., EMERGENCY POWER SYS.,
SAMPLING SYS., DETAILS OF ERCW LOADS,
SPOOL PIECE CONNECTIONS.

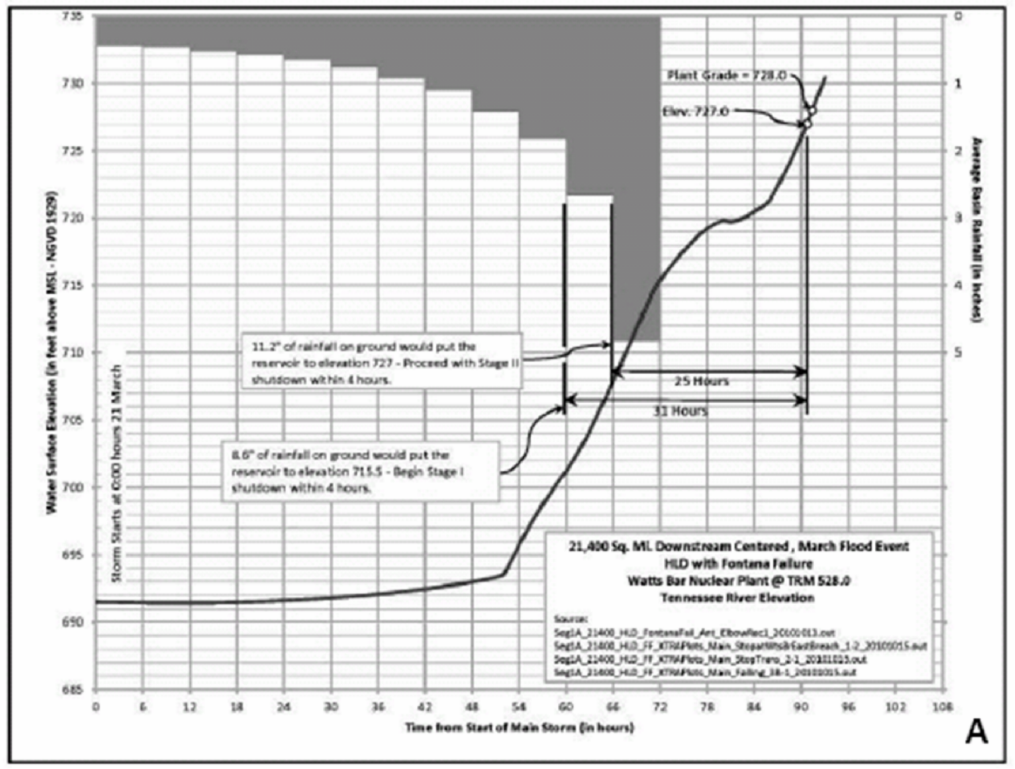
Figure 2.4-108 Schematic Flow Diagram Flood Protection Provisions Open Reactor Cooling (Unit 1 Shown, Unit 2 Similar)

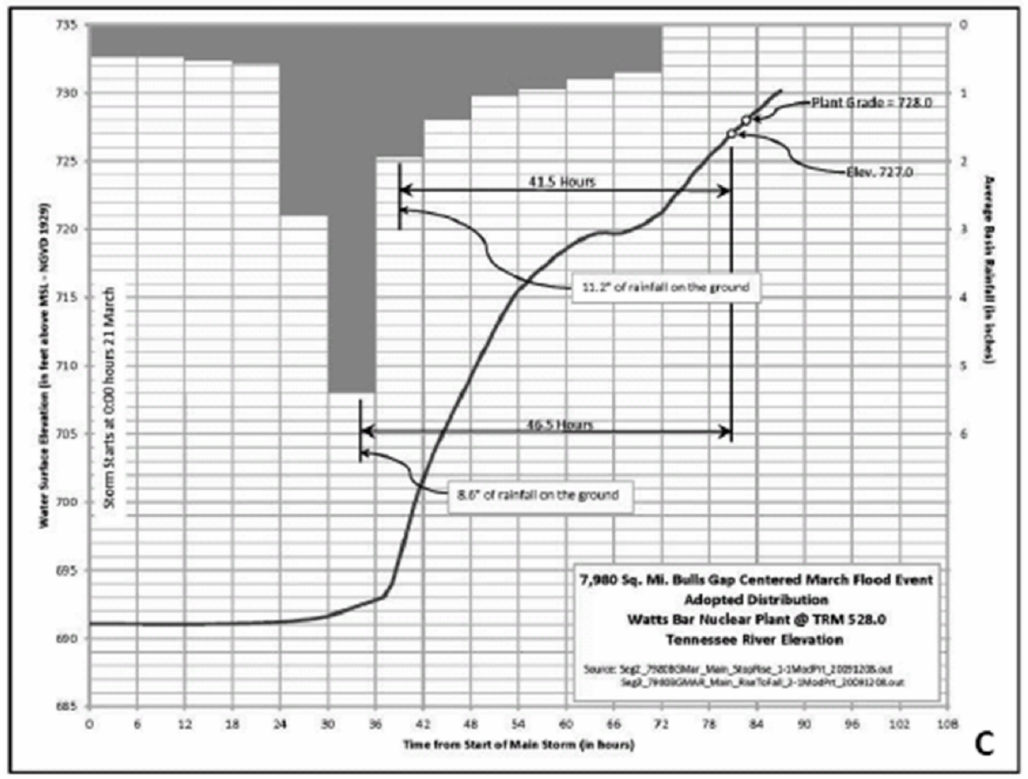


NOTES:
DRAWING DOES NOT INCLUDE:
VENTILATION SYS., EMERGENCY POWER SYS., SAMPLING SYS., DETAILS OF ERCW LOADS, SPOOL PIECE CONNECTIONS.

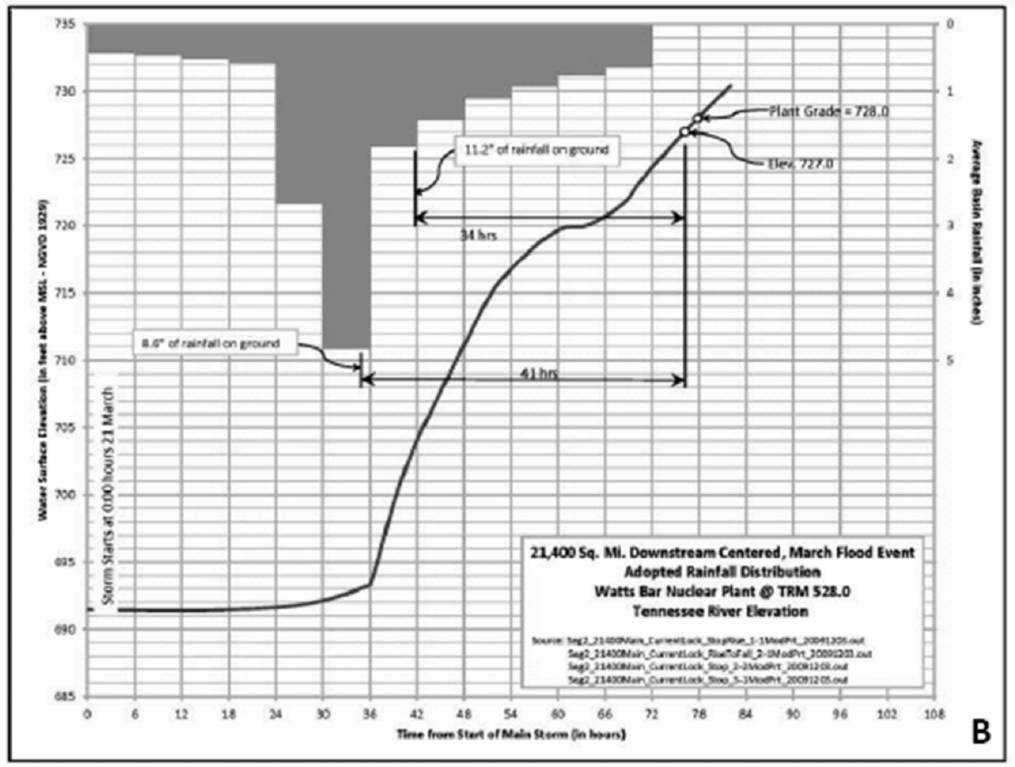
WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
SCHEMATIC FLOW DIAGRAM FLOOD PROTECTION PROVISIONS NATURAL CONVECTION COOLING (unit 1 shown, unit 2 similar) Figure 2.4-109

Figure 2.4-109 Schematic Flow Diagram Flood Protection Provisions Natural Convection Cooling (Unit 1 Shown, Unit 2 Similar)





NOTE: Times shown allow 4 hours for communications and forecast computations.



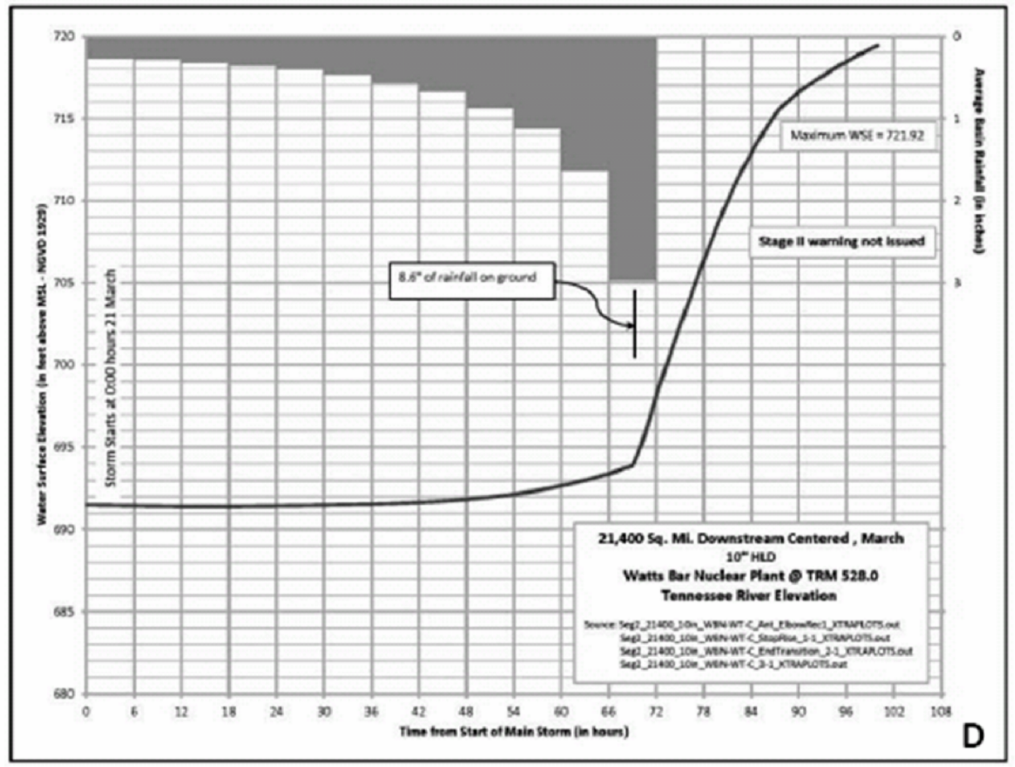
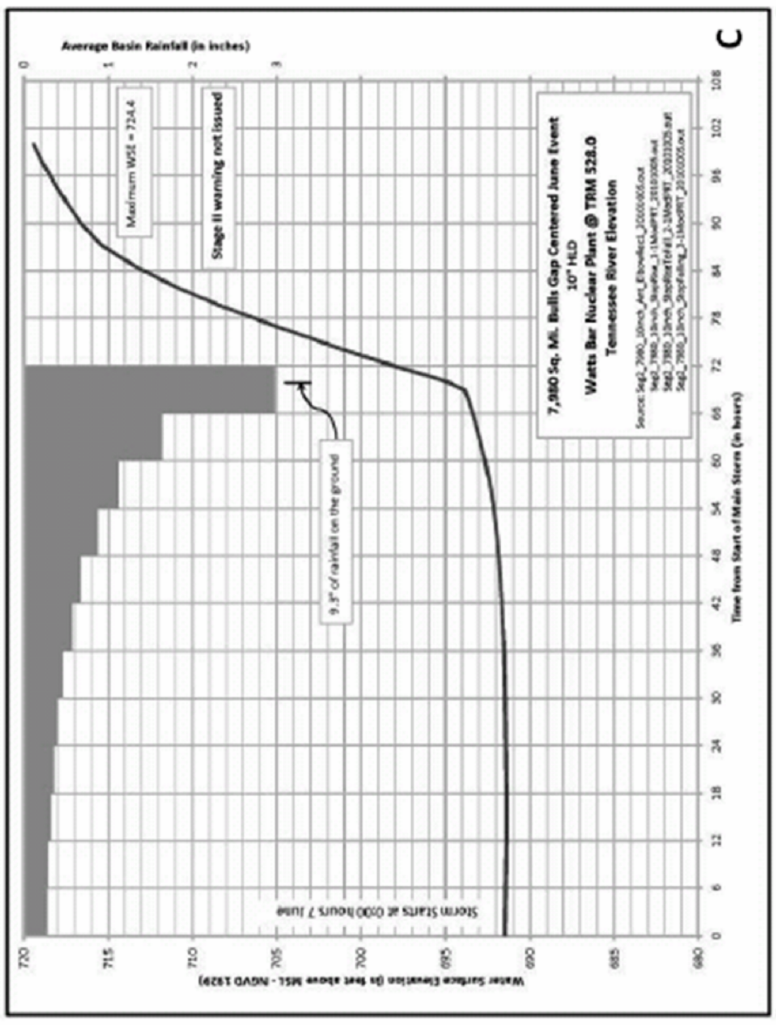
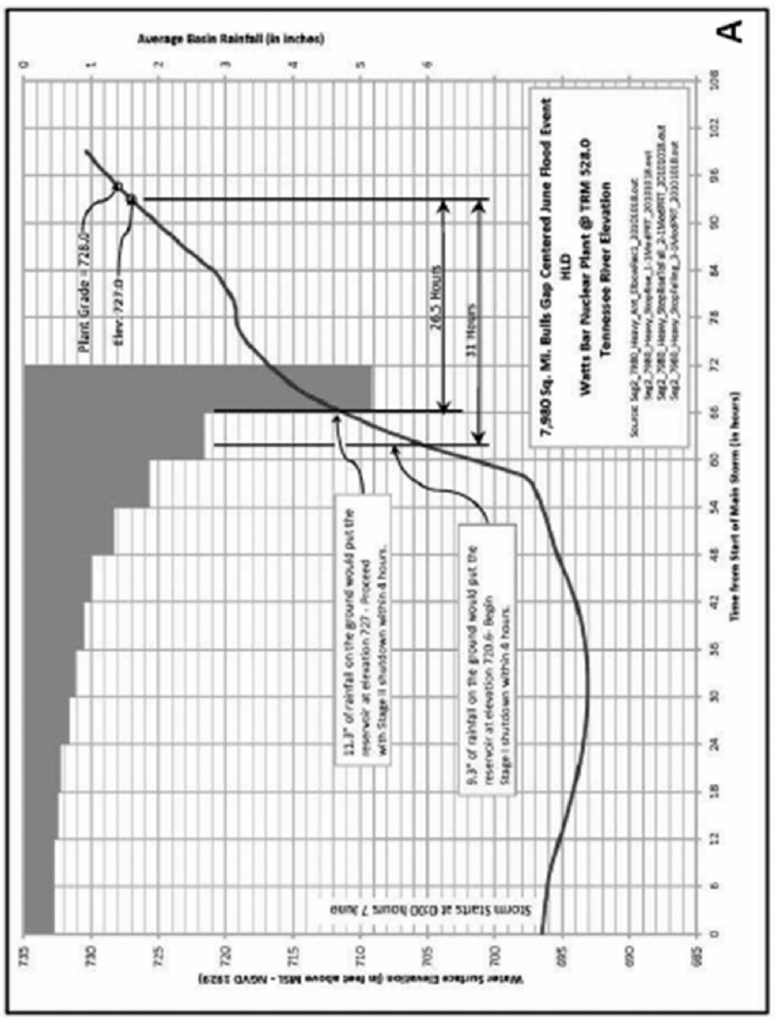


Figure 2.4-110 (Sheet 1) Watts Bar Nuclear Plant Rainfall Flood Warning Time Basis For Safe Shutdown For Plant Flooding - Winter Events





NOTE: Times shown allow 4 hours for communications and forecast computations.

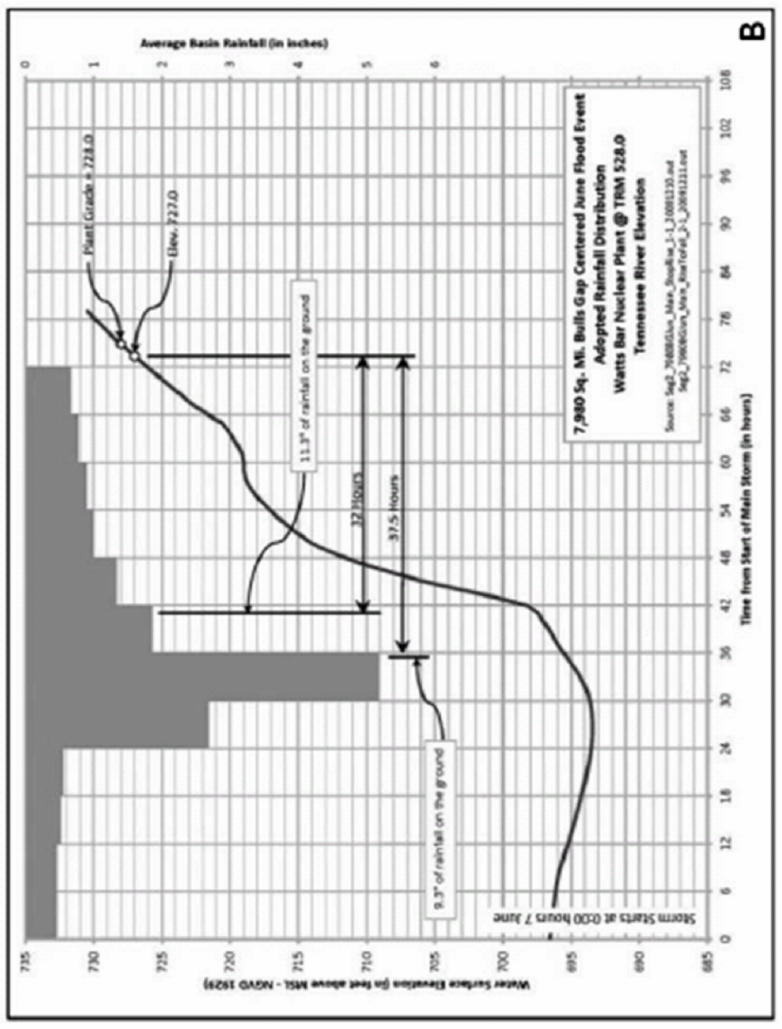


Figure 2.4-110 (Sheet 2) Watts Bar Nuclear Plant Rainfall Flood Warning Time Basis For Safe Shutdown For Plant Flooding - Summer Events

Figure 2.4-111 Deleted by Amendment 103

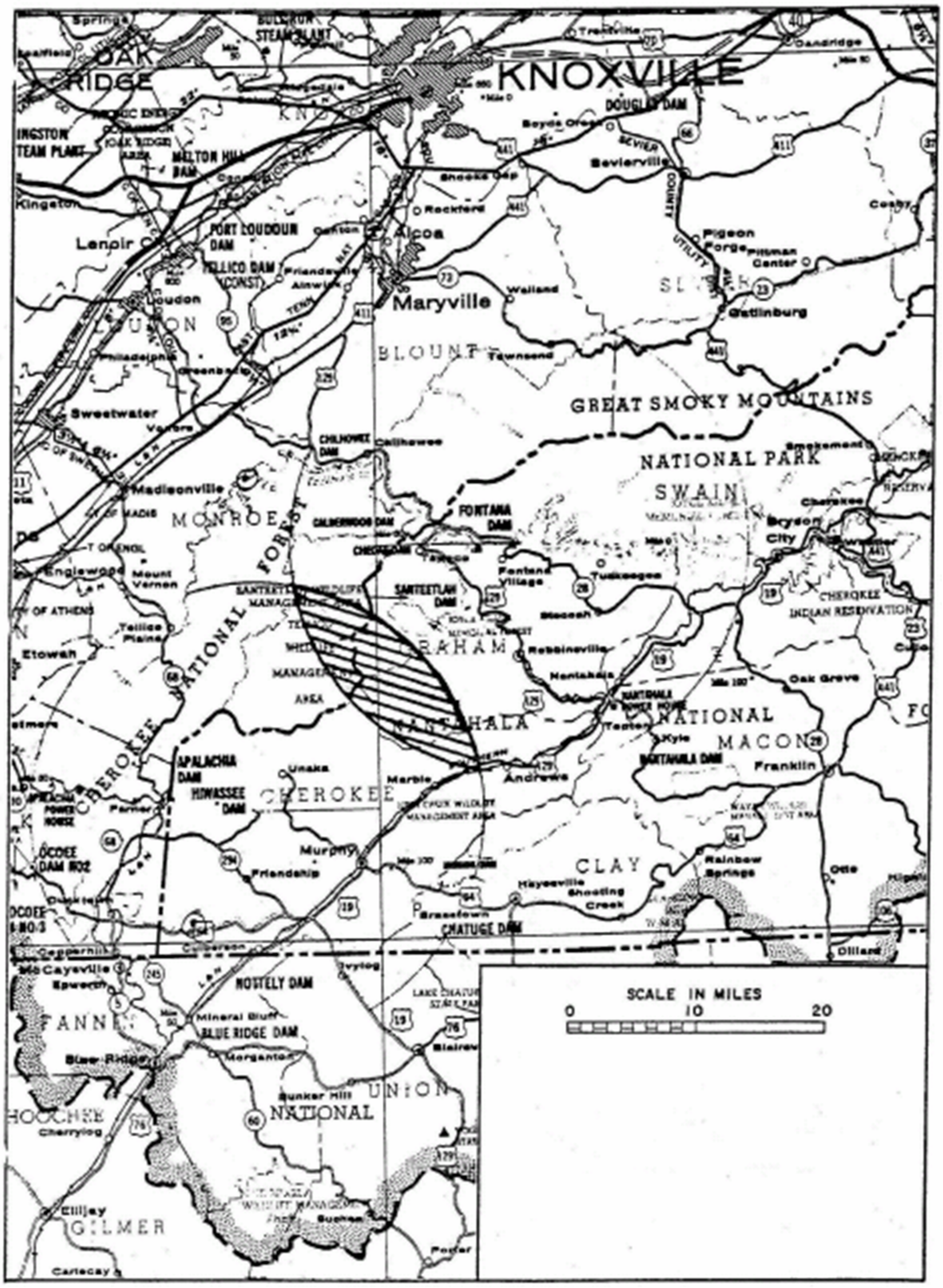


Figure 2.4-112 OBE with Epicenter Within Area Shown

Figure 2.4-113 Deleted by Amendment 107

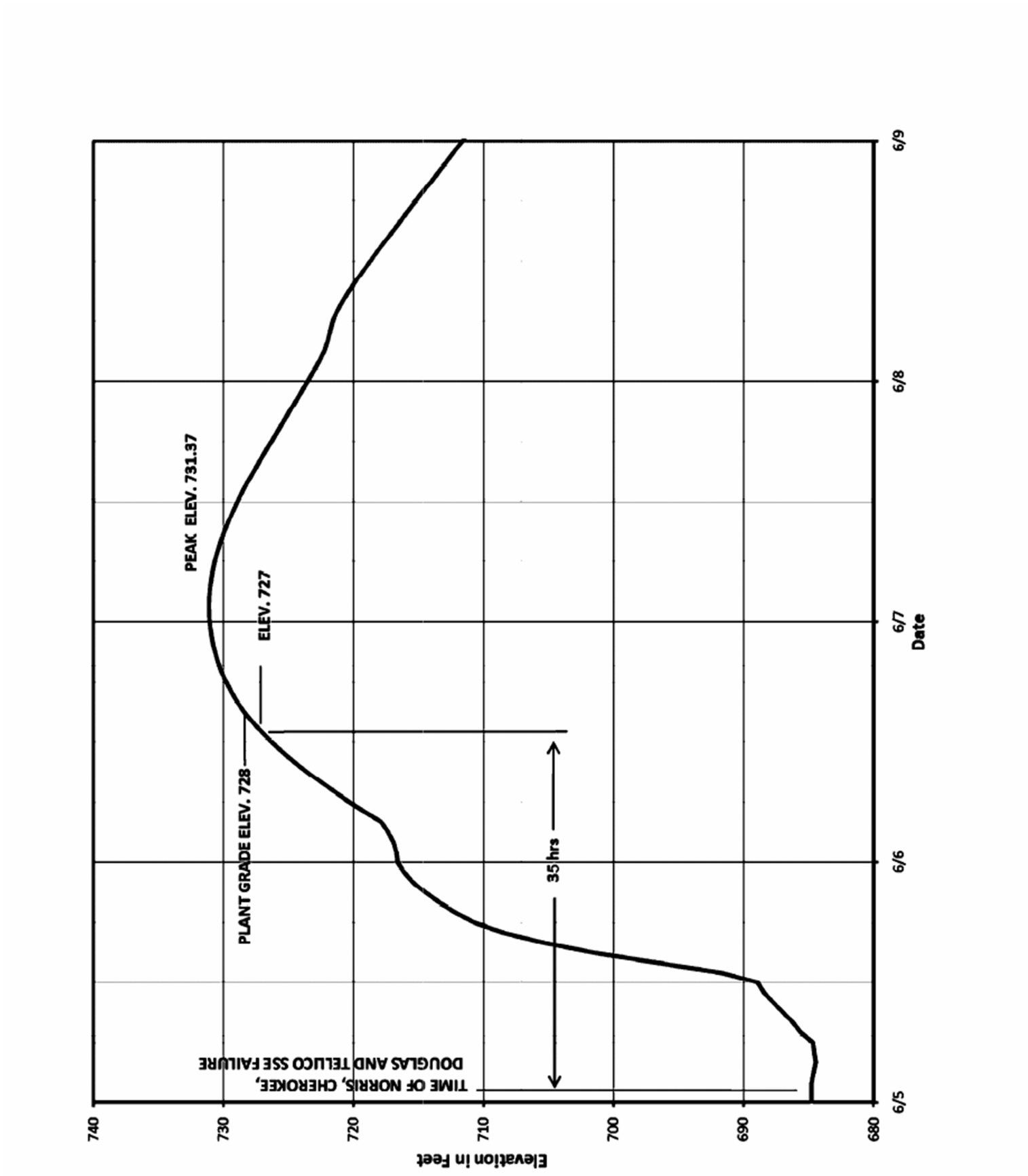


Figure 2.4-114 SSE Failure of Norris, Cherokee, Douglas, and Tellico Dams with 25-Year Flood Failure Wave at Watts Bar Nuclear Plant

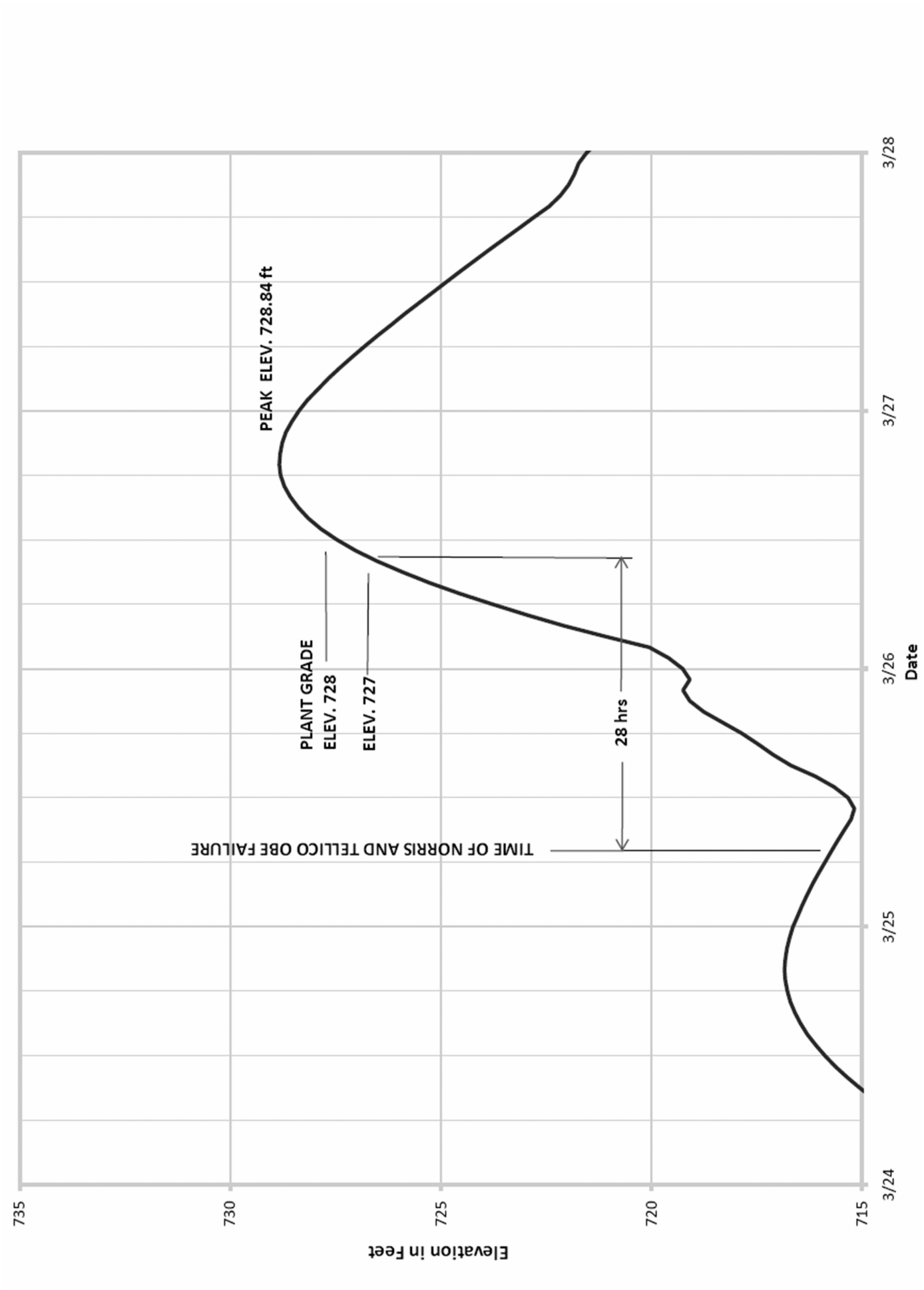


Figure 2.4-115 OBE Failure of Norris and Tellico Dams with 1/2 PMF Event Failure Wave at Watts Bar Nuclear Plant

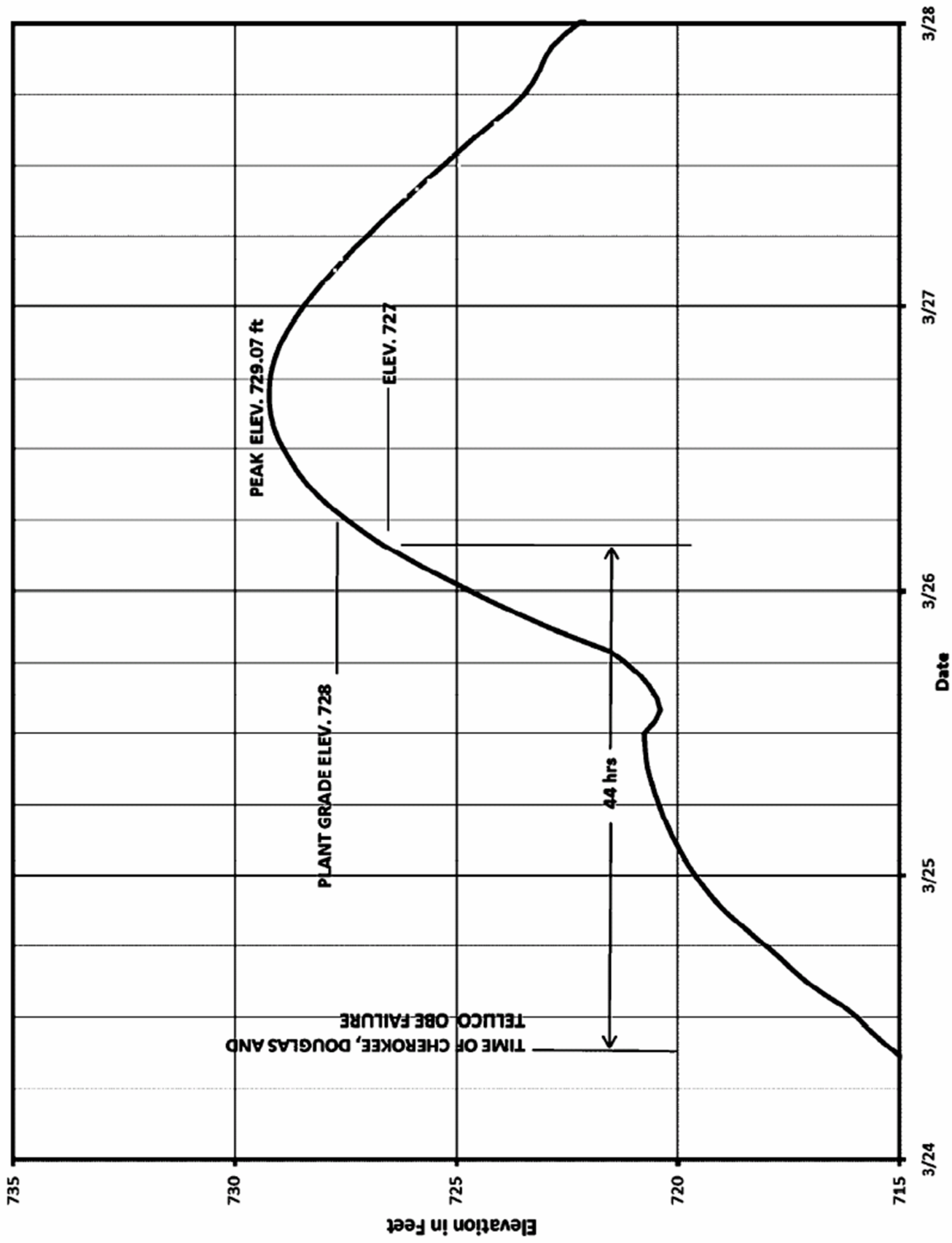


Figure 2.4-116 OBE Failure of Cherokee, Douglas and Tellico Dams with 1/2 PMF Event Failure Wave at Watts Bar Nuclear Plant