boundaries per 10 CFR 73. The control of personnel access to the exclusion area during emergencies is discussed in the Radiological Emergency Plan for the Sequoyah Nuclear Plant.

2.1.2.2 Boundaries for Establishing Effluent Release Limits

The effluent boundary (or unrestricted area boundary) is shown in Figure 2.1.2-2. The boundary of the Unrestricted Area (as defined in 10 CFR 20) is the same as the site boundary, but does not include the area over bodies of water. In accordance with the SQN Technical Specifications, limits for gaseous effluent releases are established for areas at or beyond the unrestricted area boundary using the methodology of the Offsite Dose Calculation Manual (ODCM). The distances from the plant to these areas are listed in Table 11.3.9-1 consistent with the ODCM. Routine releases of radioactivity meet the requirements of 10 CFR 20 and 10 CFR 50, Appendix I.

2.1.2.3 The Restricted Area

An area inside the exclusion area boundary is designated as the Restricted Area (as defined in 10 CFR 20). Access to this area is controlled for the purpose of protection of individuals from exposure to radiation and radioactive materials. The restricted area boundary can be adjusted, or temporary restricted areas established, as necessary, for the purpose of radiation protection.

2.1.3 Population and Population Distribution

Present and projected population information is contained in this section. Population data for 1985 are based on the Provisional Estimates of the Population of Counties, July 1, 1985. Population data for 1990 are based on the "1990 Census of Population" for Tennessee, North Carolina, Georgia, and Alabama. Projected population data are based on "County Projection to 2040" by the Regional Economic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, 1992. The allocation of county population into the various segments was based on a count of dwelling units from 1985 low-level aerial photography within ten miles of the site and census and 1:250,000 topographic maps for the remaining area.

2.1.3.1 Population Within 10 Miles

Population is distributed rather unevenly within 10 miles of the Sequoyah Nuclear Plant site. Over 50 percent of the 1990 population was in only seven sectors of the 5- to 10-mile range. These sectors are from S to and including NW (going clockwise around the compass). This concentration is a reflection of suburban Chattanooga and the town of Soddy-Daisy. Resident population in the remaining area is sparse and scattered with the exception of the 4-5 WSW annular segment. This pattern is projected to continue in the future with 55 percent of the total 2020 population being contained in this same portion of the 10-mile area. In addition, the 3-4 WSW annular segment is also projected for significant growth. The 0-10 mile population distributions for 1970 through 2020 are given in Tables 2.1.3-1 through 2.1.3-6a and are keyed to the various distances and directions shown on Figure 2.1.1-3.

2.1.3.2 Population Within 50 Miles

Although the site is located in southeastern Tennessee, the area within a 50-mile radius of the site encompasses portions of northwestern Georgia, northeastern Alabama, and a small portion of southwestern North Carolina.

The largest population concentration within 50 miles of the site is the city of Chattanooga, with a 1990 population of 152,466. The northernmost limits of the urbanization around Chattanooga are approximately four miles west-southwest of the plant site. Four smaller population centers (population of 10,000 to 50,000) are scattered around the area. The closest is Cleveland, Tennessee, about 13 miles east-southeast of the plant site with 1990 population of 30,354. In the 30- to 40-mile range are Dalton, Georgia, to the south-southeast (1990 population 21,761) and Athens, Tennessee, to the east-northeast (1990 population 12,054). McMinnville, Tennessee, with a 1990 population of 11,194, is 50 miles northwest of the plant site. In addition, the town of Soddy-Daisy (1990 pop. 8400) is located approximately 6 miles from the site. Development throughout the rest of the region consists primarily of smaller towns dispersed throughout low density rural development. Most of them serve as small retail or service centers for the surrounding farms, although a number are developing an industrial base. Tables 2.1.3-7 through 2.1.3-12a show the 0-50 mile population distributions for the year 1970 through 2020 for various distances and directions shown on Figure 2.1.1-2.

2.1.3.3 Low Population Zone

The low population zone distance as defined in 10 CFR Part 100 has been chosen to be three miles (4,828 meters). The population of this area (2,005 in 1970) and the population density (71 people per square mile in 1970) are both low. In addition, this area is of such size that in the unlikely event of a serious accident there is a reasonable probability that appropriate measures could be taken to protect the health and safety of the residents. Specific provisions for the protection of this area were considered in the development of the Sequoyah Nuclear Plant site emergency plan. The present and projected population figures for this area are included in Tables 2.1.3-1 through 2.1.3-6. Features of the area within the low population zone distances are shown on Figure 2.1.3-1.

2.1.3.4 Transient Population

Transient population within 10 miles of the plant is made up primarily of visitors to the various recreation facilities along the shoreline of the Chickamauga Reservoir. Figure 2.1.1-3 shows the location of the three primary public recreation facilities: Harrison Bay and Booker T. Washington State Parks and the Chester Frost County Park. In addition, there are many commercial marinas, group camps, and cottage developments as well as small formal and informal public access areas along the reservoir shoreline.

Peak hour attendance at these facilities was estimated by the TVA Recreation Resources Branch and is shown in Tables 2.1.3-11 through 2.1.3-16 for various distances and direction. The attendance at the major facilities is distributed to various segments according to where specific activities are located within the total park.

The transient population on the site is very limited. The Sequoyah Energy Connection is less than one mile southwest of the plant and it accommodates visitor groups of up to about 75. This visitation is not reflected in Tables 2.1.3-13 through 2.1.3-19.

2.1.3.5 Population Center

The nearest population center (as defined in 10 CFR Part 100) is Chattanooga, Tennessee, located as described previously.

2.1.3.6 Public Facilities and Institutions

Schools are the only public institutions containing significant population concentrations within 10 miles of the site. Their names, locations, and the 1990, 1993, 1997, and projected enrollments are contained in Table 2.1.3-20. To project enrollments, TVA consulted with the Hamilton County and Bradley County school officials.

2.1.4 Uses of Adjacent Lands and Waters

Land use in the vicinity of the proposed plant site can be examined best by dividing the area into four parts (see Figure 2.1.4-1): (1) the area west of Chickamauga Reservoir and north of the plant; (2) the area west of Chickamauga Reservoir, north of the city of Chattanooga, and southwest of the plant; (3) the area east of Chickamauga Reservoir and southeast of Harrison Bay and the Volunteer Army Ammunition Plant (VAA Plant); and (4) the area east of Chickamauga Reservoir and northeast of Harrison Bay and the VAA Plant.

Area No. 1

With the exception of the community of Soddy-Daisy, the area west of Chickamauga Reservoir and north of the site is sparsely settled. Development consists of scattered dwellings with some associated small-scale farming. Public access areas, campgrounds, boat docks, and an occasional small residential subdivision have been developed along the reservoir shoreline in scattered locations. The Soddy, Possum, and Sale Creek embayments are especially popular with fishermen and family boaters.

U.S. Highway 27 parallels the reservoir approximately five miles to the west. Soddy-Daisy, with a 1985 population of 8,400, is located along this highway about six miles from the plant.

This area is projected to experience a number of changes by the year 2010. One that was recently completed is the upgrade of U.S. 27 into a major north-south highway connecting northern Hamilton County with downtown Chattanooga. It has replaced the old two lane road and reduced commuting time significantly. Much more residential development is forecast for this area because of that, but not to the point that population densities will be significant. Contributing to the projected development are two other proposals. First is the provision of sewer to part of the area, which would increase both the rate and density of growth. Second is a proposed east-west road crossing the lake just north of the Sale Creek embayment. It would connect Cleveland with highways in Sequatchie County. If built, it would stimulate development along its route and a major concentration of commercial and high-density residential at its intersection with U.S. 27 if the proposed sewers are built. Another significant proposed land use is an industrial park between the nuclear plant and Hixson Pike. It too is dependent on the provision of sewers. It would likely house light manufacturing plants.

Area No. 2

The area west of Chickamauga Reservoir between the Chattanooga city limits and the site has experienced considerable residential growth in the last few years. The area is characterized by considerable vacant land interspersed with high quality residential subdivisions. Much of the new residential development is concentrated between the Hixson and Dallas Hills communities and along the reservoir shoreline. Public recreation facilities are dominated by the 280-acre Chester Frost County Park (formerly Hamilton County Park) receiving over 250,000 visits annually. North Chickamauga Creek in the 9-10 mile range has been designated as a "greenway" with the development of trails and day use facilities near the mouth of the creek underway. Residential development is expected to advance steadily in this general area in the future because of the improvement to U.S. 27 discussed in Area 1. In summary, this area is considered a growth area in Hamilton County. As the population projections indicate, increases are expected throughout the area. In the past the tendency has been to concentrate along the reservoir shoreline. This trend is expected to continue; but, as the shoreline becomes developed, growth is expected to take place in the form of infilling throughout the entire area utilizing the now vacant land.

Area No. 3

Until 1977, when explosives production ceased, the VAA Plant had been a significant barrier to growth in this area because of environmental problems. Since then, residential development has picked up in the area, especially in the vicinity of the lake. There is also substantial commercial and light industrial use along State Highways 58 and 153. This pattern of growth is expected to continue within the natural limitation of the area, which is primarily poor soil for septic tank drain fields. In addition, a significant portion of the VAA site is being marketed for use as an industrial park, which should also increase the development in this area. Sewers are projected for this area, which would increase the rate and density of residential development. The primary recreation feature is the Booker T. Washington State Park, which had 393,000 visits in 1987.

Area No. 4

As in Area No. 3, much of this area also has been affected in the past by the VAA Plant, with residential development picking up in recent years. However, the basic character of the area is rural, with the exception of the Harrison Bay State Park in the two- to five-mile range along the eastern shoreline. In addition to numerous farms, there are scattered private cottages and houses in the vicinity of the park. Public campsites are also located at Skull Island and Grasshopper Creek Park.

From 7 to 10 miles in the vicinity of the city of Cleveland, residential subdivisions have concentrated along existing roads. Also, Interstate 75 is causing readjustments in development through the area.

At present, Area No. 4 is not a growth area for Chattanooga and sewers are not projected for most of the area. Therefore, due to the hilly terrain and poor soils for drain fields, future residential development is expected to be very low density. However, industrial development at the VAA plant, as mentioned previously, may have an impact in this area.

Hamilton and Bradley Counties, Tennessee, fall within a 10-mile radius of the Sequoyah site, having a total land area of approximately 555,000 acres with 159,359 acres of this in farms or about 29 percent of the total land area. On the 1,367 farms in this area, 87,465 acres were found to be used as cropland. A breakdown of the farm oriented land use for each county is given in Table 2.1.4-1. Table 2.1.4-2 tabulates yield and associated land area for various harvested crops. As of 11-1-88, the number of dairy cows within a 5-mile radius of the plant site was 69. In general, the land adjacent to the plant site is suitable dairying land. A land use census is conducted annually by TVA to locate the nearest milk producing animals. In 1988 all animals were cows.

A 1980 U.S. Forest Service survey of Tennessee indicates that approximately 51 percent of the land area in Bradley and Hamilton counties is forested and 49 percent is non-forested. These two counties contain 96,600 and 202,710 acres of forest respectively. Growing stock volume in the counties is estimated to be 335.3 million cubic feet, with 51.8 percent softwood and 48.2 percent hardwoods. The general extent and type of forest cover is shown in Figure 2.1.4-2.

Chickamauga Reservoir is one of a series of TVA multipurpose reservoirs located on the mainstream of the Tennessee River. The primary project uses are for flood control, navigation and hydropower generation, although extensive secondary uses including industrial and public water supply, commercial and sport fishing, recreation, and disposal of treated wastewater have also developed.

Chickamauga Reservoir, which extends from Chickamauga Dam (TRM 471.0) to Watts Bar Dam (TRM 529.9), has been classified by the Tennessee Division of Water Pollution Control for the following uses: municipal water supply, industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation. The reservoir receives extensive use for these purposes.

The historic water quality and aquatic ecology conditions of Chickamauga Reservoir were described in the final Environmental Statement for Sequoyah Nuclear Plant Units 1 and 2, TVA, February 13, 1974. On July 26, 1974 TVA submitted a Standard Form C Application to the Environmental Protection Agency (EPA) for a National Pollutant Discharge Elimination System permit (NPDES) for the nonradiological discharges from Sequoyah Nuclear Plant. On June 4, 1979, TVA received NPDES permit No. TN0026450 from the EPA for the nonradiological component of the discharges from Sequoyah Nuclear Plant. This permit is updated as required to maintain permits for nonradiological discharges from Sequoyah Nuclear Plant. The permit includes appropriate provisions for the implementation and reporting of instream preoperational and operational monitoring programs in Chickamauga Reservoir with respect to water quality and aquatic ecology. As required by the permit, copies of these reports are also submitted to NRC. The reports of instream monitoring programs submitted under the NPDES permit, both past and future, contain updating information on the water quality and aquatic ecology of Chickamauga Reservoir. A separate updating and reporting of the aquatic conditions of Chickamauga Reservoir outside of the established framework of the NPDES permit requirements is neither planned or warranted in the FSAR.

TABLE 2.1.3-1

1970 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	890	-	15	50	10	5	810
NNE	545	-	-	60	85	45	355
NE	390	-	-	-	45	30	315
ENE	650	-	15	-	100	130	405
E	540	-	25	20	85	70	340
ESE	1,225	10	65	65	135	80	870
SE	965	5	190	25	85	85	575
SSE	1,275	-	35	115	335	105	685
S	2,570	-	80	5	190	265	1,030
SSW	3,425	-	55	55	205	115	2,995
SW	2,535	-	-	45	175	45	2,270
WSW	6,475	5	65	335	650	615	4,805
W	3,430	5	35	115	275	200	2,800
WNW	3,030	-	25	145	405	285	2,170
NW	3,965	10	40	185	210	200	3,320
NNW	1,235	10	80	15	40	145	945
Total	32,145	45	725	1,235	3,030	2,420	24,690

TABLE 2.1.3-2

1980 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	730	-	15	40	10	5	660
NNE	440	-	-	50	65	40	285
NE	315	-	-	-	40	25	250
ENE	555	-	15	-	80	105	355
E	505	-	20	15	70	55	345
ESE	1,195	10	50	50	110	65	910
SE	900	5	155	20	70	70	580
SSE	1,045	-	25	95	270	85	570
S	1,275	-	65	5	155	215	835
SSW	2,785	-	45	45	170	95	2,430
SW	2,860	-	-	40	140	35	2,645
WSW	6,785	5	50	270	530	500	5,430
W	3,845	5	30	95	220	180	3,315
WNW	3,385	-	20	120	325	375	2,545
NW	4,930	10	35	150	165	220	4,350
NNW	1,160	10	60	10	35	160	885
Total	32,710	45	585	1,005	2,455	2,230	26,390

TABLE 2.1.3-3

1985 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	2,045	20	41	175	76	62	1,671
NNE	870	0	30	73	136	62	573
NE	746	0	0	67	67	54	558
ENE	1,114	0	11	24	172	210	697
E	1,186	0	70	11	191	137	777
ESE	2,084	0	118	113	194	137	1,522
SE	1,186	0	129	272	118	152	1,165
SSE	3,171	0	73	320	500	430	1,848
S	3,494	0	67	143	229	547	2,508
SSW	5,878	0	32	81	288	116	5,361
SW	6,575	0	10	236	435	122	5,772
WSW	13,676	20	146	495	866	1,113	11,036
W	4,397	10	20	180	506	530	3,151
WNW	3,462	10	30	281	461	461	2,219
NW	3,142	50	80	225	438	259	2,090
NNW	2,038	10	202	80	71	171	1,504
Total	55,714	120	1,059	2,776	4,744	4,563	42,452

TABLE 2.1.3-4

1990 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	2,195	28	52	212	85	65	1,753
NNE	1,036	0	36	88	160	75	677
NE	901	0	0	81	82	65	673
ENE	1,419	0	13	29	209	255	913
E	1,485	0	85	13	232	166	989
ESE	2,754	0	143	137	235	166	2,073
SE	2,469	0	157	329	143	187	1,653
SSE	3,719	0	88	388	607	516	2,120
S	3,658	0	82	173	277	663	2,463
SSW	7,471	0	39	98	349	140	6,845
SW	6,517	0	12	323	475	141	5,566
WSW	15,895	24	208	697	1,341	1,435	12,190
W	5,245	8	32	259	739	771	3,436
WNW	4,205	4	35	413	640	539	2,574
NW	3,802	67	118	318	625	312	2,362
NNW	2,460	4	290	114	74	214	1,764
Total	65,231	135	1,390	3,672	6,273	5,710	48,051

TABLE 2.1.3-5

2000 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	2,289	29	54	221	89	68	1,828
NNE	1,080	0	38	92	167	78	706
NE	940	0	0	84	86	68	702
ENE	1,480	0	14	30	218	266	952
E	1,549	0	89	14	242	173	1,031
ESE	2,872	0	149	143	245	173	2,162
SE	2,575	0	164	343	149	195	1,724
SSE	3,878	0	92	405	633	538	2,211
S	3,814	0	86	180	289	691	2,568
SSW	7,791	0	41	102	364	146	7,138
SW	6,796	0	13	337	495	147	5,804
WSW	16,575	25	217	727	1,398	1,496	12,711
W	5,469	8	33	270	771	804	3,583
WNW	4,385	4	36	431	667	562	2,684
NW	3,965	70	123	332	652	325	2,463
NNW	2,565	4	302	119	77	223	1,839
Total	68,021	141	1,449	3,829	6,541	5,954	50,106

TABLE 2.1.3-6

2010 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

		Miles from Site					
Direction	Total	0-1	1-2	2-3	3-4	4-5	5-10
N	2,360	30	56	228	91	70	1,885
NNE	1,114	0	39	95	172	81	728
NE	969	0	0	87	88	70	724
ENE	1,526	0	14	31	225	274	982
E	1,597	0	91	14	249	179	1,064
ESE	2,962	0	154	147	253	179	2,229
SE	2,655	0	169	354	154	201	1,778
SSE	3,999	0	95	417	653	555	2,280
S	3,934	0	88	186	298	713	2,649
SSW	8,034	0	42	105	375	151	7,361
SW	7,008	0	13	347	511	152	5,985
WSW	17,093	26	224	750	1,442	1,543	13,109
W	5,640	9	34	279	795	829	3,695
WNW	4,522	4	38	444	688	580	2,768
NW	4,089	72	127	342	672	336	2,540
NNW	2,645	4	312	123	80	230	1,897
Total	70,147	145	1,495	3,949	6,746	6,140	51,672

TABLE 2.1.3-6a

2010 POPULATION DISTRIBUTION WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	2,418	31	57	234	94	72	1,931
NNE	1,141	0	40	97	176	83	746
NE	993	0	0	89	90	72	741
ENE	1,563	0	14	32	230	281	1,006
E	1,636	0	94	14	256	183	1,090
ESE	3,034	0	158	151	259	183	2,284
SE	2,720	0	173	362	158	206	1,821
SSE	4,097	0	97	427	669	568	2,335
S	4,030	0	90	191	305	730	2,713
SSW	8,230	0	43	108	384	154	7,541
SW	7,179	0	13	356	523	155	6,132
WSW	17,511	26	229	768	1,477	1,581	13,429
W	5,778	9	35	285	814	849	3,785
WNW	4,632	4	39	455	705	594	2,836
NW	4,188	74	130	350	689	344	2,602
NNW	2,710	4	319	126	82	236	1,943
Total	71,861	149	1,531	4,045	6,911	6,290	52,935

TABLE 2.1.3-7

1970 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

		Miles from Site				
Direction	Total	0-10	10-20	20-30	30-40	40-50
N	14,550	890	3,425	1,860	2,570	5,805
NNE	19,970	545	6,055	3,915	4,685	4,770
NE	22,025	390	1,210	2,830	7,600	9,995
ENE	41,510	650	3,770	5,425	21,405	10,260
E	19,690	540	9,995	3,285	1,835	4,035
ESE	43,600	1,225	26,685	3,250	1,055	11,385
SE	13,265	965	4,960	3,135	1,845	2,360
SSE	48,495	1,275	6,075	8,590	29,210	3,345
S	47,810	1,570	9,840	9,785	19,000	7,615
SSW	137,590	3,425	79,150	34,630	13,825	6,560
SW	146,185	2,535	104,960	25,950	7,495	5,245
WSW	48,275	6,475	19,655	4,455	9,345	8,345
W	17,075	3,430	1,490	4,660	3,785	3,710
WNW	14,545	3,030	2,390	3,135	4,080	1,910
NW	14,320	3,965	980	1,365	725	7,285
NNW	10,110	1,235	540	2,780	1,545	4,010
Total	659,015	32,145	281,180	119,050	130,005	96,635

TABLE 2.1.3-8

1980 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

		Miles from Site				
Direction	Total	0-10	10-20	20-30	30-40	40-50
N	15,605	730	3,560	2,030	2,535	6,750
NNE	20,805	440	6,485	4,120	4,705	5,055
NE	23,270	315	1,230	2,860	7,615	11,250
ENE	46,035	555	3,900	6,200	24,740	10,640
E	21,920	505	11,930	3,380	2,005	4,100
ESE	51,760	1,195	34,815	3,350	1,075	11,325
SE	15,040	900	6,835	3,140	1,795	2,370
SSE	56,420	1,045	6,840	9,005	36,080	3,450
S	51,060	1,275	9,565	9,895	22,290	8,035
SSW	156,825	2,785	90,575	42,330	14,695	6,440
SW	162,260	2,860	115,955	29,725	8,655	5,065
WSW	54,975	6,785	23,310	4,595	11,440	8,845
W	17,480	3,845	1,470	4,820	3,705	3,640
WNW	14,875	3,385	2,645	3,160	3,835	1,850
NW	17,880	4,930	1,050	1,460	765	9,675
NNW	10,060	1,160	510	2,725	1,555	4,110
Total	736,270	32,710	320,675	132,795	147,490	102,600

TABLE 2.1.3-9

1985 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

Direction	Total	0-10	10-20	20-30	30-40	40-50
		Miles from Site				
N	21,308	2,045	4,922	3,190	2,310	8,841
NNE	31,222	870	9,507	4,365	7,350	9,130
NE	29,466	746	2,175	5,524	5,573	15,448
ENE	52,493	1,114	3,942	4,881	26,393	16,163
E	29,712	1,186	14,581	5,761	4,534	3,650
ESE	60,518	2,084	39,948	4,272	1,745	12,469
SE	27,161	1,836	4,977	4,548	12,881	2,919
SSE	63,290	3,171	10,711	7,829	31,660	9,920
S	70,268	3,494	20,067	18,800	17,723	10,184
SSW	159,215	5,878	84,597	42,513	16,248	9,979
SW	143,916	6,575	98,057	20,998	8,179	10,108
WSW	63,676	13,676	24,026	3,551	13,269	9,155
W	23,283	4,397	1,355	5,560	4,963	7,008
WNW	20,291	3,462	4,915	4,070	5,688	2,156
NW	21,140	3,142	1,230	1,490	1,096	14,182
NNW	12,847	2,038	445	2,910	2,515	4,939
Total	829,804	55,714	325,453	140,260	162,127	146,250

TABLE 2.1.3-10

1990 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

		Miles from Site				
Direction	Total	0-10	10-20	20-30	30-40	40-50
N	21,471	2,195	4,390	2,665	2,641	9,580
NNE	31,190	1,036	9,280	4,399	7,206	9,269
NE	29,749	901	2,390	5,916	5,308	15,234
ENE	55,722	1,419	7,461	4,897	25,698	16,247
E	33,376	1,485	18,584	5,296	4,526	3,485
ESE	53,443	2,754	32,802	4,305	1,734	11,848
SE	23,655	2,469	5,659	6,099	3,970	5,458
SSE	76,949	3,719	10,496	10,471	41,756	10,507
S	93,648	3,658	38,376	21,859	20,136	9,619
SSW	163,242	7,472	87,613	40,958	16,818	10,381
SW	98,030	6,515	55,198	17,609	8,997	9,711
WSW	85,592	15,889	44,979	3,524	13,109	8,092
W	25,078	5,247	2,616	5,546	5,059	6,611
WNW	19,124	4,204	3,611	3,445	5,677	2,188
NW	22,599	3,802	1,801	2,015	1,164	13,817
NNW	14,273	2,460	839	3,055	2,646	5,274
Total	847,142	65,225	326,093	142,060	166,445	147,318

TABLE 2.1.3-11

2000 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

Direction	Total	0-10	10-20	20-30	30-40	40-50
		Miles from Site				
N	23,320	2,201	4,954	2,856	2,860	10,450
NNE	34,058	1,036	10,595	4,679	7,667	10,081
NE	31,899	902	2,668	6,265	5,634	16,430
ENE	60,379	1,421	8,578	5,245	27,527	17,607
E	36,433	1,485	20,674	5,688	4,846	3,740
ESE	58,292	2,754	36,514	4,626	1,842	12,556
SE	26,081	2,469	6,314	6,775	4,414	6,108
SSE	85,780	3,719	11,818	11,774	46,792	11,678
S	103,675	3,658	42,248	24,566	22,584	10,618
SSW	178,503	7,472	96,253	45,246	18,356	11,176
SW	106,520	6,839	60,896	19,168	9,589	10,028
WSW	92,896	17,190	49,314	3,870	14,280	8,242
W	27,248	5,715	2,885	6,088	5,426	7,134
WNW	20,522	4,500	3,917	3,699	6,034	2,372
NW	24,507	4,144	1,960	2,176	1,222	15,004
NNW	15,114	2,515	966	3,286	2,802	5,546
Total	925,225	68,021	360,554	156,007	181,874	158,769

TABLE 2.1.3-12

2010 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

		Miles from Site				
Direction	Total	0-10	10-20	20-30	30-40	40-50
N	24,711	2,206	5,385	3,009	3,028	11,082
NNE	36,232	1,036	11,600	4,893	8,022	10,681
NE	33,460	903	2,859	6,495	5,855	17,349
ENE	63,886	1,422	9,431	5,499	28,862	18,672
E	38,743	1,485	22,276	5,972	5,080	3,930
ESE	61,927	2,754	39,360	4,859	1,918	13,036
SE	27,870	2,469	6,817	7,270	4,729	6,585
SSE	92,224	3,719	12,806	12,726	50,436	12,537
S	111,202	3,658	45,208	26,632	24,354	11,350
SSW	189,612	7,472	102,822	48,274	19,331	11,713
SW	112,822	7,086	65,232	20,223	9,973	10,308
WSW	98,545	18,178	52,615	4,139	15,197	8,415
W	28,884	6,071	3,089	6,509	5,698	7,517
WNW	21,522	4,726	4,126	3,875	6,288	2,508
NW	25,933	4,405	2,074	2,295	1,261	15,899
NNW	15,780	2,557	1,064	3,475	2,925	5,759
Total	983,353	70,147	386,764	166,147	192,954	167,341

TABLE 2.1.3-12a

2020 POPULATION DISTRIBUTION WITHIN FIFTY MILES OF SITE

		Miles from Site				
Direction	Total	0-10	10-20	20-30	30-40	40-50
N	25,824	2,210	5,737	3,119	3,154	11,605
NNE	38,021	1,036	12,425	5,073	8,318	11,170
NE	34,872	904	3,050	6,738	6,077	18,103
ENE	66,776	1,424	10,096	5,719	30,013	19,524
E	40,611	1,485	23,516	6,229	5,286	4,094
ESE	64,776	2,754	41,562	5,071	1,991	13,398
SE	29,079	2,469	7,206	7,596	4,910	6,898
SSE	96,099	3,719	13,494	13,290	52,566	13,030
S	116,275	3,658	47,531	27,909	25,402	11,775
SSW	197,551	7,472	107,951	50,169	19,934	12,025
SW	117,867	7,284	68,724	20,954	10,250	10,654
WSW	103,157	18,975	55,273	4,337	15,894	8,678
W	30,194	6,358	3,249	6,820	5,914	7,852
WNW	22,333	4,908	4,292	4,020	6,499	2,614
NW	27,075	4,615	2,162	2,383	1,311	16,605
NNW	16,353	2,591	1,140	3,602	3,034	5,987
Total	1,026,862	71,861	407,408	173,028	200,554	174,010

TABLE 2.1.3-13

1970 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

		Miles from Site					
Direction	Total	0-1	1-2	2-3	3-4	4-5	5-10
N	465	0	0	35	30	20	380
NNE	270	0	0	110	10	20	130
NE	20	0	20	0	0	0	0
ENE	130	0	130	0	0	0	0
E	30	0	30	0	0	0	0
ESE	10	5	10	0	0	0	0
SE	15	0	15	0	0	0	0
SSE	475	0	35	0	0	210	230
S	755	10	105	0	0	10	630
SSW	1,210	0	10	160	210	280	550
SW	1,655	0	50	155	305	870	275
WSW	10	0	0	0	10	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	195	0	0	0	40	155	0
Total	5,240	10	405	460	605	1,565	2,195

TABLE 2.1.3-14

1980 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	593	0	0	43	40	25	485
NNE	346	0	0	140	13	25	168
NE	25	0	25	0	0	0	0
ENE	165	0	165	0	0	0	0
E	40	0	40	0	0	0	0
ESE	15	0	15	0	0	0	0
SE	20	0	20	0	0	0	0
SSE	608	0	45	0	0	270	293
S	964	13	135	0	0	13	803
SSW	1,541	0	13	205	270	358	695
SW	2,124	0	65	201	390	1,118	350
WSW	13	0	0	0	13	0	0
W	330	330	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	249	0	0	0	51	198	0
Total	7033	343	523	589	777	2,007	2,794

TABLE 2.1.3-15

1985 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

		Miles from Site					
Direction	Total	0-1	1-2	2-3	3-4	4-5	5-10
N	453	0	0	0	0	35	418
NNE	217	0	0	3	0	3	211
NE	87	0	87	0	0	0	0
ENE	5	0	5	0	0	0	0
E	45	0	45	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	124	0	124	0	0	0	0
SSE	8	0	0	0	0	0	8
S	731	0	73	0	0	328	330
SSW	2,502	0	147	206	276	213	1,660
SW	1,918	0	38	5	237	935	703
WSW	265	0	0	265	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	4	0	0	0	0	4	0
NNW	269	0	0	45	98	126	0
Total	6,628	0	519	524	611	1,644	3,330

TABLE 2.1.3-16

1990 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	1,439	0	0	0	0	80	1,359
NNE	150	0	0	75	0	75	0
NE	412	0	412	0	0	0	0
ENE	87	0	87	0	0	0	0
E	46	0	46	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	128	0	128	0	0	0	0
SSE	87	0	0	0	0	0	87
S	749	0	75	0	0	336	338
SSW	4,066	0	151	212	1,375	219	2,109
SW	3,637	0	468	512	243	1,140	1,274
WSW	272	0	0	272	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	87	0	0	0	0	87	0
NNW	277	0	0	46	101	130	0
Total	11,437	0	1,367	1,117	1,719	2,067	5,167

TABLE 2.1.3-17

2000 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

Direction	Total	Miles from Site 0-1	1-2	2-3	3-4	4-5	5-10
N	1,571	0	0	0	0	87	1,484
NNE	401	0	0	82	0	82	237
NE	450	0	450	0	0	0	0
ENE	95	0	95	0	0	0	0
E	50	0	50	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	140	0	140	0	0	0	0
SSE	95	0	0	0	0	0	95
S	818	0	82	0	0	367	369
SSW	4,441	0	165	232	1,502	239	2,303
SW	3,971	0	511	559	265	1,245	1,391
WSW	297	0	0	297	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	95	0	0	0	0	95	0
NNW	302	0	0	50	110	142	0
Total	12,726	0	1,493	1,220	1,877	2,257	5,879

TABLE 2.1.3-18

2010 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITE

		Miles from Site					
Direction	Total	0-1	1-2	2-3	3-4	4-5	5-10
N	1,672	0	0	0	0	93	1,579
NNE	426	0	0	87	0	87	252
NE	479	0	479	0	0	0	0
ENE	101	0	101	0	0	0	0
E	53	0	53	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	149	0	149	0	0	0	0
SSE	101	0	0	0	0	0	101
S	870	0	87	0	0	390	393
SSW	4,725	0	176	247	1,598	254	2,450
SW	4,226	0	544	595	282	1,325	1,480
WSW	316	0	0	316	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	101	0	0	0	0	101	0
NNW	321	0	0	53	117	151	0
Total	13,540	0	1,589	1,298	1,997	2,401	6,255

TABLE 2.1.3-19

2020 ESTIMATED PEAK HOUR RECREATION VISITS WITHIN TEN MILES OF SITES

		Miles from Site					
Direction	Total	0-1	1-2	2-3	3-4	4-5	5-10
N	1,752	0	0	0	0	97	1,655
NNE	446	0	0	91	0	91	264
NE	502	0	502	0	0	0	0
ENE	106	0	106	0	0	0	0
E	56	0	56	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	156	0	156	0	0	0	0
SSE	106	0	0	0	0	0	106
S	912	0	91	0	0	409	412
SSW	4,954	0	184	259	1,675	267	2,569
SW	4,431	0	570	624	296	1,389	1,552
WSW	331	0	0	331	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	5	0
NNW	179	0	0	56	123	152	0
Total	13,931	0	1,665	1,361	2,094	2,253	6,558

TABLE 2.1.3-20

EDUCATIONAL INSTITUTIONS IN VICINITY OF SEQUOYAH NUCLEAR PLANT
1990-2020

School	Location	1990	1993	1997	2000	2010	2020
Harrison Bay Vocational School	3-4 SE	473	400	401	434	462	485
McConnel Elementary School	3-4 WSW	836	895	751	855	909	954
Loftis Middle School	3-4 WSW			839	910	1000	1100
John Allen Elementary School	3-4 W	227	309	368	390	400	420
Snowhill Elementary School	4-5 SE	831	655	651	650	650	650
Big Ridge Elementary School	4-5 SW	851	720	569	600	700	800
Soddy-Daisy Elementary School	4-5 W	756	640	400	413	439	461
Soddy-Daisy High School	4-5 W	1580	1510	1607	1687	1800	2000
Daisy Elementary	4-5 W	----	176	509	560	610	700
Sequoyah Vocational Center	4-5 W	600	600	635	650	700	770
McDonald Elementary School (Bradley County)	5-10 SE	175	161	Closed	----	----	----
Ooltewah High School	5-10 SSE	1561	1450	1569	1710	1880	2000
Wallace A. Smith Elementary School	5-10 S	496	614	670	695	770	847
Brown Junior High School	5-10 SSW	755	814	433	486	550	605
Central High School	5-10 SSW	1218	1046	1077	1176	1252	1313
Harrison Elementary School	5-10 SSW	809	563	583	866	922	967
Hixson High School	5-10 SW	1323	895	1130	1384	1473	1544
Falling Water Elementary School	5-10 WSW	259	220	326	330	340	357
Ganns-Middle Valley School	5-10 WSW	780	622	449	500	600	720
Mowbray Elementary School	5-10 WNW	98	74	Closed	----	----	----
Soddy-Daisy Middle School*	5-10 WNW	808	825	1607	1700	1870	2000
Soddy Elementary School	5-10 W	573	535	400	440	484	540
	Total:	15,009	13,724	14,974	16,416	17,811	19,233

*Name change--formerly Soddy-Daisy Junior High School

TABLES 2.1.4-1

FARM ORIENTED LAND USE

LAND AND LAND IN FARMS

County	Approximate Land in Area	Land in Farms	Proportion in Farms
	--------------Ac---------------		-----pct----
Bradley	210,000	94,364	45.0
Hamilton	345,000	64,995	18.8

NUMBER AND AVERAGE SIZE OF FARM

County	All Farms	Average Size of Farm
	--no.--	----Ac----
Bradley	754	125
Hamilton	613	106

LAND IN FARMS ACCORDING TO USE

County	Cropland	Woodland Including Woodland Pasture	All Other Land	Irrigated Land
		-----------------Ac---------------------------		
Bradley	53,488	28,497	12,379	633
Hamilton	33,977	23,364	7,654	1,021

CROPLAND

County	Harvested Cropland	Cropland Used for Pasture	All Other Cropland
	------------------------Ac---------------------		
Bradley	20,477	31,382	1,629
Hamilton	13,159	18,919	1,919

Source: 1982 Census of Agriculture

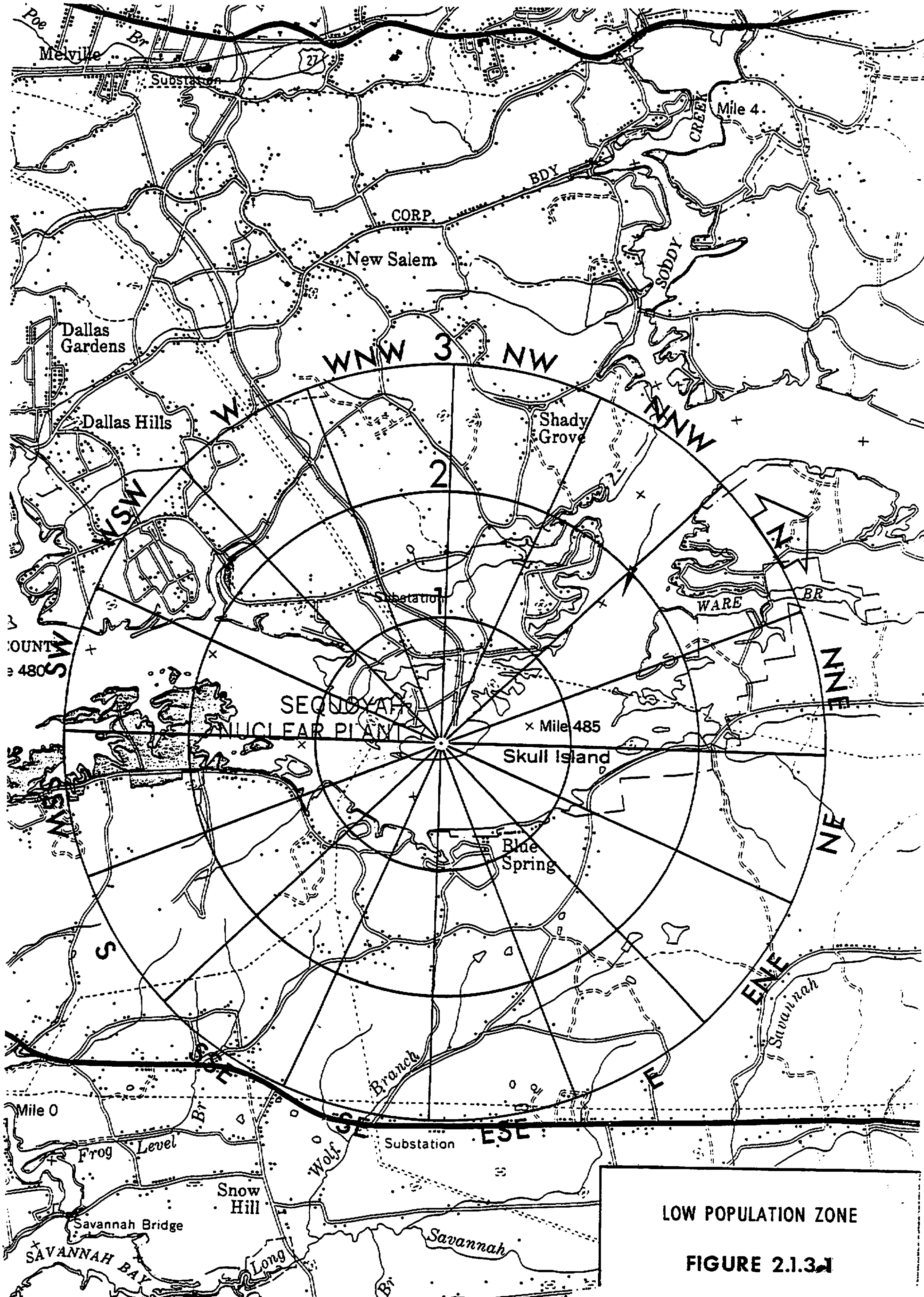
TABLES 2.1.4-2

CROPS HARVESTED

	Bradley County		Hamilton County	
	Yield	Acres	Yield	Acres
Field corn bu/Ac	77	1,482	71	1,057
Sorghum bu/Ac	-	-	63	45
Wheat bu/Ac	37	896	26	1,414
All other small grain	N/A	291	N/A	-
Soybeans bu/Ac	34	1,005	22	2,026
Hay tons/Ac	1.8	15,661	1.6	8,596
Cotton bales/Ac	-	-	-	-
Peanuts lbs/Ac	-	-	-	-
Tobacco lbs/Ac	1,826	81	1,885	7
Vegetable, sweet corn, or melon	N/A	50	N/A	87
Irish and sweet potatoes	N/A	5	N/A	5
Berries	N/A	10	N/A	-
Land in orchards	N/A	311	N/A	147
Other crops	N/A	685	N/A	-

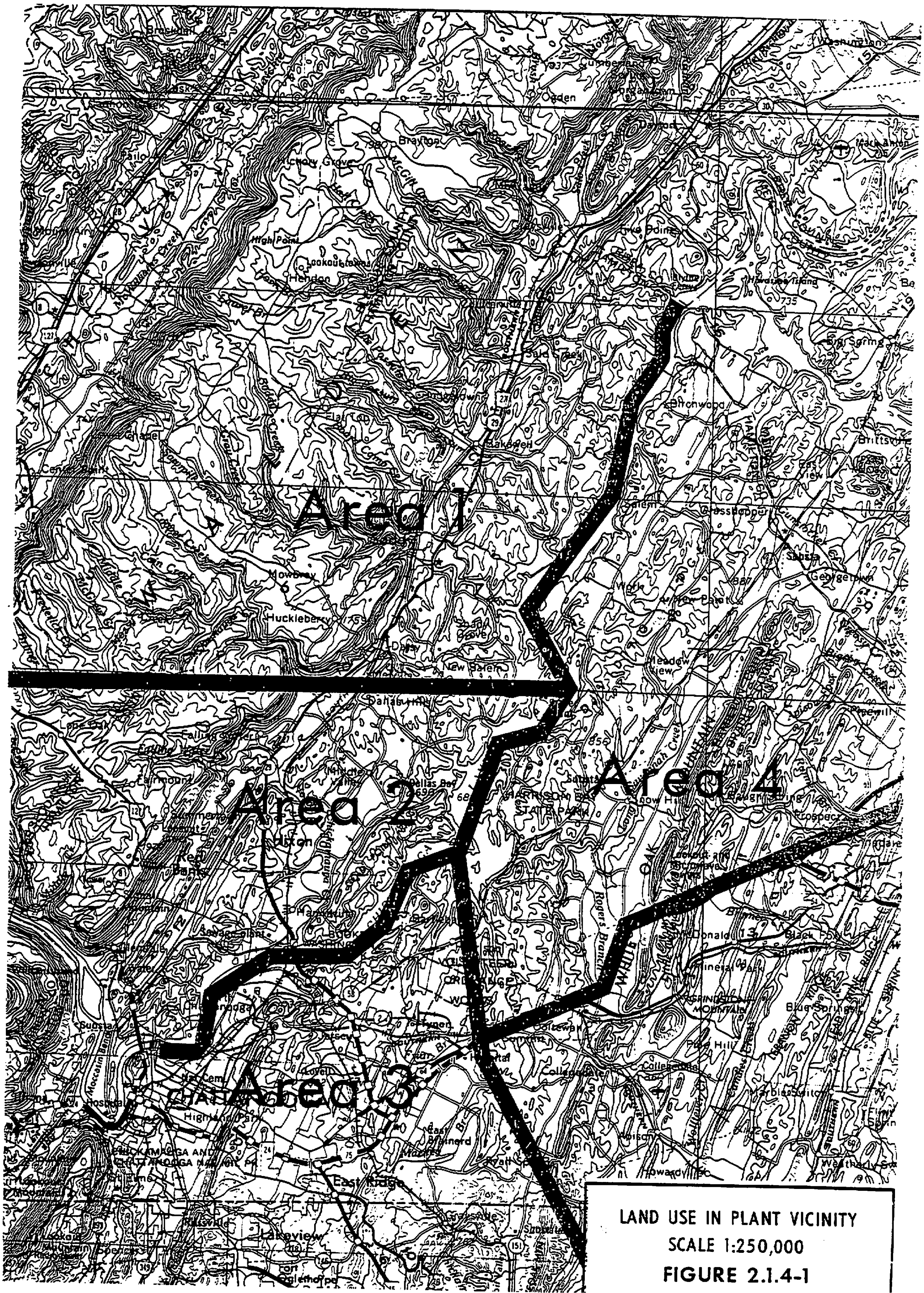
Source: 1982 Census of Agriculture

Best Available Historical Image

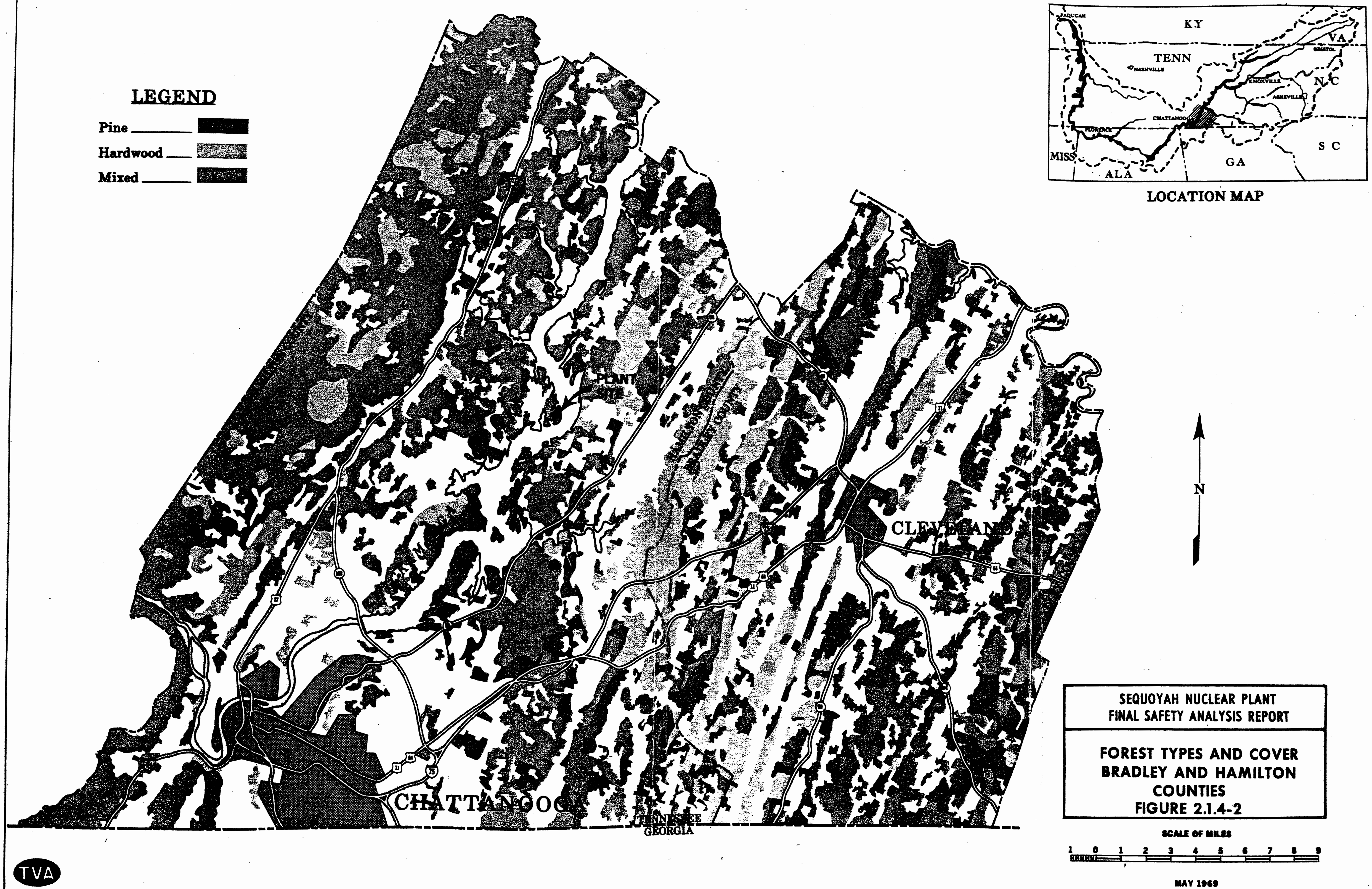


LOW POPULATION ZONE

FIGURE 2.1.3-1



LAND USE IN PLANT VICINITY
SCALE 1:250,000
FIGURE 2.1.4-1



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

FORESTS TYPES AND COVER
BRADLEY AND HAMILTON
COUNTIES
FIGURE 2.1.4-2

2.2 NEARBY INDUSTRIAL, TRANSPORTATION, AND MILITARY FACILITIES

There are no industrial or military facilities within five miles of the Sequoyah Nuclear Plant site which would potentially pose a hazard to the safe operation of the plant. A discussion of the highway network in the vicinity of the plant site is contained in Section 2.1. Facilities of interest beyond five miles include the Volunteer Army Ammunition (VAA) Plant and the Dallas Bay Sky Park. Also, Federal Airway V333 passes directly over the site, and Chickamauga Lake is a commercially navigable waterway. The Chattanooga Airport is located approximately 14.5 miles from the plant site. These are the only facilities of potential significance to the safe operation of the plant, and based on the evaluations set forth below, these activities will pose no hazard.

2.2.1 Location and Routes

Chickamauga Lake is a navigable waterway used by both commercial and recreational traffic. Through a series of locks and dams, commercial traffic can travel from Knoxville, upstream of the site to the mouth of the Tennessee River at the Ohio River.

The Dallas Bay Sky Park is a general aviation airport located about 5.5 miles WSW of the plant. The Chattanooga Airport is a full-service commercial airport located about 14.5 miles SSW of the plant.

The nearest boundary of the VAA Plant is about eight miles from the plant site. Figure 2.1.1-3 shows this relationship. The plant is in a stand-by mode and has not produced explosives since 1977. It is not expected to resume production unless there would be a national emergency. [

] Barges have never been used for shipping and they are not expected to be used in the future. Rail cars have been used in the past for explosives when the plant was in production but are not expected to be used in the future unless production resumes. (The nearest mainline railroad is about five and one-half miles west of the nuclear plant.) [

]

2.2.2 Description of Products

Up to 44 training operations per day take place at the Dallas Bay Sky Park with an average of about 25. Many of them involve low-altitude maneuvers in the general vicinity of the plant.

Air traffic on or near Federal Airway V333 on the most recent peak traffic day at the Chattanooga Airport was 42. This includes both IFR (Instrument Flight Rules) and VFR (Visual Flight Rules) flights. They ranged in altitude from 2,000 to 15,000 feet. The type of aircraft which utilize Federal Airway V333 include: Cessna 152; Cessna 425; BA-31; DC-9; MD-80; Boeing 727; K-10; F-28; C-130; SW-3; BE-100; BE-200; and BE-90.

The data were for an 18 hour period on July 21, 1992, and reflect the peak traffic for the area of responsibility of the airport, not necessarily V333. Traffic during the six undocumented hours is likely to be very small.

Air traffic at the Chattanooga Airport averages about 140 incoming flights per day. Under certain wind conditions, an estimated 35 - 40 percent will make an approach that takes them over or near the plant at an elevation of about 2500 feet above the ground.

[

]

Table 2.2.2-1 shows the total amount of certain hazardous materials shipped past the Sequoyah Nuclear Plant from 1982 to 1992 on a yearly basis based on Corps of Engineers lock data. The product listed as gasoline on the table is actually RU250. In addition, data on chlorine shipments became available starting in 1990. Table 2.2.2-1a contains 1990 shipping data from a TVA survey of dock operators.

Based on 1992 shipping data, chlorine is shipped at a rate of about one 1,100 ton barge every ten days; RU250 (gasoline) is no longer shipped; residual fuel oil is shipped at a rate of one three-barge tow every three months with about 1,500 tons per barge; and asphalt is shipped at a rate of about three barges per month with two 1,500-ton barges and one 3,000-ton barge. Variations in total yearly shipments occur by adjusting any or all of the three variables--shipping frequency, number of barges per tow, and barge size.

2.2.3 Evaluations

2.2.3.1 Evaluation of Explosion Hazards from Nearby Transportation Routes

As indicated in Tables 2.2.3-1 and 2.2.3-2, certain hazardous materials are transported by river barge past the Sequoyah Nuclear Plant site. In addition, explosive materials are also transported over nearby railroad lines. Therefore, these materials were evaluated for their potential to damage the safety related structures of the plant. The materials include TNT, gasoline, liquid natural gas (LNG) and unspecified fertilizers.

Table 1736 of AMCH-385-224 requires that 500,000 lb of TNT (maximum transported by rail) be stored at least 5,400 feet from any unbarricaded, inhabited building and that 400,000 lb of TNT be stored at least 2,550 feet from such building. These distances are much less than the nearest railroad (29,000 feet) or highway (39,000 feet) to Sequoyah over which large amounts of explosives can be transported. Thus, there is no potential for damage to the Sequoyah plant due to the transport of TNT from or storage of TNT at the VAA Plant.

Table 2.2.3-3 indicates the amount of gasoline shipped past the Sequoyah site over the past 15 years. The gasoline supply for Knoxville is provided by pipeline. As of 1974 with the pipeline in full operation no future gasoline barge shipments past the Sequoyah site are expected except in case of an emergency. The potential for damage to the Sequoyah plant from a gasoline barge explosion is considered to be negligible.

In response to concerns raised by the ACRS, the possibility of a barge explosion in the vicinity of the new ERCW pumping station has been reviewed. Our response is as follows:

(1) The ACRS identified liquid natural gas (LNG) as a substance to be considered in an exploding barge scenario. From our review of the barge shipments past Sequoyah for calendar year 1978, there were no shipments of LNG on the Tennessee River. It should be noted that barge shipments of LNG past Sequoyah are not likely since natural gas transportation is handled almost entirely by pipeline in this region. Therefore, we do not consider the potential for an exploding LNG barge near the new ERCW pumping station to be a credible event.

(2) As indicated in Table 2.2.3-2, there were, in calendar year 1978, shipments of unspecified fertilizers past the Sequoyah Nuclear Plant. Hence, the possibility of an accidental explosion must be considered.

In 1966, the U.S. Bureau of Mines issued a study entitled "Explosion Hazards of Ammonium Nitrate Under Fire Exposure," which examined the deflagration and detonation hazards associated with Ammonium Nitrate (AN). The study indicates:

(a) Ordinary fertilizer-grade AN requires strong overpressures to initiate detonation within the mixture.

(b) AN and AN-fuel mixtures were exposed to fire with no transition from deflagration to detonation being observed.

(c) A combination of fire and overpressure results in transition to detonation. However, in free-flowing beds of AN and AN-fuel mixtures, pressures as high as 8000 lb/in^2 did not generate detonation. Only in experiments where the AN was not allowed to flow freely was transition to detonation observed in the AN-fuel mixture at pressures above 1000 lb/in^2, but not with pure AN.

(d) It was found that hot AN (under fire exposure) readily detonated when impacted with a high velocity projectile or shock wave. Explosions in storage and shipments of AN have apparently resulted only when nearby explosions or structure collapse have occurred concurrent with fire in the AN.

(e) Gas detonations have been shown incapable of initiating detonation in AN mixtures. In general, fertilizers shipped on the Tennessee River employ diatomaceous earth and kaolin clay for anticaking dusts rather than using oil sealant, thus detonations are possible only in cargoes where fire and missiles or external detonation are present. Most bulk fertilizers with earth or clay mixtures will not burn without mixing a considerable amount of paper or flammable material into the fertilizer.

Based on the insensitivity to detonation exhibited by most common fertilizers, the unlikely sequence of events required for detonation must include: Barge collision, fire in the fertilizer cargo, and concurrent detonation or missile-inducing event. Therefore, given the low probability of a barge collision and the low percentage of fertilizer shipments on the Tennessee River, it is concluded that, because of the very low probabilities associated with the event, no hazard exists to the intake pumping station from the transportation of fertilizers by barge on the Tennessee River system.

2.2.3.2 Evaluation of Barge Impact with the ERCW Intake Structure

The collision of a tow with the ERCW intake pumping station is considered to be an unlikely event. The intake structure is protected by location from collision with river traffic heading downstream for water surfaces up to elevation 705, which is 22 feet above maximum normal pool level and 15 feet above a flood condition equivalent to one-half the probable maximum flood. The probability per year of a collision with a drifting barge heading downstream is conservatively estimated to be 4.4×10^{-8}. The probability of a collision involving a tow heading upstream has been determined to be 1.6×10^{-5}/year. These probabilities were calculated using the event tree techniques (Reference 1) as described below and are believed to be conservative.

Collision With River Traffic Heading Downstream

1. Probability of reaching or exceeding flood level 705. Because of the existence of an upstream protective dike with a top elevation of 700.0 as shown in Figure 2.1.2-1 the flood level has to be 705.0 or higher in order for a river vessel to go over the top of the dike and subsequently collide with the intake structure. The probability of a water surface reaching or exceeding flood level 705 is 4×10^{-6} in any given year.

2. Probability of random hit. The probability that a barge drifts, on a collision course, toward the intake structure depends on the relative sizes of river width and intake structure. Probability of random hit equals structure size divided by river width: $P=67/6000 = 1.1 \times 10^{-2}$. The width of the river at the plant site, based on a flood level of 705, was estimated conservatively from Figure 2.4.1-1. The length of the upstream exterior wall of the intake structure was used as the structure size in the computation.

3. Other considerations.

    a. Mechanics of river flow. The Sequoyah Nuclear Plant is located on the convex bank of the river. According to flow theory and actual observations made on various rivers (Reference 2), surface-drifting subjects will never be able to reach the vicinity of the intake structure. Water particles in a bend have a "transverse circulation"; particles near the surface move toward the concave bank and those at the bottom move toward the convex bank. Since the transverse circulation of water particles and the direction of the bend are related by the laws of fluid dynamics, the reversal of the direction of the transverse circulation is a condition almost impossible to exist.

    b. Correlation between flood occurrence and river vessel release. Occurrence of a flood does not necessarily result in the release of a river vessel, and for any given level the probability of release is always less than one.

c. Probability of river vessel arrival. Even if a certain flood level were reached and a river vessel were released, the river vessel might not be able to arrive at the immediate upstream station of the intake structure due to the fluctuation of the flood level and the irregularity of the bank formation.

If only the probability of reaching flood level 705 and the probability of random hit are accounted for, the collision probability is then the product of the probabilities of the two individual events, yielding a probability of 4.4×10^{-8} collisions/year.

This procedure is conservative because the consideration of river flow mechanics and chance of release and arrival of river vessel are not included in the computation. Therefore, river traffic-intake structure collision at the Sequoyah Nuclear Plant site is considered to be incredible.

Collision With River Traffic Heading Upstream

Tow operators on the Tennessee River have been required to be licensed by the U.S. Coast Guard since 1972. A requirement for this license is that they must abide by the Western Rivers Rules of the Road. These rules provide that only tows having radar may proceed during inclement weather while those not having radar must tie up. The U.S. Coast Guard has stated that the type of shoreline and mooring cells in the vicinity of Sequoyah Nuclear Plant afford excellent weather protection. The plant is located between Tennessee River Mile (TRM) 484 and 485; first class safety harbors are located near TRM 483 and 489. The Coast Guard has further stated that the present channel markings are more than sufficient for a prudent navigator. The pumping station is well outside the navigation channel (approximately 300 feet from the boundary) and a daymarker and light is located on the far side of the channel directly opposite the plant to guide upstream traffic away from the plant.

Sequoyah Nuclear Plant is located on the convex bank of a bend in the Tennessee River Channel. Upstream tows attempting to cut short the navigation of the bend would have a difficult angle of approach to the pumping station. As addressed in the discussion for traffic heading downstream, tows losing power in the bend and drifting will drift toward the shoreline opposite the intake structure.

The probability of 1.6×10^{-5} collisions/year was obtained using the following information. The calculation is believed to be conservative.

1. Data available for the years 1945-1979 was searched for barge groundings on the Chickamauga Reservoir. Of the 10 groundings found, 7 were not applicable because of grounding during inclement weather before 1972 or because of intentional grounding caused by loss of power. A range of 40.35 miles (40.35 x 5280 x 2 feet) of shoreline and a total of 19,674 tows during these years were involved. This yields a probability of grounding per tow per foot of shoreline on the reservoir of 3.6×10^{-10}.

2. The target length of the intake structure susceptibility was conservatively taken as 200 feet. (The intake structure is 118 feet by 67 feet.) The average number of tows heading upstream past the intake structure during 1974 to 1979 was approximately 225 per year. The number of tows on the Chickamauga Reservoir reached a peak in 1970, but has been

roughly uniform during 1974 to 1979 and is believed to be a good indication of the expected number of tows for the next several years. The probability is therefore calculated as 3.6×10^{-10} groundings per tow per foot of shoreline x 200 feet of shoreline x 225 tows per year = 1.6×10^{-5} collisions/year.

An evaluation of the navigation capabilities and requirements for navigation through this section of the river, mile 484 to 485, was conducted. This evaluation provides a strong qualitative rationale that the expected rate of occurrence of an upstream barge impact on the ERCW pumping station is very unlikely compared to the random probability of a tow grounding.

TVA is confident that the real expected rate of occurrence of barge impact on the ERCW is far less than the calculated value of 1.6×10^{-5} events per year. TVA's understanding of the inadequately documented events has led to the belief that the calculated random probability of hitting a portside bank (tow traveling upstream) at the Sequoyah river location is conservative. The rationale for this belief is discussed below.

Discussions with the U.S. Coast Guard revealed the following information about the potential for a barge tow to accidentally collide (direct impact or otherwise) with the ERCW pumping station.

The certified barge tug pilot primarily navigates in the traditional "river-pilot" manner, which is by (1) experience, (2) line of sight to landmarks, (3) U.S. Corps of Engineers chart (updated annually), and (4) the Coast Guard Western Rules of the Road. However, the modern (1981) river tug pilot is generally equipped with depth finders (sonar fathomometers), range finding radars, electronics to define water and wind vectors, 2-way radio, and electronic status indication of operational systems. The development and upgrade of modern navigational aids, as well as a more reliable propulsion system, ensures an increasingly accurate, effective navigation of the river by barge pilots.

In all weather, the position, without electronic aids, is known to less than 200 feet, and with navigational electronics, to less than 50 feet. On Chickamauga Reservoir, in the traverse by the Sequoyah Nuclear Plant, the position is very well defined because there are buoys every 0.2 mile on the port and starboard sides (a total of 14); there are five navigation lights; the river and riverbank topography is unusually distinctive; and there are distinctive landmarks (the Sequoyah cooling towers and power transmission lines). The radar equipped boat uses the transmission lines as the primary position locator. A river pilot going upstream by Sequoyah will choose to go on the starboard side because of courtesy (Western Rules of the Road) and because of the need to efficiently and safely navigate an "s" curve through this traverse.

The upstream barge is surprisingly maneuverable. A barge can make a 180° change in course without emergency measures in about twice the length of tow (i.e., within 400 to 800 feet). An upstream barge can make a 90° controlled turn in less than 0.2 mile under typical conditions, i.e., current (2-1/2 knots), wind (10 knots), and power (single screw). If a tug loses propulsion in upstream traverse, he still has effective steerage for 1/4-1/2 mile (approximately 3-6 minutes, worst case). The pilot can make emergency stops by slipping an anchor or a spud. An upstream barge can easily be piloted to hit a target area 90° to port or starboard within 25 feet under bad conditions and within 5 feet under good conditions. Therefore, a certified river pilot, even in extremis (defined as 'must take emergency measures to avoid trouble or to ground his tow'), can and would avoid the ERCW. The ERCW is a significant structure, which is well marked and lighted as a navigation hazard. In extremis, a pilot will select the best course of action from an economic and safety standpoint. And, in a traverse by the Sequoyah ERCW, he will most likely attempt a grounding on an underwater shoal to his starboard side (the Denny Bluff Shoal).

The river barge pilot is a U.S. Coast Guard certified pilot, whose license is renewed annually and who has periodic physical and proficiency examinations. If a pilot is suspected of malfeasance, a suspension and relocation proceeding is conducted. No cases of malfeasance or of reported drunkenness have occurred on the north Tennessee River in the last five years.

2.2.3.3 Evaluation of Hazards from Air Traffic

Traffic along Federal Airway V333 is so slight and passes at such an altitude (4000 feet minimum) so as to pose no hazard.

2.2.3.4 Evaluation of the Accidental Release of Toxic Gases from Onsite Storage Facilities

Main control room habitability during a postulated hazardous chemical release at or near the plant has been evaluated (reference 3). This evaluation utilizes the approach outlined in Regulatory Guide 1.78 and concludes that the main control room habitability is not jeopardized by accidental release of chemicals stored on site. In addition, plant procedures maintain a list of these hazardous materials, their storage facilities, and quantities they are stored in.

2.2.3.5 Evaluation of the Accidental Release of Toxic Gases from Offsite Storage Facilities

There are no industrial or military facilities where large quantities of toxic chemicals could be stored within a 5-mile radius of the plant.

2.2.3.6 Evaluation of the Upstream Release of Corrosive Liquids or Oils on the ERCW Intake Structure

Protection of the ERCW intake structure from corrosive liquids or oils, released upstream of the plant site, is provided by the mechanics of river flow. The intake structure is located on the inside convex bank of the river bend downstream of a dike rising to an elevation of approximately 700 feet (MSL). The dike coupled with the mechanics of river flow protects the structure. According to flow theory and actual observations made on various rivers, water particles in a bend have a "transverse circulation"; particles near the surface move toward the concave bank and those at the bottom move toward the convex bank. Hence, for normal river levels, the released material would be swept around the intake structure. In the event of liquids or oils reaching the intake structure, no significant effect should occur. Pumps take suction approximately 50 feet below the minimum normal water level and approximately 13 feet below the level anticipated in the event of downstream dam failure. Any oils or fluids which did enter the pumps would be highly diluted and in such a state would have a minimum effect on system piping losses and heat exchanger capabilities.

2.2.3.7 Evaluation of the Potential for Damage to Equipment or Structures Important to Reactor Safety in the Event of the Collapse of Cooling Towers

As shown in Figure 2.1.2-1, the natural draft cooling towers are located a distance away from safety-related structures at least equal to the height of the towers above grade. Therefore, if the towers collapse, the function of the safety-related structures will not be impaired. Missiles resulting from flying debris will also not impair the safety-related structures as discussed in Chapter 3.

2.2.3.8 Evaluation of a Release on the Tennessee River of Toxic or Flammable Materials on Plant Safety Features and Control Room Habitability

The shipping on the Tennessee River consists mainly of fuel oils, wood products and minerals. Chemicals represent only a minor percentage of the barge shipping by the Sequoyah Nuclear Plant. A list of the commodities shipped passed the Sequoyah Nuclear Plant in 1972 is presented in Table 2.2.3-1. On the average, seven tows per week consisting of three barges passed the Sequoyah site. Of the dangerous cargo traffic, one tow per week consisting of two barges passed the Sequoyah site on the average.

The release of flammable or toxic materials on the river in the vicinity of the plant will have no effect on the plant safety features.

The ERCW intake pumping station is protected against fire by virtue of design. Pump suction is taken from the bottom of the channel. All pumps and essential cables and instruments are protected from fire by being enclosed within concrete walls. Even if fuel oil from a spill should reach the intake pumping station, the oil would not have significant effect on the water intake system or the systems it serves. Entry of oil in the intake structure is unlikely since oil will float on water. Any oil that did enter the pumps would be highly diluted and in such a state would have a minor effect on system piping losses and heat exchanger capabilities.

In the event of a release of dense smoke from combustion of flammable liquids in the direction of the control room, personnel in the MCR can manually initiate a CRI which will isolate the control room when a hazardous smoke concentration level is detected. (See sections 6.4 and 9.4.) The Control Room Air Cleanup System has high efficiency particulate filters and charcoal absorbers. A portion of the control room air recirculation flow is also passed through filters. Thus, the concentration of smoke will be maintained at a very low level. In addition, self-contained breathing apparatus will also be available.

2.2.3.9 Evaluation of Potential Fire and Smoke Hazard from Onsite Fuel Oil Storage Facilities

The onsite storage facilities for diesel fuel oil are described in detail in Sections 9.5.4.1 and 9.5.4.2. The maximum amount of fuel oil stored at the plant is (1) 68,000 gallons in each of four storage tanks within the diesel generator building, (2) Two 550-gallon "day" tanks are also located within each diesel generator room. (3) Two storage tanks with a capacity of 71,000 gallons each are located south-southeast of the diesel generator building. The storage sites are approximately 260 and 300 meters from the control building, respectively.

The oil storage tanks in the diesel generator building (DGB) are embedded in a concrete substructure of a Class I seismic building. The storage tanks and diesel generators are separated by thick concrete walls. Fire protection for the DGB is described in the fire protection report (see 9.5.1).

A postulated fire involving the oil storage facilities which are located south-southeast of the diesel generator building should have no consequences other than the effects of dense smoke. These tanks are separated from other facilities and are surrounded by a high dike.

An evaluation of the hazard to personnel in the control room from a release of dense smoke is given in Section 6.4.1.2.

2.2.4 Forest Fires

Further clearing has taken place since the time of plant construction. For the most part, the ground has been cleared for two thousand feet around the plant buildings. There are no wooded areas close enough to present a hazard from forest fires.

2.2.5 References

1. Atomic Energy Commission, WASH-1400-D, Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, 1974.

2. Kondrat'ev, N. E., River Flow and River Channel Formation, Technical Services, U. S. Department of Commerce, 1959.

3. TIC-ECS-27, "Main Control Room Habitability During Hazardous Chemical Releases at or Near the Plant."

TABLE 2.2.2-1

HAZARDOUS RIVER TRAFFIC
THAT PASSES SEQUOYAH NUCLEAR PLANT
1982 - 1992 (TONS)
U.S. ARMY CORPS OF ENGINEERS DATA

COMMODITY	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2871 Nitrogenous Fertilizer	2,982	20,260	12,417	20,958	19,867	12,1234	11,636	7,591	8,988	NA	NA
56216 Urea Fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	8,988	35,569	24,657
2911 Gasoline	0	0	0	0	3,287*	0	0	0	0	0	0
2914 Distilate Fuel Oil	0	3,325	2,762	0	0	0	0	0	0	0	0
2915 Residual Fuel Oil	14,223	0	31,008	43,469	21,849	0	25,487	13,375	16,205	NA	NA
33440 Fuel Oils NEC	NA	NA	NA	NA	NA	NA	NA	NA	16,205	9,105	26,582
2819 Basic Chems NEC	20,295	0	6,036	4,778	2,906	2,588	3,132	0	46,200	NA	NA
52210 Carbon	NA	NA	NA	NA	NA	NA	NA	NA	0	0	2,869
52224 Chlorine	NA	NA	NA	NA	NA	NA	NA	NA	46,200	34,100	38,500
TOTAL	37,500	23,585	52,223	69,205	47,909	14,722	40,255	20,966	71,393	77,774	92,608

NA More detailed and specific commodity codes became available in 1990. Duplicate entries are found in 1990 because the old commodity and the new were identical.

* The actual product was RU250.

Table 2.2.2-1a

Hazardous River Traffic
That Passes Sequoyah Nuclear Plant

Calendar Year 1990
(TVA Survey Data)

Asphalt-	Five barges/month, two at 3,000 tons/barge and three at 1,500 tons/barge
Caustic Soda-	One barge/month, 1,400 tons/barge
Chlorine-	One barge every eight days, 1,100 tons/barge
Phosphate-	One barge every two months, 1,500 tons/barge
Potash-	One barge every two months, 1,500 tons/barge
Residual Fuel Oil-	Three barges every two months, 1,500 tons/barge
Sulfate Potash-	One barge every four months, 1,500 tons/barge
Urea-	Six barges per year (three in spring, three in fall), 1,500 tons/barge

SQN

Table 2.2.2-1b

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TABLE 2.2.3-1 (Sheet 1)

BARGE FREIGHT TRAFFIC PASSING SEQUOYAH NUCLEAR PLANT SITE
TENNESSEE RIVER MILE 484.5

Calendar Year 1972

Commodity	Net Tons	Classed As
Wheat	14,516	--
Manganese Ores and Concentrates	20,773	--
Nonferrous Metal Ores	32,110	--
Coal and Lignite	260,959	--
Limestone	826	--
Sand, Gravel, Crushed Rock	9,990	--
Nonmetallic Minerals, nec	38,364	--
Molasses	7,848	--
Pulpwood	234,017	--
Newsprint	89,383	--
Paper and Paperboard	2,912	--
Pulp, Paper, nec	751	--
Caustic Soda, Liquid,*	3,557	Corrosive Liquid
Basic Chemicals and Products,* nec	26,471	Inflammable Compressed
Miscellaneous Chemical Products*	7,650	Noninflammable Compressed Gas
Gasoline*	126,378	Inflammable Liquid
Kerosene*	879	Combustible Liquid
Distillate Fuel Oil*	2,330	Combustible Liquid

TABLE 2.2.3-1 (Sheet 2)
(Continued)

BARGE FREIGHT TRAFFIC PASSING SEQUOYAH NUCLEAR PLANT SITE TENNESSEE RIVER MILE 484.5

Calendar Year 1972

Commodity	Net Tons	Classed As
Residual Fuel Oil*	22,520	Combustible Liquid
Asphalt Tar and Pitches*	104,696	Hazardous
Lime	3,469	--
Misc. Nonmetallic Mineral Product	255	--
Slag	1,595	--
Iron and Steel Ingots	621	--
Iron and Steel Bars, Angles, etc.	1,379	--
Iron and Steel Plates and Sheets	2,395	--
Ferroalloys a/*	10,235	Hazardous
Primary Iron and Steel Products, nec	864	--
Copper	8,496	--
Aluminum, Unworked	5,545	--
Machinery, except Electrical	1,854	--
Electrical Machinery	300	--
Nonferrous Metal Scrap	1,554	--
TOTAL	1,045,492	

nec - not elsewhere classified

*Considered dangerous cargo as set forth in Code of Federal Regulations, Title 46, Parts 146 to 149, revised as of January 1, 1969, pp. 24-27.

a/ If ferrochrome, ferromanganese, or ferrosilicon.

Source: Corps of Engineers, Department of the Army.

TABLE 2.2.3-2 (Sheet 1)

TENNESSEE RIVER TRAFFIC PASSING SEQUOYAH NUCLEAR PLANT

(Tennessee River Mile 484.5)

Calendar Year 1978

Code	Commodity	Net Tons
0107	Wheat	2,773
1011	Iron Ore	14,390
1061	Manganese Ore	152,043
1121	Coal	182,021
1411	Limestone	2,800
1491	Salt	146,036
2062	Molasses	7,985
2415	Pulpwood	317,407
2611	Pulp	32,039
2621	Newsprint	20,882
2631	Paper and Paperboard	7,141
2810	Caustic Soda	7,811
2819	Basic Chemicals, NEC	42,174
	* (Methyl Methacrylate)	(37,137)
2871	Nitrogenous Chemical Fertilizers	4,825
2879	Fertilizers and Materials, NEC	10,491
*2915	Residual Fuel Oil	132,681
*2918	Asphalt, Tar and Pitches	151,379
2920	Coke	14,640

TABLE 2.2.3-2 (Sheet 2)
(Continued)

TENNESSEE RIVER TRAFFIC PASSING SEQUOYAH NUCLEAR PLANT

(Tennessee River Mile 484.5)

Calendar Year 1978

Code	Commodity	Net Tons
3291	Miscellaneous Nonmetallic Minerals	346
3312	Slag	2,918
3314	Iron and Steel Ingots	1,186
3315	Iron and Steel Bars	1,504
3316	Iron and Steel Plates	3,473
3318	Ferroalloys	2,800
3319	Primary Iron and Steel	35
3411	Fabricated Metal Products	125
3511	Machinery	575
3611	Electrical Machinery	150
3711	Motor Vehicles	235
3791	Miscellaneous Transportation Equipment	125
	TOTAL	1,262,990

Source: Corps of Engineers, Department of the Army

*Flammable liquids as classified in the "Code of Federal Regulations"

TABLE 2.2.3-3

Gasoline Barge Receipts at Port at Knoxville (In Net Tons)

Year	Net Tons
1960	219,452
1961	143,453
1962	203,625
1963	228,264*
1964	11,084
1965	16,773
1966	2,390
1967	45,079
1968	14,005
1969	36,831
1970	27,361
1971	157,743
1972	126,378
1973	36,506
1974	0**

* Pipeline completed 12/63

** TVA estimate

Source: "Waterbore Commerce of United States Part II"
Department of Army Corp. of Engineers

2.3 METEOROLOGY

2.3.1 Regional Meteorology

2.3.1.1 Data Sources

References used in describing the regional meteorology were the (1) general surface windflow patterns shown by the normal sea level pressure distribution (annual, February, July, and October) for North America and the North Atlantic Ocean--from the U.S. Atomic Energy Commission, ORO-99, A Meteorological Survey of the Oak Ridge Area, Weather Bureau, Oak Ridge, Tennessee, November 1953; (2) wind storm and thunderstorm occurrence--from (a) Local Climatological Data, "Annual Summary with Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Center, 1979, and (b) Severe Local Storm Occurrences, 1955-1967, ESSA Technical Memorandum WSTM FCST 12, U.S. Department of Commerce, Weather Bureau (now NWS), Silver Spring, Maryland, September l969; (3) tornado occurrence--from (a) "Tornado Occurrences in Tennessee, 1916-1964," John V. Vaiksnoras, State Climatologist, U.S. Department of Commerce, Weather Bureau, Nashville, Tennessee, May 5, 1965, (b) "Tornado Probabilities," H. C. S. Thom, Monthly Weather Review, Volume 91, Nos. 10-12, 1963, (c) discussion with John Vaiksnoras, State Climatologist for Tennessee, Nashville, Tennessee, August 3, 1972, (d) "Tornadoes of the United States," Snowden D. Flora, University of Alabama, November 1953, and (e) National Severe Storms Forecast Center tornado data, 1987 (4) air pollution potential--from Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, George C. Holzworth, Division of Meteorology, Environmental Protection Agency, Preliminary Document, May 10, 1971; and (5) precipitation--from (a) Precipitation in the Tennessee River Basin, TVA, Division of Water Control Planning, Hydraulic Data Branch, period of record 35 years (1935-1969), (b) Local Climatological Data, "Annual Summary with Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Center, 1979, (c) U.S. Army, Domestic Area Section, Glaze - Its Meteorology and Climatology, Geographical Distribution, and Economic Effects, Technical Report EP-105, Quartermaster Research and Engineering Center, Natick, Massachusetts, March 1959, and (d) Ostby, Frederick (Employee of U.S. Department of Commerce, NOAA, NWS, National Severe Storms Forecast Center, Kansas City, Missouri), telephone conversation with TVA meteorologist, Norris Nielsen, September 14, 1973.

2.3.1.2 General Climate

The Sequoyah site is in the eastern Tennessee portion of the Southern Appalachian region which is dominated much of the year by the Azores-Bermuda anticyclonic circulation shown in the annual normal sea level pressure distribution (Figure 2.3.1-1). [1] This circulation over the southeastern United States is most pronounced in the fall and is accompanied by extended periods of fair weather and widespread atmospheric stagnation. [2] In winter, the normal circulation pattern becomes diffuse as the eastward moving migratory high and low pressure systems, associated with the midlatitude westerly current, bring alternating cold and warm air masses into the area with resultant changes in wind direction, wind speed, atmospheric stability, precipitation, and other meteorological elements. In summer, the migratory systems are less frequent and less intense, and the area is under the dominance of the western edge of the Azores-Bermuda anticyclone with a warm moist air influx from the Atlantic Ocean and the Gulf of Mexico.

The terrain features of the region have some effect on the general climate. With the mountain ridge and valley terrain aligned northeast-southwest over eastern Tennessee, there is a definite bimodal upvalley-downvalley windflow in the lower 500 to 1000 feet during much of the year. The high Cumberland Plateau terrain, 1500 to 1800 feet above the valley elevation, tends to moderate many of the migratory storms which move from the west across the region. A detectable lake breeze circulation resulting from discontinuities in differential surface heating between land and water is not expected because of the relatively narrow width of the Tennessee River as it flows southwestward through the valley area.

2.3.1.3 Severe Weather

Wind storms may occur several times a year, particularly during winter, spring, and summer with winds exceeding 35 mph and on occasion exceeding 60 mph. The records show the highest wind speed recorded in Chattanooga was 82 mph in March 1947. [3] The highest hourly wind speed recorded at the Sequoyah meteorological facility during the first year of operation, April 2, 1971 -March 31, 1972, was 40 mph. High wind may accompany moderate-to-strong cold frontal passages about 20 to 30 times a year with the maximum frequency in March and April.

High wind may accompany thunderstorms, which occur on about 55 days a year with a maximum frequency in July [3]. The distribution of average monthly thunderstorm occurrences recorded during 1931-1979 at the Chattanooga National Weather Service Office is as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1	2	4	5	7	l0	11	9	4	1	1	1	56

Severe storm data for 1955-1967 [4] show l0 occurrences of hail 3/4 inch or greater in diameter, 20 occurrences of wind storms with speeds of 50 knots or greater, and 15 occurrences of tornadoes in the one degree latitude-longitude square containing the site. If these severe storm occurrences are assumed to be exclusive of one another, it can be assumed that about 45 severe thunderstorms occurred in the one degree square in this 13-year period. The annual occurrence for the square would be about 3.5. A smaller annual occurrence would be expected for the immediate site area, which is much smaller than the one degree square for which these statistics apply.

The probability of tornado occurrence is extremely low. Statistics show that during the 49-year period, 1916-1964, no tornadoes were reported in Hamilton County, where the Sequoyah site is located. [5] During the 1965-1986 period, three tornadoes were reported in the county. [18] During 1987-October 2002, seven tornadoes were reported in the county. [24] During 1955-1967, a total of 15 tornadoes was recorded for the one degree latitude-longitude square containing the site, for an annual occurrence of 1.15. [4] Using the principles of geometric probability described by H. C. S. Thom, [6] his frequency data for that 1-degree square, and a tornado path size of 0.284 mi^2, [7] the probability of a tornado striking any point in the plant site area is 4.4 x 1O^{-5}.

The National Severe Storms Forecast Center in Kansas City, Missouri calculated the tornado return probability for the Sequoyah site based on tornado occurrences within a 30 nautical mile (nm) radius during 1950-1986.[18] A circle of 30 nm radius has an area comparable to a one degree latitude-longitude square. Based on the 29 tornado occurrences with path size estimates in the 37-year period, the return probability is 1.635 x 10^{-4} and the mean return interval is 6,115 years. The annual tornado occurrence in the 30nm radius circle was 0.84 (based on 31 tornadoes reported) during that period. During the subsequent period spanning 1987 through October 2002, 23 tornadoes were reported in the same circle. [24] Thus, for the period spanning 1950 through October 2002, 54 tornadoes occurred for an annual occurrence of 1.02. Given the typically small path size of these tornadoes, the return probability and return interval given above should still be representative.

Tornadoes in the eastern Tennessee area generally move northeasterly and cover an average surface path five miles long and one hundred yards wide. [7] Winds of 150 to 200 mph are common in the whirl and are estimated to occasionally reach 300 mph. [7,8]

Days of high air pollution potential, shown in Figure 2.3.1-2, have been depicted by G. C. Holzworth, who presents an expected frequency of high meteorological potential for air pollution. [9] Over a five-year period, his data show that there were about thirty days, or about six days annually, that such conditions could have affected the site area, with most of the days occurring in the fall.

The highest monthly average rainfall near the site area occurs during the winter and early spring months, with March usually having the greatest amount. [10] The maximum 24-hour rainfall reported near the plant site was 7.56 inches in August. High precipitation is also observed in July when air mass thunderstorm activity is common. Minimum precipitation occurs normally in October.

The occurrence of snow, freezing rain, and ice storms in the mid-winter period is not uncommon. During 1931-1995, the maximum total monthly snowfall recorded at Chattanooga was 20.0 inches in March 1993. [25] The average annual snowfall for this period was 4.4 inches. The best estimate of the 100-year recurrence snowfall from a single storm is 14.5 inches which fell during a period from December 4, 1886 through December 6, 1886. [19] The maximum amount on the ground at any one time was 19 inches. This March 1993 24-hour storm was the maximum that occurred in 118 years of record at Chattanooga, Tennessee. No greater single storm or monthly amounts were observed in the southeastern Tennessee area around the plant site through July 2002. [26] The record depth of snow is below the maximum that the safety-related structures can withstand. Assuming the 20-inch snowfall was the depth on top of above ground structures, this equates to a snow load of 14.6 pounds per square foot compared to the design snow load of 20 pounds per square foot. Design criteria for the roofs of safety-related structures is given in Section 3.8. From 1917-18 to 1924-25, there were about three observations of ice storms heavy enough to damage telephone and telegraph lines in the Sequoyah site area. [ll] At least three and perhaps as many as six glaze storms occurred in the general area of the site from 1925-26 to 1952-53. There were about four glaze storms with ice thickness 1/4-inch or more during the period 1928-29 to 1936-37. Also, from 1939 to 1948, freezing rain or drizzle of a trace (0.01 inch) or more occurred on about two days a year.

Hail storms of significant intensity (hailstones 3/4 inch or more in diameter) would likely never occur in the plant area. [7] The probability of occurrence of such a storm can be calculated using Thom's tornado probability equation. [6] With a mean hail path area of two $mi.^2$ (1/2 mi. by 4 mi.) [12], an annual occurrence (of hail 3/4 inch or more in diameter) of 0.77 [4], and an area of 3887 $mi.^2$ for the one degree latitude-longitude square containing the site [6], the probability is calculated to be 3.96 x 10^{-4}.

Lightning strike density in the vicinity of the plant has been computed to be an average of about 8 ground strikes per square kilometer per year. [27] These are defined as cloud to ground strokes of lightning.

2.3.2 Local Meteorology

2.3.2.1 Data Sources

Most of the data used in this meteorological description were collected at the onsite meteorological facility (Environmental Data Station) in the four-year period from January 1, 1972 through December 31, 1975. Location of this facility with respect to the Sequoyah Nuclear Plant is shown in Figure 2.3.2-1.

A one-year period (May 1, 1975 - April 30, 1976) of wind and temperature data was used for comparison of stability classifications based on hourly-average vertical temperature difference (WT) values with those based on end-of-hour WT values. This comparison was done to determine any effects on the stability class frequency distribution and the joint wind speed and wind direction frequency distributions by stability class resulting from the change in temperature recording procedure from an end-of-hour reading to an hourly-average value.

Because of the limited period of onsite data, long-term fog and snowfall trends as well as supplementary temperature information were obtained from data records for the National Weather Service Office at Lovell Field, Chattanooga, located 14.5 miles south-southwest of the site (Figure 2.3.2-2). Precipitation data were obtained from a 20-year record from the TVA rain gauge station 685, Friendship School, Tennessee, located about 2.5 miles north-northeast of the plant site.

2.3.2.2 Normal and Extreme Values of Meteorological Parameters

With the limited period of onsite data, it is not reasonable to discuss normal and extreme values of meteorological parameters measured onsite; instead, the data should point toward representative mean values of the local meteorological parameters. Therefore, normal and extreme values of parameters measured offsite should be more representative of long-term regional climate, although local site influences may not be reflected.

Wind Direction

Data from the 33-foot wind instruments at the permanent meteorological facility for the January 1972 - December 1975 period represent reasonably well the expected wind conditions in the plant site area. The annual and monthly patterns (Tables 2.3.2-1 through 2.3.2-13 and Figures 2.3.2-3 through 2.3.2-15) show the predominant directions from the northeast and southwest quadrants which reflect the orographic channeling effects of the northeast-southwest aligned valley-ridge terrain.

For most of the months, but especially for the cooler months of the year, there is a weak secondary maximum of wind frequency from the northwest quadrant. This is most likely associated with post cold frontal winds, which are most likely during the optimum seasons (winter and early spring) for frequent migratory low pressure systems.

Wind Direction Persistence

The wind direction persistence1 analysis (based on the 33-foot (10-meter) data) shown in Table 2.3.2-14, gives the persistence for periods two hours or more from the given wind directions. The greatest persistence was from the north-northeast, which included the maximum of 33 hours. Persistence of 24 hours or more occurred with winds from the southwest, north, and northeast. The analysis shows that the occurrence of persistence periods lasting three hours or more is about 59 percent. For 12 hours or more, the occurrence is about four percent.

Wind Speed

The seasonal and annual occurrences of wind speed at the 33-foot tower level for all wind directions are shown in Tables 2.3.2-1 through 2.3.2-13 and Figures 2.3.2-3 through 2.3.2-15. The preponderance of winds from the northeast within the 0.6 to 3.4 mph wind speed range is most likely attributable to the anticyclonic circulation that dominates the eastern Tennessee region in the late summer and fall. Also, the identification of wind speeds less than 3.5 mph with stable anticyclonic flow is reflected in the high frequency of occurrence of this range in late summer and early fall--a period during which stable anticyclonic conditions are most common. On the other hand, these low wind speeds occur least often in winter and early spring--a period frequented by the passage of migratory low pressure systems.

Wind speeds 7.5 mph and greater occurred most frequently with upvalley winds (from the southwest). These wind speeds occurred very infrequently with winds from the east-northeast, east, east-southeast, and southeast. The predominance of strong winds from the southwest may be attributable to the channeling of the southerly and southwesterly flow preceding the passage of cold fronts through the area. Winds greater than 7.5 mph were more frequent from November through April, with a maximum of about 32 percent in April; they occurred least often in July and August.

[1] Persistent wind is defined in this analysis as a continuous wind from one of the 22-1/2 degree sectors (e.g., north-northeast) except that the persistence is not considered to be interrupted if the wind departs from the sector for one hour and then returns, or if there are up to two hours of missing data followed by a continuation of the same directional persistence.

Temperature

A summary of the first year (April 2, 1971 - March 31, 1972) of onsite temperature data from the meteorological facility is shown in Table 2.3.2-15. The average annual temperature was 59.7°F with the range of monthly averages from 40.1°F in February to 75.5°F in August. The extreme maximum and minimum were 96.3°F and 2.9°F in June and January, respectively. Onsite temperature data compare reasonably well with the normal temperature records from the Chattanooga National Weather Service Office (Weather Bureau) shown in Table 2.3.2-16, although extremes of temperature from the one year of onsite data are somewhat conservative as compared to extremes for Chattanooga. [3] [25]

Atmospheric Water Vapor

The first year of onsite temperature and dew point data were used to compute mean and extreme values of absolute and relative humidity shown in Tables 2.3.2-17 and 2.3.2-18. The average annual absolute humidity was 9.7 g/m^3 with the range of monthly averages from 16.2 g/m^3 in June to 4.2 g/m^3 in February. The extreme maximum was 22.3 g/m^3 in June and the extreme minimum was 1 g/m^3 in February.

The average annual relative humidity was 66.5 percent with the range of monthly averages from 50.6 percent in April to 78.4 percent in October and December. The extreme maximum was 100 percent in March, June, September, November, and December, and the extreme minimum was 17 percent in April.

Precipitation

Precipitation patterns, based on a 20-year period (1948-1967) of data collection at the TVA rain gauge station 685, 2.5 miles north-northeast of the plant site, are shown in Table 2.3.2-19. [10] The data show that there was an average of 117 days annually with 0.01 inch or more of precipitation. The average monthly precipitation was 4.81 inches, with the maximum monthly average 6.76 inches occurring in March and the minimum monthly average 2.86 inches occurring in October. The extreme monthly maximum and minimum were 16.58 inches in November and 0.09 inch in October, respectively. This station was discontinued after 1972, but examination of records for 1968-1972 showed no changes in extremes. [28] Also, the extreme maximum and minimum values in Table 2.3.2-19 have not been exceeded at the Chattanooga airport station during the 1940-2002 period. [25]

Snowfall does not occur often in the Sequoyah site area. Chattanooga snowfall data in Table 2.3.2-20 are considered representative. [25] The average annual snowfall was 4.4 inches and occurred mostly in December through March. The maximum 24-hour snowfall reported at Chattanooga was 20.0 inches in March 1993; the next highest was 10.2 inches in January 1988.

Fog

No observations of the frequency and intensity of fogs have been made in the site area. However, Chattanooga National Weather Service records (Table 2.3.2-21) indicate that heavy fogs (visibility of 1/4 mile or less) occurred on an average of 36 days annually with a maximum average monthly frequency of six days in October and a minimum average monthly frequency of two days from February through July. [3]

Atmospheric Stability

At the present time, atmospheric stability is calculated from the difference between the hourly-average temperature values from two levels. Prior to January 8, 1975, the temperature difference was calculated by a high speed digital computer that was programmed to convert the difference between the ambient temperature sensor resistances at any two instrument levels to a temperature difference value (WT). Before January 8, 1975, both temperature and temperature difference data were obtained from end-of-hour readings.

Four years (January 1, 1972 - December 31, 1975) of onsite temperature difference data from the 33- and 150-foot (9- and 46-meter) tower levels of the permanent meteorological facility were categorized into seven atmospheric stability groups (Pasquill classes A through G). Table 2.3.2-22 shows that the Pasquill stability classes E, F, and G occurred about 72 percent of the time. The most stable class, G, occurred about seven percent of the time. The total occurrence of the least stable classes, A, B, and C, was about eight percent, while the neutral stability class, D, occurred about 20 percent of the time.

Joint percentage frequencies of wind direction and wind speed for the Pasquill stability classes A through G are summarized in Tables 2.3.2-23 through 2.3.2-29 and Figures 2.3.2-16 through 2.3.2-22. The most critical conditions, class G and wind speeds less than 3.5 mph (Table 2.3.2-29, Figure 2.3.2-22), occurred less than six percent of the time. Stability category G is most often associated with downvalley winds (from the north-northeast and northeast), with a secondary maximum associated upvalley winds (from the southwest and south-southwest). Annual frequencies for classes E and F (Tables 2.3.2-27 and 2.3.2-28) show respective frequencies of about 17 and 15 percent for wind speeds less than 3.5 mph.

Using the same type of instrumentation, the capability for calculating hourly average ΔT values (based on hourly-average temperature values) was established in January 1975. A special adjustment of the computer program developed for this purpose was made to also obtain instantaneous, end-of-hour ΔT values for comparison with the hourly-average values.

Table 2.3.2-30 provides the frequencies for hourly-average and end-of-hour stability classes (Pasquill A-G), and Tables 2.3.2-31 through 2.3.2-58 provide joint frequencies of wind direction and wind speed by stability class, each for hourly-average and end-of-hour ΔT values. Summaries based on hourly-average and end-of-hour ΔT values are presented for 33- to 150-foot ΔT and 33-foot wind direction and wind speed data, and for 33- to 300-foot ΔT and 300-foot wind direction and wind speed data. The same wind direction and wind speed data were used with the hourly-average and the end-of-hour ΔT data.

2.3.2.3 Potential Influence of the Plant and its Facilities on Local Meteorology

The presence and operation of the Sequoyah Nuclear Plant should have no noticeable effects on the local meteorology, with the exception of a slight increase in frequency, duration, and intensity of steam fogs forming at the river surface due to heated water releases through the diffusers. These fogs develop as a result of elevation of the dew point by the addition of moisture to the air from the water surface. Once this shallow fog moves on shore, the moisture source is cut off and the fog dissipates. Thus, the increased fogging should be confined within the boundaries of the Chickamauga Reservoir and should not affect long-term fog patterns in the surrounding area. This phenomenon has been observed frequently over the extended river and reservoir system within the Tennessee Valley Region.

Based on previous experience with natural-draft cooling tower operation at the TVA Paradise Steam Plant, no adverse impact on the local meteorology is expected from the operation of supplemental natural-draft cooling towers at the Sequoyah Plant. Some minor effects may include increased atmospheric moisture, decreased solar radiation, and increased concentrations of aerosols related to the drift. However, the significance of these effects would be very difficult or impossible to measure.

2.3.2.4 Topographical Description

The principal effect of the topography in the Sequoyah area on the diffusion of effluent releases is one of confinement to the downwind sectors of predominant wind. Figure 2.3.2-23, sheets 1-9, shows the topographic features within five miles and topographic cross sections in the 16 compass sectors. Annually, the majority of the releases of radioactive effluent would be dispersed within the northeasterly and southwesterly quadrants from the plant as a result of the upvalley-downvalley low-level wind. Therefore, relative ground-level concentrations would be expected to be higher in these sectors, particularly during periods of low wind and stable conditions. Also, with the relatively flat and undulating valley floor, there should be minimal discontinuity of the general low-level wind pattern from terrain roughness or irregularity. Furthermore, differences in the ambient thermal or stability structure in the area from differential surface heating between land and water should not cause significant alterations to the wind and stability patterns in the plant area. On rare occasions, slight buildup of effluent concentration could occur in the Cumberland escarpment area, about 15 miles to the northwest, where some geographically induced impingement or entrapment of the effluent might be expected.

2.3.3 On-Site Meteorological Measurement Program

2.3.3.1 Siting and Description of Instruments

The Sequoyah meteorological facility consists of a 91-meter (300 foot) instrumented tower for wind and temperature measurements, a separate 10-meter (33 foot) tower for dewpoint measurements, a ground-based instrument for rainfall measurements, and an Environmental Data Station (EDS), which houses the data collection and recording equipment. A system of lightning and surge protection circuitry with proper grounding is included in the facility design. This facility is located approximately 0.74 miles (1.2 kilometers) southwest of the Reactor Building and about 50 feet (15 meters) above plant grade (Figure 2.3.2-1).

Rainfall is monitored from a rain gauge located approximately 55 feet from the tower. Data collected include: (1) wind speed and direction at 10, 46, and 91 meters (33, 150, and 300 feet), (2) temperature at 10, 46, and 91 meters; (3) a separate 10 meter (33 foot) tower for dewpoint measurements; and (4) rainfall at 1 meter (3 feet). More exact measurements heights for wind and temperature sensors are given in the “Instrument Description” subsection. Elsewhere in this document, temperature and wind sensor heights are given as 10, 46, and 91 meters. Collection of onsite meteorological data at the Sequoyah Nuclear Plant commenced in April 1971 with measurements of wind speed and wind direction at 10 meter and 91 meters, temperature at 1, 10, 46, and 91 meters; and dewpoint and rainfall at 1 meter. Measurements of 46 meter windspeed/direction and 10 meter dewpoint began on August 6, 1976. Measurement of 1 meter dewpoint ended on January 9, 1979. Measurement of 1 meter temperature ended on January 10, 1979. The dewpoint sensor was moved to a separate tower on June 7, 1994.

Instrument Description

A description of the meteorological sensors follows. More detailed sensor specifications are included in the EDS manual [Reference 20]. Replacement sensors, which may be of a different manufacturer or model, will satisfy Regulatory Guide 1.23 (Revision 0). [Reference 13]

SENSOR	HEIGHT (feet)	DESCRIPTION
Wind Direction	31.9, 152.8, and 299.9[a]	Climet Instruments, Inc., Model 012-16[c]; threshold, 0.75 mph; accuracy, ± 3°.

SENSOR	HEIGHT (feet)	DESCRIPTION
Wind Speed	31.9, 152.8 and 299.9[a]	Climet Instruments, Inc., Model 011-4[c]; threshold, 0.6 mph; accuracy, ± 1% or 0.15 mph, whichever is greater.
Temperature	30.3, 150.9, and 297.9[a]	Weed Instrument Co., Model 101[c]; accuracy, ± 0.06°F; R. M. Young, Model 43408[C] aspirated radiation shield; error, 0°F to 0.4°F.
Dewpoint	30.3[b]	Protimeter Inc., Model DPS-100[c]; accuracy, ± 0.9°F.
Rainfall	4	Tipping bucket rain gauge.

a. Prior to making precise measurements of the sensor heights in 1977, they were assumed to be 33 feet, 150 feet, and 300 feet. Consequently, the nominal height values of 33, 150, and 300 feet are used elsewhere in the text.

b. Prior to making a precise measurement of the sensor height in 1977, it was assumed to be 33 feet. Consequently, the nominal height value of 33 feet is used elsewhere in the text.

c. A replacement sensor of a different manufacturer or model will satisfy R.G. 1.23 (Revision 0).

2.3.3.2 Data Acquisition System

The previous data collection system, which included a NOVA minicomputer, was replaced by a new system on April 5, 1988. This data acquisition system is located at the EDS and consists of meteorological sensors, a computer and various interface devices. These devices send meteorological data to the plant and to the Central Emergency Control Center (CECC), to enable callup for data validation and archiving offsite.

System Accuracies

The meteorological data collection system is designed and replacement components are chosen to meet or exceed specifications for accuracy identified in NRC Regulatory Guide 1.23, Revision 0.

The meteorological data collection system (root-sum-squared [RSS] error) satisfies the R.G. 1.23 accuracy requirements. A detailed listing of error sources for each parameter is included in the EDS manual [Reference 20].

2.3.3.3 Data Recording and Display

The data acquisition is under control of the computer program. The output of each meteorological sensor is scanned periodically, scaled, and the data values are stored.

Meteorological sensor outputs are measured at the following rates: horizontal wind direction and wind speed, every five seconds (720 per hour); temperature and dewpoint, every minute (60 per hour); rainfall, every hour (one per hour). Prior to January 8, 1975, only one temperature reading was made each hour. Software data processing routines within the computer accumulate output and perform data calculations to generate 15-minute and hourly averages of wind speed and temperature, 15-minute and hourly vector wind speed and direction, hourly average of dewpoint, hourly horizontal wind direction sigmas, and hourly total precipitation. Prior to February 9, 1987, a prevailing wind direction calculation method was used. Subsequently, vector wind speed and direction have been calculated along with arithmetic average wind speed.

Selected data each 15 minutes and all data each hour are stored for remote data access.

Data sent to the plant computer systems every minute includes 10, 46, and 91 meter values for wind speed, wind direction, and temperature.

Data sent to the Central Emergency Control Center (CECC) computer in Chattanooga every 15 minutes includes 91-, 46-, and 10-meter wind direction, wind speed, and temperature values. These data are available from the CECC computer to other TVA and State emergency centers in support of the Radiological Emergency Plan (REP), including the Technical Support Center at Sequoyah. Remote access of meteorological data by the NRC is available through the CECC computer.

Data are sent from the EDS to an offsite computer for validation, reporting, and archiving.

2.3.3.4 Equipment Servicing, Maintenance, and Calibration

The meteorological equipment at EDS is kept in proper operating condition by staff that are trained and qualified for necessary tasks.

Most equipment is calibrated or replaced at least every six months of service. The methods for maintaining a calibrated status for the components of the meteorological data collection system (sensors, recorders, electronics, DVM, data logger, etc.) include field checks, field calibration, and/or replacement by a laboratory calibrated component. More frequent calibration intervals for individual components may be conducted, on the basis of the operational history of the component type. Detailed procedures are used and are referenced in the EDS Manual. Overall quality assurance functions for meteorological monitoring are described and referenced in TVA's Quality Assurance Program--Meteorological Monitoring. [Reference 23]

2.3.3.5 Operational Meteorological Program

The operational phase of the meteorological program includes those procedures and responsibilities related to activities beginning with the initial fuel loading and continuing through the life of the plant. This phase of the meteorological data collection program will be continuous without major interruptions. The meteorological program has been developed to be consistent with guidance given in NRC Regulatory Guide 1.23 (Revision 0) and the reporting procedure in Regulatory Guide 1.21 (Revision 1). [14] The basic objective is to maintain data collection performance to assure at least 90 percent joint recoverability and availability of data needed for assessing the relative concentrations and doses resulting from accidental or routine releases.

The restoration of the data collection capability of the meteorological facility in the event of equipment failure or malfunction will be accomplished by replacement or repair of affected equipment. A stock of spare parts and equipment is maintained to minimize and shorten the periods of outages. Equipment malfunctions or outages are detected by maintenance personnel during routine or special checks. Equipment outages that affect the data transmitted to the plant can be detected by review of data displays in the reactor control room. Also, checks of data availability to the emergency centers are performed each work day. When an outage of one or more of the critical data items occurs, the appropriate maintenance personnel will be notified.

In the event that the onsite meteorological facility is rendered inoperable, or there is an outage of communications or data access systems; there is no fully representative offsite source of meteorological data for identification of atmospheric dispersion conditions. Therefore; TVA has prepared objective backup procedures to provide estimates for missing or garbled data. These procedures incorporate available onsite data (for a partial loss of data), offsite data, and conditional climatology. The CECC meteorologist will apply the appropriate backup procedures.

2.3.4 Short-Term (Accident) Diffusion Estimates

2.3.4.1 Objective

Two sets of atmospheric dilution factors (X/Q values) are currently used for accident releases modeled as ground level releases from the Sequoyah Nuclear Plant for specified time intervals and distances. The first set is based on one year (April 2, 1971 through March 31, 1972) of data from the Sequoyah permanent meteorological facility. Part of this set was used in the design accident dose calculations and is shown in Table 15A-2. The latest and most widely used set is based on four years (January 1972 through December 1975) of data (Tables 2.3.2-23 through 2.3.2-29). This data was used in Chapter 11.

2.3.4.2 Calculations

Two mathematical models were used in estimating atmospheric dilution factors during postulated reactor accidents - one for the 1-hour and 8-hour (0-8 hours) averaging periods and the other for the 16-hour (8-24 hours), 3-day (1-4 days), and 26-day (4-30 days) averaging periods. Calculations with the two models utilize hourly values of wind direction, wind speed, and atmospheric stability (Pasquill classes A through G).

Nomenclature

A = minimum cross-sectional area of the Reactor Building (m^2)

c = an empirical constant used in defining the magnitude of the building wake (dimensionless)

Q = source strength or effluent release rate (curies/sec)

u = mean horizontal wind speed at 10 meters (m/sec)

x = distance from effluent release point to point at which X/Q values are computed (m)

π = 3.1416

σ_y = Pasquill horizontal crosswind plume standard deviation (m)

σ_z = Pasquill vertical plume standard deviation (m)

x = ground-level concentration (curies/m^3)

Model for the 1-Hour and 8-Hour Averaging Periods

Atmospheric dilution factors were calculated for the 1-hour and 8-hour averaging periods using a Gaussian centerline building wake diffusion equation discussed in NRC Regulatory Guide 1.4 (Revision 2) [15] and Slade [16]:

$$X / Q = \frac{1}{(\eta \, \sigma_Y \, \sigma_Z + cA)\bar{u}} \qquad (1)$$

where cA is a building wake factor.

Model for Averaging Periods Greater than 8 Hours

Atmospheric dilution factors were calculated for the 16-hour, 3-day, and 26-day averaging periods using a Gaussian sector average building wake diffusion equation presented in NRC Regulatory Guide 1.4 (Revision 2):

$$X / Q = \frac{2.032}{\sigma_Z \, x\bar{u}} \qquad (2)$$

For this model, it is assumed that sufficient time elapses to allow the plume to meander and uniformly spread across the 22-1/2-degree downwind sector.

Locations for Which Atmospheric Dilution Factors Were Calculated and Effluent Release Zones

Atmospheric dilution factors were calculated for two location categories: (1) exclusion area boundary, and (2) outer boundary of the Low Population Zone (LPZ). The effluent release zones for the Sequoyah Plant were defined for three locations (see Figure 2.1.2.-2): (1) Release Zone 1, the Auxiliary Building vent exhaust and the Shield Building vent exhaust; (2) Release Zone 2, the radioactive chemical hood exhaust; and (3) Release Zone 3, the condenser air ejector exhaust.

Atmospheric Dilution Factors for the Exclusion Area Boundary

Each release zone was considered individually in calculating atmospheric dilution factors at the exclusion area boundary. The distances from each effluent release zone to the intersections of the 16 compass-point directional sectors with the exclusion area boundary are shown in Table 2.3.4-1.

The hourly average wind speed and atmospheric stability were obtained for a given hour in the January 1972 - December 1975 data period. These data were used with equation (l) to calculate an atmospheric dilution factor corresponding to the exclusion area boundary distance for a particular release zone. This procedure was repeated for each release zone as frequently as there was valid hourly meteorological information available during the 48-month period. These calculations resulted in a list of hourly values for each of the three release zones which were tabulated into cumulative frequency distributions and are shown in Tables 2.3.4-2, 2.3.4-3, and 2.3.4-4 corresponding to Release Zones 1, 2, and 3, respectively. The 5th and 50th percentile and average values of the atmospheric dilution factors for each release zone were also computed and follow:

One-Hour Atmospheric Dilution Factors

At Exclusion Area Boundary (sec/m^3)

Release Zone	5th Percentile	50th Percentile	Average
1	0.859×10^{-3}	0.163×10^{-3}	0.269×10^{-3}
2	0.795×10^{-3}	0.145×10^{-3}	0.243×10^{-3}
3	0.892×10^{-3}	0.164×10^{-3}	0.279×10^{-3}

A more conservative approach consisted of using the above procedure except selecting the shortest distance from each release zone to the exclusion area boundary and calculating the atmospheric dilution factor for all directions using this fixed distance. The minimum distances as shown in Table 2.3.4-1 are 556 meters, 600 meters, and 509 meters for Release Zones 1, 2, and 3, respectively. The calculations resulted in a list of hourly values for each of the three release zones. These values were tabulated into cumulative frequency distributions as shown in Tables 2.3.4-5, 2.3.4-6, and 2.3.4-7, corresponding to Release Zones 1, 2, and 3, respectively. The 5th and 50th percentile and average atmospheric dilution factors follow:

One-Hour Atmospheric Dilution Factors

At Exclusion Area Boundary (sec/m^3)

Release Zone	5th Percentile	50th Percentile	Average
1	0.147×10^{-2}	0.234×10^{-3}	0.396×10^{-3}
2	0.130×10^{-2}	0.215×10^{-3}	0.365×10^{-3}
3	0.162×10^{-2}	0.258×10^{-3}	0.435×10^{-3}

Atmospheric Dilution Factors for Outer Boundary of the LPZ

Atmospheric dilution factors for the outer boundary of the LPZ were calculated by considering a single source or release zone that was assumed to be representative of the three actual release zones. Unlike the calculations for the actual exclusion area boundary in which distances changed with direction, the distance of 4828 meters was used for all calculations for the outer boundary of the LPZ. These values were calculated for averaging times of 1 hour, 8 hours, 16 hours, 3 days, and 26 days. All 1-hour average values were obtained by use of equation (1) and the hourly meteorological observations. The cumulative frequency distribution of these values is listed in Table 2.3.4-8. The 5th and 50th percentile and average values are also shown.

For a given sector, the 8-hour average atmospheric dilution factor was obtained by averaging the hourly values. For a given 8-hour period, sixteen 8-hour averages were obtained--one for each compass-point sector. The average value selected to represent the given 8-hour period was the maximum of the sixteen. There were 35,057 8-hour periods from January 1, 1972 through December 31, 1975 where consecutive 8-hour periods overlapped for seven hours. An atmospheric dilution factor was not calculated for an 8-hour period unless there were at least four hours of valid meteorological observations during the period. After the values were computed for the valid 8-hour periods, they were summarized into the cumulative frequency distribution shown in Table 2.3.4-9. The average and 5th and 50th percentile statistics were also computed.

All other averages (the 16-hour, 3-day, and 26-day averages) were treated in a fashion analogous to the 8-hour average except that equation (2) was used to calculate the atmospheric dilution factors. Tables 2.3.4-10, 2.3.4-11, and 2.3.4-12 summarize the cumulative frequency distributions of the values for the corresponding l6-hour, 3-day, and 26-day averaging periods, respectively. The 5th and 50th percentile and average values for each averaging period are included in the following table:

Averaging Time	Atmospheric Dilution Factor at Outer Boundary of LPZ (sec/m^3) 5th Percentile	50th Percentile	Average
1-hour	0.139×10^{-3}	0.142×10^{-4}	0.319×10^{-4}
8-hour	0.539×10^{-4}	0.980×10^{-5}	0.169×10^{-4}
16-hour	0.717×10^{-5}	0.236×10^{-5}	0.299×10^{-5}
3-day	0.434×10^{-5}	0.176×10^{-5}	0.201×10^{-5}
26-day	0.271×10^{-5}	0.153×10^{-5}	0.148×10^{-5}

Data from the one-year period (May 1, 1975 through April 30, 1976) were used to compare atmospheric dilution factors obtained from stability classes determined from end-of-hour temperature measurements and those determined from hourly average temperature measurements. These data (Tables 2.3.2-31 through 2.3.2-44) include wind direction and wind speed at 33 feet (10 meters) above ground and temperature difference between the elevations of 33 and 150 feet (46 meters).

Table 2.3.4-13 compares atmospheric dilution factors based on (1) hourly-average ΔT data and (2) end-of-hour ΔT data. The values presented for comparison are fifth percentile values for 1-hour and 8-hour periods at the minimum exclusion area boundary distance of 556 meters and for 8-hour, 16-hour, 3-day, and 26-day periods at the LPZ distance of 4828 meters.

It is apparent from examination of the data tables that the differences between atmospheric dilution factors obtained from the data set containing hourly-average ΔT and those obtained from the data set containing end-of-hour ΔT are not significant. The joint frequencies of wind direction and wind speed by atmospheric stability class for 33- to 300-foot ΔT and 300-foot wind data show even closer agreement than those based on 33- to 150-foot ΔT and 33-foot wind data. Therefore, any calculations based on end-of-hour 33- to 300- foot ΔT, or even 150- to 300-foot ΔT, could be expected to be at least as representative of those based on hourly-average ΔT as those for 33- to 150-foot ΔT and 33-foot wind data presented in Table 2.3.4-13.

2.3.5 Long-Term (Routine) Diffusion Estimates

2.3.5.1 Objective

In this section, calculated average annual atmospheric dispersion factors (X/Q values) are reported at specified distances for routine releases from the Sequoyah Nuclear Plant. A dispersion equation is applied which accounts for initial dilution of gaseous effluents in the building wake. Joint frequency distributions of wind direction and speed by atmospheric stability class based on onsite meteorological data collected during the period of January 1972 through December 1975 are used in the calculations. Joint frequency distributions are presented in Tables 2.3.2-23 through 2.3.2-29.

2.3.5.2 Calculations

Average annual atmospheric dispersion factors are calculated for locations along 16 radial lines corresponding to the major compass points drawn from the center of the nuclear plant complex. Calculations in each of the 16 sectors are made for the site boundary and for the distances 1, 2, 3, 4, 5, 10, 15, 20, 30, 40, and 50 miles. Three effluent release zones are designated for calculating atmospheric dispersion factors at the site boundary (see Figure 2.1.2-2). These are as follows:

Release Zone 1 - Auxiliary Building vent exhaust and Shield Building vent exhaust.

Release Zone 2 - Radioactive chemical hood exhaust.

Release Zone 3 - Condenser air ejector exhaust.

In calculating the average annual atmospheric dispersion factors for the selected distances between 1 and 50 miles, it is assumed that gaseous effluents are released from a single point (the three release zones are not considered in these calculations). The distances to the unrestricted area boundary from this point are shown in Table 11.3.9-1.

Atmospheric dispersion calculations are based on a building wake model described by Davidson [16,17]. The average annual atmospheric dispersion factor at any point of interest x is given by:

wind speeds stability types

$$\frac{X}{Q_o} = \left(\frac{2}{\pi}\right)^{1/2} \frac{1}{W} \sum i \sum j \frac{f_{ij}}{(\Sigma_z)_j U_i}, \text{ SEC}/m^3$$

where

W = 2p x/16, the sector width at downwind distances x, m,

u_i = wind speed i, m/s,

f_{ij}= frequency with which wind speed u_i occurs in the sector of interest during atmospheric stability class j,

$$(\Sigma_z)_j = \left((\sigma_z)_j^2 + \frac{cA}{\pi}\right)^{1/2}$$

the vertical standard deviation of the plume (modified for the effect of building wake dilution) at the distance x for stability class j, m,

$(\sigma_z)_j$ = Pasquill vertical standard deviation of the plume at the distance x for stability class j, m,

c = parameter that relates the cross-sectional area of a building to the size of the turbulent wake caused by the building,

A = minimum Reactor Building cross-sectional area, m^2.

In the expression for (σ_z), c is assumed to be 0.5 and A is assumed to be 1,800 m^2. Table 2.3.4-14 lists average annual atmospheric dispersion factors for the Sequoyah site.

2.3.6 References

1. U.S. Atomic Energy Commission, A Meteorological Survey of the Oak Ridge Area, ORO-99, Weather Bureau, Oak Ridge, Tennessee
November 1953, page 377.

2. U.S. Atomic Energy Commission, A Meteorological Survey of the Oak Ridge Area, ORO-99, Weather Bureau, Oak Ridge, Tennessee, November 1953, page 192.

3. Local Climatological Data, "Annual Summary With Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Center, Asheville, North Carolina, 1979.

4. Severe Local Storm Occurrences, 1955-1967, ESSA Technical Memorandum WSTM FCST 12, U.S. Department of Commerce, Weather Bureau (now NWS), Silver Spring, Maryland, September 1969.

5. "Tornado Occurrences in Tennessee, 1916-1964," John V. Vaiksnoras, U.S. Department of Commerce, Weather Bureau, Nashville, Tennessee, May 5, 1965.

6. "Tornado Probabilities," H. C. S. Thom, Monthly Weather Review, Volume 91, Nos. 10-12, 1963, pp. 730-736.

7. Discussion with John Vaiksnoras, State Climatologist for Tennessee, Nashville, Tennessee, August 3, 1972.

8. "Tornadoes of the United States," Snowden D. Flora, University of Oklahoma Press, November 1953.

9. Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, George C. Holzworth, Division of Meteorology, Environmental Protection Agency, Preliminary Document, May 10, 1971.

10. Precipitation in the Tennessee River Basin, Tennessee Valley Authority, Division of Water Control Planning, Hydraulic Data Branch, period of record 35 Years (1935-1969).

11. Glaze - Its Meteorology and Climatology, Geographical Distribution, and Economic Effects, Technical Report EP-105, U.S. Army, Domestic Area Section, Quartermaster Research and Engineering Center, Environmental Protection Research Division, Natick, Massachusetts, March 1959.

12. Ostby, Frederick, employee of U.S. Department of Commerce, NOAA, NWS, National Severe Storms Forecast Center, Kansas City, Missouri, telephone conversation with TVA meteorologist, Norris Nielsen, September 14, 1973.

13. Regulatory Guide 1.23, Revision 0 (Safety Guide 23), "Onsite Meteorological Programs," U.S. Atomic Energy Commission, Washington, D.C., February 1972.

14. Regulatory Guide 1.21, Revision 1, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," U.S. Atomic Energy Commission, Washington, D.C., June 1974.

15. Regulatory Guide 1.4, Revision 2, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors," U.S. Atomic Energy Commission, Washington, D.C., June 1974.

16. Meteorology and Atomic Energy, D. H. Slade, ed., USAEC Report, TID-24190, July 1968.

17. Atmospheric Diffusion Experiments with SF_6 Tracer Gas at Three Mile Island Nuclear Station Under Low Wind Speed Inversion Conditions, Pickard, Lowe, and Associates, Inc., The Research Corporation of New England, General Public Utilities Service Corporation, January 1972.

18. Tornado data for the Sequoyah Nuclear Plant site prepared by the National Severe Storms Forecast Center, Kansas City, Missouri, November 1987.

19. "Extremes of Snowfall: United States and Canada," Weatherwise, Published for American Meteorological Society by Weatherwise, Inc., December 1970.

20. Sequoyah Nuclear Plant Environmental Data Station Manual, Tennessee Valley Authority.

21. Deleted by Amend 15

22. Deleted by Amend 15

23. Quality Assurance Program for Meteorological Monitoring for Nuclear Plants, Tennessee Valley Authority, AS-QAP-2.

24. Storm Data, U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, North Carolina, Volume 29, Number 1 through Volume 44, Number 10, January 1987 - October 2002.

25. Local Climatological Data, “Annual Summary with Comparative Data,” Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, North Carolina, 2002.

26. Climatological Data, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, North Carolina, Volumes 101-107, July (Number 7) Issues, 1996 - 2002.

27. Lighting Strike Density for the Contiguous United States From Thunderstorm Duration Records, NUREG/CR-3759, prepared by NOAA’s National Severe Storms Laboratory, Norman, Oklahoma, for Division of Health, Siting, and Waste Management, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1984.

28. Precipitation in the Tennessee River Basin, Tennessee Valley Authority, Division of Water Control Planning, Hydraulic Data Branch, 1968 - 1972.

SQN

TABLE 2.3.2-1

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	WIND SPEED (MPH) 5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.51	3.20	1.63	0.67	0.58	0.0	0.0	0.0	6.59
NNE	0.82	8.30	5.05	2.46	2.18	0.11	0.0	0.0	18.92
NE	0.48	3.86	2.59	1.01	0.83	0.06	0.0	0.0	8.83
ENE	0.42	1.58	0.39	0.09	0.0	0.01	0.0	0.0	2.49
E	0.50	0.80	0.11	0.03	0.02	0.01	0.0	0.0	1.47
ESE	0.33	0.45	0.07	0.02	0.01	0.02	0.0	0.0	0.90
SE	0.34	0.82	0.19	0.01	0.02	0.0	0.0	0.0	1.38
SSE	0.41	1.36	0.55	0.23	0.36	0.06	0.02	0.0	2.99
S	0.47	2.89	2.49	1.58	1.53	0.14	0.0	0.0	9.10
SSW	0.29	3.79	4.91	3.44	2.84	0.24	0.0	0.0	15.51
SW	0.30	3.55	4.79	3.02	1.93	0.20	0.02	0.0	13.81
WSW	0.24	1.68	1.19	0.66	0.69	0.16	0.02	0.0	4.64
W	0.21	0.78	0.47	0.35	0.44	0.06	0.01	0.0	2.32
WNW	0.27	0.70	0.36	0.34	0.51	0.03	0.0	0.0	2.21
NW	0.18	0.93	0.63	0.74	0.83	0.07	0.0	0.0	3.38
NNW	0.27	1.55	1.23	0.93	0.99	0.04	0.0	0.0	5.01
SUBTOTAL	6.04	36.24	26.65	15.58	13.76	1.21	0.07	0.0	99.55

TOTAL HOURS OF VALID WIND OBSERVATIONS	32338
TOTAL HOURS OF OBSERVATIONS	35064
RECOVERABILITY PERCENTAGE	92.2
TOTAL HOURS CALM	140 = 0.43 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 4.6 MPH

SQN

TABLE 2.3.2-2

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

JANUARY (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.61	2.27	1.29	0.68	1.21	0.0	0.0	0.0	6.06
NNE	1.59	5.04	5.04	2.46	2.20	0.04	0.0	0.0	16.37
NE	0.68	4.81	2.77	0.95	2.27	0.27	0.0	0.0	11.75
ENE	0.34	1.25	0.30	0.11	0.0	0.0	0.0	0.0	2.00
E	0.45	0.87	0.15	0.27	0.04	0.0	0.0	0.0	1.78
ESE	0.38	0.49	0.0	0.0	0.0	0.0	0.0	0.0	0.87
SE	0.27	0.38	0.0	0.0	0.0	0.0	0.0	0.0	0.65
SSE	0.42	0.64	0.27	0.04	0.19	0.11	0.23	0.0	1.90
S	0.27	1.89	1.17	0.98	1.74	0.11	0.0	0.0	6.16
SSW	0.30	3.07	4.02	3.67	5.15	0.42	0.0	0.0	16.63
SW	0.30	3.45	5.49	3.45	2.65	0.68	0.0	0.0	16.02
WSW	0.30	2.01	1.55	0.87	1.29	0.42	0.0	0.0	6.44
W	0.15	0.83	0.42	0.45	0.42	0.0	0.0	0.0	2.27
WNW	0.11	0.42	0.30	0.08	0.38	0.04	0.0	0.0	1.33
NW	0.30	0.45	0.61	0.49	0.53	0.0	0.0	0.0	2.38
NNW	0.49	1.10	1.06	1.25	2.39	0.04	0.0	0.0	6.33
SUBTOTAL	6.96	28.97	24.44	15.75	20.46	2.13	0.23	0.0	98.94

TOTAL HOURS OF VALID WIND OBSERVATIONS 2640
TOTAL HOURS OF OBSERVATIONS 2976
RECOVERABILITY PERCENTAGE 88.7
TOTAL HOURS CALM 28 = 1.1 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 5.2 MPH

TABLE 2.3.2-3

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

FEBRUARY (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.20	2.19	1.75	1.04	0.92	0.04	0.0	0.0	6.14
NNE	0.68	5.77	4.22	1.99	3.07	0.44	0.0	0.0	16.17
NE	0.48	4.62	2.91	0.96	1.15	0.36	0.0	0.0	10.48
ENE	0.48	2.35	0.52	0.28	0.04	0.08	0.0	0.0	3.75
E	0.56	0.80	0.20	0.12	0.16	0.08	0.0	0.0	1.92
ESE	0.28	0.56	0.12	0.12	0.12	0.28	0.0	0.0	1.48
SE	0.24	0.44	0.16	0.12	0.28	0.04	0.0	0.0	1.28
SSE	0.32	0.60	0.36	0.20	0.56	0.12	0.04	0.0	2.20
S	0.32	1.71	1.63	0.80	0.92	0.08	0.0	0.0	5.46
SSW	0.16	2.79	4.10	2.67	3.42	0.24	0.0	0.0	13.38
SW	0.28	3.07	4.54	3.82	2.99	0.56	0.0	0.0	15.26
WSW	0.20	1.83	1.55	1.12	0.60	0.12	0.0	0.0	5.42
W	0.12	0.60	0.44	0.64	0.76	0.04	0.0	0.0	2.60
WNW	0.28	0.44	0.52	0.76	1.27	0.04	0.0	0.0	3.31
NW	0.04	0.64	0.72	1.67	1.83	0.16	0.04	0.0	5.10
NNW	0.0	1.00	1.51	1.43	1.59	0.16	0.04	0.0	5.73
SUBTOTAL	4.64	29.41	25.25	17.74	19.68	2.84	0.12	0.0	99.68

TOTAL HOURS OF VALID WIND OBSERVATIONS 2511
TOTAL HOURS OF OBSERVATIONS 2712
RECOVERABILITY PERCENTAGE 92.6
TOTAL HOURS CALM 10 = 0.40 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 5.3 MPH

TABLE 2.3.2-4

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

MARCH (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.18	2.09	1.70	0.85	0.57	0.0	0.0	0.0	5.39
NNE	0.39	5.87	4.85	1.95	2.94	0.14	0.0	0.0	16.14
NE	0.25	3.64	2.76	0.99	0.32	0.04	0.0	0.0	8.00
ENE	0.18	2.05	0.50	0.07	0.0	0.0	0.0	0.0	2.80
E	0.28	0.67	0.11	0.0	0.0	0.0	0.0	0.0	1.06
ESE	0.14	0.28	0.14	0.04	0.0	0.0	0.0	0.0	0.60
SE	0.18	0.32	0.18	0.0	0.0	0.0	0.0	0.0	0.68
SSE	0.25	0.67	0.46	0.42	0.67	0.07	0.04	0.0	2.54
S	0.42	1.45	1.27	1.49	3.89	0.42	0.0	0.0	8.94
SSW	0.21	2.58	3.93	3.61	5.80	0.88	0.0	0.0	17.01
SW	0.21	2.55	5.20	2.69	1.73	0.35	0.0	0.0	12.73
WSW	0.18	1.59	1.38	0.64	0.85	0.35	0.11	0.0	5.10
W	0.14	0.71	0.74	0.28	1.42	0.28	0.14	0.0	3.71
WNW	0.04	0.50	0.35	0.71	1.31	0.11	0.04	0.0	3.06
NW	0.04	0.88	0.64	1.45	2.16	0.21	0.0	0.0	5.38
NNW	0.21	1.13	1.95	1.63	1.70	0.18	0.0	0.0	6.80
SUBTOTAL	3.30	26.98	26.16	16.82	23.36	3.03	0.29	0.0	99.94

TOTAL HOURS OF VALID WIND OBSERVATIONS	2826
TOTAL HOURS OF OBSERVATIONS	2976
RECOVERABILITY PERCENTAGE	95.0
TOTAL HOURS CALM	2 = 0.07 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 5.7 MPH

TABLE 2.3.2-5

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

APRIL (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.04	1.34	0.81	0.81	1.00	0.0	0.0	0.0	4.00
NNE	0.19	4.99	3.30	2.19	1.69	0.08	0.0	0.0	12.44
NE	0.12	4.41	2.49	1.69	2.26	0.04	0.0	0.0	11.01
ENE	0.19	1.53	0.19	0.12	0.0	0.0	0.0	0.0	2.03
E	0.15	0.73	0.12	0.0	0.0	0.0	0.0	0.0	1.00
ESE	0.23	0.12	0.12	0.0	0.0	0.0	0.0	0.0	0.47
SE	0.08	0.46	0.23	0.0	0.0	0.0	0.0	0.0	0.77
SSE	0.35	1.04	0.27	0.58	1.53	0.23	0.0	0.0	4.00
S	0.46	1.50	1.38	2.46	3.03	0.46	0.0	0.0	9.29
SSW	0.27	2.95	4.22	3.38	5.45	0.07	0.0	0.0	17.34
SW	0.15	2.23	4.87	3.68	5.87	0.46	0.15	0.0	17.41
WSW	0.04	1.61	1.34	0.92	1.65	0.73	0.12	0.0	6.41
W	0.04	0.31	0.42	0.61	0.69	0.31	0.0	0.0	2.38
WNW	0.08	0.54	0.73	0.50	1.27	0.12	0.0	0.0	3.24
NW	0.12	0.46	0.73	0.96	1.42	0.23	0.0	0.0	3.92
NNW	0.0	0.54	0.77	1.11	1.73	0.08	0.0	0.0	4.23
SUBTOTAL	2.51	24.76	21.99	19.01	27.59	3.81	0.27	0.0	99.94

TOTAL HOURS OF VALID WIND OBSERVATIONS	2606
TOTAL HOURS OF OBSERVATIONS	2880
RECOVERABILITY PERCENTAGE	90.5
TOTAL HOURS CALM	3 = 0.12 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 6.0 MPH

TABLE 2.3.2-6

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

MAY (72-75)

WIND DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	WIND SPEED 5.5-7.4	(MPH) 7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.45	3.18	1.89	0.63	0.24	0.0	0.0	0.0	6.39
NNE	0.77	8.00	4.75	2.58	1.19	0.08	0.0	0.0	17.29
NE	0.52	3.35	2.79	1.29	0.56	0.04	0.0	0.0	8.51
ENE	0.31	1.75	0.66	0.03	0.0	0.0	0.0	0.0	2.75
E	0.49	1.36	0.21	0.0	0.0	0.0	0.0	0.0	2.06
ESE	0.52	0.52	0.07	0.0	0.0	0.0	0.0	0.0	1.11
SE	0.36	1.12	0.24	0.0	0.0	0.0	0.0	0.0	1.74
SSE	0.52	2.10	0.66	0.14	0.14	0.03	0.0	0.0	3.59
S	0.42	3.25	3.35	2.34	2.03	0.21	0.0	0.0	11.60
SSW	0.31	4.83	6.53	3.39	2.58	0.10	0.0	0.0	17.80
SW	0.10	4.40	4.02	2.27	1.22	0.10	0.03	0.0	12.14
WSW	0.17	1.50	1.12	0.49	0.42	0.03	0.0	0.0	3.73
W	0.31	0.66	0.45	0.21	0.07	0.0	0.0	0.0	1.70
WNW	0.31	0.63	0.24	0.21	0.14	0.0	0.0	0.0	1.53
NW	0.24	0.98	0.73	0.49	0.77	0.03	0.0	0.0	3.24
NNW	0.14	1.47	1.05	0.52	0.94	0.03	0.0	0.0	4.15
SUBTOTAL	5.96	39.16	28.76	14.59	10.30	0.53	0.03	0.0	99.33

TOTAL HOURS OF VALID WIND OBSERVATIONS	2863
TOTAL HOURS OF OBSERVATIONS	2976
RECOVERABILITY PERCENTAGE	96.2
TOTAL HOURS CALM	16 = 0.56 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 4.3 MPH

SQN

TABLE 2.3.2-7

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

JUNE (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.55	3.19	1.46	0.24	0.0	0.0	0.0	0.0	5.44
NNE	1.26	7.60	3.94	2.36	1.06	0.04	0.0	0.0	16.26
NE	0.43	2.28	1.69	0.24	0.0	0.0	0.0	0.0	4.64
ENE	0.63	1.85	0.63	0.31	0.0	0.0	0.0	0.0	3.42
E	0.55	0.47	0.12	0.0	0.0	0.0	0.0	0.0	1.14
ESE	0.43	0.59	0.04	0.0	0.0	0.0	0.0	0.0	1.06
SE	0.39	1.38	0.12	0.0	0.0	0.0	0.0	0.0	1.89
SSE	0.43	1.46	1.14	0.16	0.16	0.0	0.0	0.0	3.35
S	0.71	4.05	3.78	2.44	1.18	0.04	0.0	0.0	12.20
SSW	0.35	5.75	6.26	4.76	1.42	0.04	0.0	0.0	18.58
SW	0.47	4.92	5.94	3.11	1.14	0.0	0.0	0.04	15.62
WSW	0.35	1.57	1.06	0.67	0.51	0.0	0.0	0.0	4.16
W	0.43	1.02	0.43	0.39	0.39	0.0	0.0	0.0	2.66
WNW	0.47	0.83	0.24	0.24	0.16	0.0	0.0	0.0	1.94
NW	0.08	0.67	0.83	0.67	1.02	0.0	0.0	0.0	3.27
NNW	0.39	1.34	1.26	0.51	0.31	0.0	0.0	0.0	3.81
SUBTOTAL	7.92	38.97	28.94	16.10	7.35	0.12	0.0	0.04	99.44

TOTAL HOURS OF VALID WIND OBSERVATIONS	2541
TOTAL HOURS OF OBSERVATIONS	2880
RECOVERABILITY PERCENTAGE	88.2
TOTAL HOURS CALM	14 = 0.55 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 4.0 MPH

TABLE 2.3.2-8

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

JULY (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.25	4.46	1.55	0.18	0.07	0.0	0.0	0.0	6.51
NNE	0.68	9.72	4.50	1.76	0.50	0.0	0.0	0.0	17.16
NE	0.18	1.62	1.98	0.68	0.0	0.0	0.0	0.0	4.46
ENE	0.25	1.44	0.43	0.07	0.0	0.0	0.0	0.0	2.19
E	0.47	0.79	0.0	0.0	0.0	0.0	0.0	0.0	1.26
ESE	0.22	0.68	0.07	0.0	0.0	0.0	0.0	0.0	0.97
SE	0.43	1.73	0.47	0.0	0.0	0.0	0.0	0.0	2.63
SSE	0.40	2.20	0.90	0.25	0.11	0.0	0.0	0.0	3.86
S	0.79	5.11	3.92	0.97	0.40	0.0	0.0	0.0	11.19
SSW	0.40	5.94	8.32	4.43	0.86	0.0	0.0	0.0	19.95
SW	0.29	4.86	5.83	3.38	1.12	0.0	0.0	0.0	15.48
WSW	0.40	1.94	0.90	0.29	0.04	0.0	0.0	0.0	3.57
W	0.25	1.26	0.32	0.18	0.0	0.0	0.0	0.0	2.01
WNW	0.32	1.26	0.43	0.25	0.07	0.0	0.0	0.0	2.33
NW	0.25	1.98	0.65	0.22	0.0	0.0	0.0	0.0	3.10
NNW	0.22	2.38	0.54	0.18	0.0	0.0	0.0	0.0	3.32
SUBTOTAL	5.80	47.37	30.81	12.84	3.17	0.0	0.0	0.04	99.99

TOTAL HOURS OF VALID WIND OBSERVATIONS	2778
TOTAL HOURS OF OBSERVATIONS	2976
RECOVERABILITY PERCENTAGE	93.3
TOTAL HOURS CALM	0 = 0.00 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 3.7 MPH

SQN

TABLE 2.3.2-9

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

AUGUST (72-75)

WIND				WIND SPEED	(MPH)				
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.45	5.35	1.40	0.35	0.03	0.0	0.0	0.0	7.58
NNE	1.08	12.81	5.39	2.27	0.59	0.0	0.0	0.0	22.14
NE	0.42	2.97	2.27	0.21	0.17	0.0	0.0	0.0	6.04
ENE	0.59	1.47	0.35	0.03	0.0	0.0	0.0	0.0	2.44
E	0.56	0.77	0.07	0.0	0.0	0.0	0.0	0.0	1.40
ESE	0.35	0.38	0.0	0.0	0.0	0.0	0.0	0.0	0.73
SE	0.21	1.33	0.14	0.0	0.0	0.0	0.0	0.0	1.68
SSE	0.35	1.92	0.84	0.10	0.14	0.0	0.0	0.0	3.35
S	0.42	3.92	4.02	2.52	0.45	0.0	0.0	0.0	11.33
SSW	0.17	4.83	6.33	3.95	0.94	0.0	0.0	0.0	16.22
SW	0.42	4.58	3.81	3.29	0.87	0.0	0.0	0.0	12.97
WSW	0.31	2.03	1.01	0.21	0.14	0.0	0.0	0.0	3.70
W	0.31	0.87	0.24	0.10	0.0	0.0	0.0	0.0	1.52
WNW	0.56	0.98	0.21	0.0	0.0	0.0	0.0	0.0	1.75
NW	0.28	1.22	0.35	0.35	0.03	0.0	0.0	0.0	2.23
NNW	0.38	2.62	1.29	0.42	0.03	0.0	0.0	0.0	4.74
SUBTOTAL	6.86	48.05	27.72	13.80	3.39	0.0	0.0	0.0	99.82

TOTAL HOURS OF VALID WIND OBSERVATIONS	2858
TOTAL HOURS OF OBSERVATIONS	2976
RECOVERABILITY PERCENTAGE	96.0
TOTAL HOURS CALM	1 = 0.03 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 3.6 MPH

SQN

TABLE 2.3.2-10

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

SEPT. (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.99	5.27	1.99	0.77	0.52	0.0	0.0	0.0	9.54
NNE	0.92	12.04	6.15	2.98	3.98	0.07	0.04	0.0	26.18
NE	0.52	3.50	2.25	0.70	0.33	0.04	0.0	0.0	7.34
ENE	0.44	1.10	0.33	0.0	0.0	0.0	0.0	0.0	1.87
E	0.85	0.85	0.15	0.04	0.0	0.0	0.0	0.0	1.89
ESE	0.44	0.44	0.11	0.04	0.0	0.0	0.0	0.0	1.03
SE	0.70	1.25	0.33	0.0	0.0	0.0	0.0	0.0	2.28
SSE	0.48	1.77	0.63	0.04	0.07	0.0	0.0	0.0	2.99
S	0.63	3.83	3.53	1.66	1.07	0.0	0.0	0.0	10.72
SSW	0.29	3.35	4.71	2.84	0.74	0.0	0.0	0.0	11.93
SW	0.33	2.69	4.31	1.91	0.66	0.0	0.0	0.0	9.90
WSW	0.44	1.55	0.63	0.22	0.0	0.0	0.0	0.0	2.84
W	0.29	0.81	0.29	0.0	0.04	0.0	0.0	0.0	1.43
WNW	0.63	0.88	0.18	0.07	0.04	0.0	0.0	0.0	1.80
NW	0.33	1.33	0.22	0.26	0.11	0.0	0.0	0.0	2.25
NNW	0.37	2.25	1.88	0.74	0.37	0.0	0.0	0.0	5.61
SUBTOTAL	8.65	42.91	27.69	12.27	7.93	0.11	0.04	0.0	99.60

TOTAL HOURS OF VALID WIND OBSERVATIONS	2716
TOTAL HOURS OF OBSERVATIONS	2880
RECOVERABILITY PERCENTAGE	94.3
TOTAL HOURS CALM	12 = 0.44 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 3.9 MPH

TABLE 2.3.2-11

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

OCTOBER (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	1.69	4.31	2.06	0.71	0.45	0.0	0.0	0.0	9.22
NNE	1.20	11.55	6.90	3.30	3.83	0.26	0.0	0.0	27.04
NE	1.01	5.63	2.81	1.05	0.34	0.0	0.0	0.0	10.84
ENE	0.75	1.91	0.15	0.0	0.0	0.0	0.0	0.0	2.81
E	0.71	0.98	0.04	0.0	0.0	0.0	0.0	0.0	1.73
ESE	0.49	0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.94
SE	0.79	0.53	0.08	0.0	0.0	0.0	0.0	0.0	1.40
SSE	0.86	1.28	0.34	0.30	0.15	0.0	0.0	0.0	2.93
S	0.34	3.49	2.10	0.75	0.34	0.0	0.0	0.0	7.02
SSW	0.41	3.86	2.63	1.50	0.56	0.0	0.0	0.0	8.96
SW	0.41	3.75	4.09	2.21	0.60	0.0	0.0	0.0	11.06
WSW	0.23	1.95	1.28	0.83	0.49	0.0	0.0	0.0	4.78
W	0.19	1.13	0.60	0.41	0.15	0.0	0.0	0.0	2.48
WNW	0.34	0.60	0.23	0.34	0.04	0.0	0.0	0.0	1.55
NW	0.23	0.49	0.56	0.56	0.11	0.0	0.0	0.0	1.95
NNW	0.56	1.58	0.90	0.71	0.30	0.0	0.0	0.0	4.05
SUBTOTAL	10.21	43.49	24.77	12.67	7.36	0.26	0.0	0.0	98.76

TOTAL HOURS OF VALID WIND OBSERVATIONS	2666
TOTAL HOURS OF OBSERVATIONS	2976
RECOVERABILITY PERCENTAGE	89.6
TOTAL HOURS CALM	34 = 1.28 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 3.9 MPH

SQN

TABLE 2.3.2-12

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

NOVEMBER (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.48	2.85	2.15	0.85	0.37	0.0	0.0	0.0	6.70
NNE	0.70	8.66	6.77	3.18	2.81	0.22	0.0	0.0	22.34
NE	0.55	5.11	3.44	1.44	1.41	0.07	0.0	0.0	12.02
ENE	0.44	1.07	0.48	0.04	0.0	0.0	0.0	0.0	2.03
E	0.55	0.78	0.18	0.0	0.0	0.0	0.0	0.0	1.51
ESE	0.33	0.26	0.18	0.0	0.0	0.0	0.0	0.0	0.77
SE	0.22	0.26	0.18	0.0	0.0	0.0	0.0	0.0	0.66
SSE	0.30	0.92	0.37	0.18	0.41	0.15	0.0	0.0	2.33
S	0.37	1.92	1.70	1.70	1.78	0.22	0.0	0.0	7.69
SSW	0.33	2.07	3.29	3.74	3.70	0.07	0.0	0.0	13.20
SW	0.37	2.48	4.29	2.85	2.00	0.07	0.0	0.0	12.06
WSW	0.11	1.15	1.48	0.78	0.92	0.07	0.0	0.0	4.51
W	0.11	0.33	0.67	0.48	0.67	0.0	0.0	0.0	2.26
WNW	0.04	0.44	0.26	0.26	0.92	0.04	0.0	0.0	1.96
NW	0.07	0.81	1.04	0.92	1.04	0.15	0.0	0.0	4.03
NNW	0.26	1.52	1.29	1.18	0.96	0.0	0.0	0.0	5.21
SUBTOTAL	5.23	30.63	27.77	17.60	16.99	1.06	0.0	0.0	99.28

TOTAL HOURS OF VALID WIND OBSERVATIONS	2703
TOTAL HOURS OF OBSERVATIONS	2880
RECOVERABILITY PERCENTAGE	93.9
TOTAL HOURS CALM	18 = 0.67 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 4.9 MPH

TABLE 2.3.2-13

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

SEQUOYAH NUCLEAR PLANT

DECEMBER (72-75)

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	Total
N	0.23	1.56	1.44	1.03	1.63	0.0	0.0	0.0	5.89
NNE	0.42	7.00	4.64	2.47	2.47	0.04	0.0	0.0	17.04
NE	0.57	4.56	2.89	2.02	1.25	0.0	0.0	0.0	11.29
ENE	0.42	1.25	0.11	0.08	0.0	0.0	0.0	0.0	1.86
E	0.34	0.49	0.0	0.0	0.0	0.0	0.0	0.0	0.83
ESE	0.15	0.57	0.04	0.0	0.0	0.0	0.0	0.0	0.76
SE	0.23	0.57	0.11	0.0	0.0	0.0	0.0	0.0	0.91
SSE	0.27	0.60	0.30	0.30	0.19	0.0	0.0	0.0	2.66
S	0.49	2.43	1.83	0.80	1.52	0.11	0.0	0.0	7.18
SSW	0.30	3.23	4.30	3.27	3.54	0.11	0.0	0.0	14.75
SW	0.27	3.57	5.21	3.73	2.62	0.27	0.0	0.0	15.67
WSW	0.08	1.41	1.03	0.99	1.52	0.27	0.0	0.0	5.30
W	0.11	0.76	0.57	0.46	0.72	0.11	0.0	0.0	2.73
WNW	0.04	0.87	0.68	0.68	0.61	0.0	0.0	0.0	2.88
NW	0.15	1.10	0.57	0.91	0.99	0.08	0.0	0.04	3.84
NNW	0.23	1.52	1.29	1.56	1.67	0.04	0.0	0.0	6.31
SUBTOTAL	4.30	32.49	25.01	18.30	18.73	1.03	0.0	0.04	99.90

TOTAL HOURS OF VALID WIND OBSERVATIONS	2630
TOTAL HOURS OF OBSERVATIONS	2952
RECOVERABILITY PERCENTAGE	89.1
TOTAL HOURS CALM	2 = 0.08 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

MEAN WIND SPEED = 5.1 MPH

TABLE 2.3.2-14 (Sheet 1)

WIND DIRECTION PERSISTENCE DATA
DISREGARDING STABILITY
SEQUOYAH NUCLEAR PLANT
JAN 1, 72 - DEC 31, 75

LOST RECORD(%)= 7.77

PERSISTENCE (HOURS)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	ACC. TOTAL	ACC. TOTAL	FREQUENCY
2	190	277	205	82	39	18	38	86	253	333	360	123	62	58	94	138	14	2370	5804	100.00
3	99	163	106	23	10	10	9	33	107	187	179	45	21	26	38	54	9	1119	3434	59.17
4	47	135	66	11	3	0	5	11	80	120	128	33	17	10	20	25	1	712	2315	39.89
5	20	89	33	6	2	1	3	3	43	77	87	21	8	10	17	22	2	444	1603	27.62
6	10	65	27	3	1	0	0	0	29	57	53	11	3	1	9	15	1	285	1159	19.97
7	13	45	14	1	1	0	0	5	20	51	43	6	1	3	7	14	0	224	874	15.06
8	9	40	18	0	0	0	0	4	8	29	18	3	4	1	5	10	0	149	650	11.20
9	6	36	10	1	0	0	0	1	8	25	15	3	1	1	2	8	0	117	501	8.63
10	3	32	8	0	0	0	0	0	6	16	10	0	0	0	3	3	0	81	384	6.62
11	0	29	7	1	0	0	0	0	4	10	5	1	1	0	3	2	0	63	303	5.22
12	0	17	8	1	0	0	0	0	5	12	5	2	0	0	2	2	0	54	240	4.14
13	3	16	1	0	0	0	0	0	2	11	6	0	0	0	0	0	0	39	186	3.20
14	0	15	3	0	0	0	0	0	3	6	7	0	0	0	0	1	0	35	147	2.53
15	0	9	2	0	0	0	0	0	1	4	3	0	1	0	0	1	0	20	112	1.93
16	0	6	3	0	0	0	0	0	0	3	4	0	0	0	1	1	0	18	92	1.59
17	0	11	3	0	0	0	0	0	1	2	1	0	0	0	2	0	0	20	74	1.27
18	0	8	0	0	0	0	0	0	0	3	1	0	0	1	0	0	0	13	54	0.93
19	0	5	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	10	41	0.71
20	0	3	1	0	0	0	0	0	0	3	0	1	0	0	0	0	0	8	31	0.53
21	0	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	4	23	0.40
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0.33
23	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	0.33
24	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	17	0.29
25	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	16	0.28
26	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	0.21
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.17
28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0.17
29	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	0.16
30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0.12
31	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0.10
32	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	4	0.07
>32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.02
TOTAL	401	1015	519	129	56	29	55	143	572	951	928	249	119	111	203	297	27	5804		

TABLE 2.3.2-14 (Sheet 2)
(Continued)

WIND DIRECTION PERSISTENCE DATA

DISREGARDING STABILITY

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

LOST RECORD(%)= 7.77

PERSISTENCE (HOURS)	WIND DIRECTION N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
MAXIMUM PERSISTENCE (HOURS)	29	33	26	12	7	5	5	9	12	21	32	20	15	18	17	19	6
50.0%	3	4	3	2	2	2	2	2	3	3	3	3	2	2	3	3	2
80.0%	4	8	6	3	3	3	3	3	5	6	5	4	4	4	5	5	3
90.0%	6	12	8	5	4	3	4	4	7	9	7	6	5	5	7	7	5
99.0%	10	25	17	11	7	5	5	8	14	17	15	12	11	9	16	15	6
99.9%	29	32	26	12	7	5	5	9	21	21	32	20	15	18	17	17	6

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL

NOTE: Persistent wind is defined in this analysis as a wind blowing continuously from one of the named 22-1/2° sectors (i.e., north-northwest) except that it is not considered to be interrupted if it departs from that sector for one hour and then returns, or if there are up to two hours of missing data followed by a continued directional persistence.

Table 2.3.2-15

TEMPERATURE*

Sequoyah Nuclear Plant
April 2, 1971-March 31, 1972

Month	Avg. Temp. °F	Avg. Max. Temp. °F	Avg. Min. Temp. °F	Extreme Max Temp. °F	Extreme Min. Temp. °F
Dec.	49.0	56.2	42.3	72.0	23.3
Jan.	42.7	52.2	33.5	71.3	2.9
Feb.	40.1	49.7	30.8	74.8	15.2
Winter	43.9	52.7	35.5	74.8	2.9
Mar.	48.7	59.3	38.6	75.8	26.4
Apr.	59.2	72.8	45.9	86.0	33.1
May	64.6	75.8	54.2	84.9	38.2
Spring	57.5	69.3	46.2	86.0	26.4
June	75.4	86.7	66.6	96.3	55.3
July	75.4	83.4	68.7	90.8	61.8
August	75.5	86.1	68.0	91.4	59.7
Summer	75.4	85.4	67.7	96.3	55.3
Sept.	72.4	82.8	63.6	95.1	53.4
Oct.	64.7	74.9	57.3	87.0	43.1
Nov.	48.8	58.8	41.0	78.0	29.2
Fall	61.9	72.1	53.9	95.1	29.2
Annual	59.7	69.8	50.8	96.3	2.9

*Temperature instrument 4 feet above ground.

Table 2.3.2-16

TEMPERATURE[a,d]

(Chattanooga, Tennessee)

Month		Avg. Temp.[b] °F	Avg. Max. Temp.[b] °F	Avg. Min. Temp.[b] °F	Extreme Max.[c] Temp. °F	Extreme Min.[c] Temp. °F
Dec.		41.2	50.9	31.4	78	-2
Jan.		40.2	49.9	30.5	78	-10
Feb.		42.9	53.4	32.3	79	1
	Winter	41.4	51.4	--	--	--
Mar.		49.8	61.2	38.4	87	8
Apr.		60.5	72.9	48.1	93	25
May.		68.5	81.0	56.0	99	34
	Spring	59.6	71.7	--	--	--
June		76.0	87.5	64.5	104	41
July		78.8	89.5	68.1	106	51
Aug.		78.0	89.0	67.0	105	50
	Summer	77.6	88.7	--	--	--
Sept.		71.9	83.4	60.4	102	36
Oct.		60.8	73.5	48.1	94	22
Nov.		48.9	60.7	37.1	84	4
	Fall	60.5	72.5	--	--	--
	Annual	59.8	71.1	48.5	106	-10

a. Local Climatological Data, "Annual Summary with Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Center, Asheville, N.C., 1979.
b. Based on record for 1941-1970.
c. Period of record 63 years, through 2002.
d. Local Climatological Data, "Annual Summary With Comparative Data, "Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, M.C., 2002.

Table 2.3.2-17

ABSOLUTE HUMIDITY*

Sequoyah Nuclear Plant

April 2, 1971-March 31, 1972

Month	Avg. A. H. g/m^3	Avg. Max. A. H. g/m^3	Avg. Min. A. H. g/m^3	Extreme Max. A. H. g/m^3	Extreme Min. A. H. g/m^3
Dec.	7.6	9.3	6.0	15.8	1.2
Jan.	5.4	7.1	3.8	15.4	1.1
Feb.	4.2	5.2	2.7	12.2	1.0
Winter	5.7	7.2	4.2	15.8	1.0
Mar.	5.9	8.0	4.3	12.7	1.5
Apr.	6.3	7.8	5.0	12.2	2.7
May	9.6	11.7	7.8	17.3	3.3
Spring	7.3	9.2	5.7	17.3	1.5
June	16.2	18.7	14.2	22.3	9.9
July	14.1	15.8	12.6	18.5	10.0
Aug.	13.9	15.9	12.2	19.6	8.7
Summer	14.7	16.8	13.0	22.3	8.7
Sept.	14.6	17.2	12.0	21.8	8.0
Oct.	12.4	14.7	10.3	19.6	5.6
Nov.	6.4	8.4	5.2	18.2	2.1
Fall	11.1	13.4	9.2	21.8	2.1
Annual	9.7	11.7	8.0	22.3	1.0

*Computed from dry bulb and dew point temperature measurements 4 feet above ground.

Table 2.3.2-18

RELATIVE HUMIDITY*

Sequoyah Nuclear Plant

April 2, 1971-March 31, 1972

Month		Avg. R. H. (percent)	Avg. Max. R. H. (percent)	Avg. Min. R. H. (percent)	Extreme Max. R. H. (percent)	Extreme Min. R. H. (percent)
Dec.		78.4	89.6	62.6	100.0	34.8
Jan.		65.0	79.9	50.1	93.9	22.5
Feb.		59.8	74.2	43.5	95.3	22.1
	Winter	67.7	81.2	52.1	100.0	22.1
Mar.		63.8	83.4	43.4	100.0	21.9
Apr.		50.6	75.8	26.8	86.6	17.0
May		62.2	82.5	40.9	95.1	18.4
	Spring	58.9	80.5	37.0	100.0	17.0
June		74.4	90.1	51.3	100.0	34.5
July		64.3	73.7	51.6	78.8	37.2
Aug.		63.3	72.7	47.2	85.3	33.8
	Summer	67.3	78.8	50.0	100.0	33.8
Sept.		73.1	84.0	53.2	100.0	32.1
Oct.		78.4	89.0	61.7	99.3	37.8
Nov.		65.3	79.6	50.4	100.0	28.0
	Fall	72.2	84.2	55.1	100.0	28.0
	Annual	66.5	81.2	48.6	100.0	17.0

*Computed from dry bulb and dew point temperature measurements 4 feet above ground.

Table 2.3.2-19

PRECIPITATION*

(Friendship School, Tennessee)
1948-1967

Month	Days with 0.01 Inch or More	Monthly Average (inches)	Extreme Monthly Max. (inches)	Extreme Monthly Min. (inches)	Max. In 24 Hrs. (inches)
Dec.	10	5.40	12.15	0.82	3.02
Jan.	12	5.99	13.61	2.35	3.88
Feb.	11	5.82	11.41	2.43	3.08
Winter	33	17.21			
Mar.	12	6.76	15.22	2.60	6.08
Apr.	10	4.70	10.88	1.18	2.62
May	9	3.87	7.53	1.41	2.75
Spring	31	15.33			
June	9	4.16	7.20	0.59	2.60
July	11	5.34	11.31	0.74	2.98
Aug.	10	3.91	8.01	1.90	7.56
Summer	30	13.41			
Sept.	7	4.02	15.40	0.83	4.27
Oct.	7	2.86	9.63	0.09	2.24
Nov.	9	4.86	16.58	0.95	3.21
Fall	23	11.74			
Annual	117	57.69			

*TVA Raingage Station 685, Friendship School, Tennessee, located about 2-1/2 miles north-northeast of Sequoyah Landing site; period of record 20 years since station activation April 30, 1948.

Table 2.3.2-20

SNOWFALL[a,b]

(Chattanooga, Tennessee)

Month	Mean Total	Maximum Total	Maximum Total in 24 Hours
Jan.	1.8	10.2	10.2
Feb.	1.2	10.4	8.7
Mar.	0.7	20.0	20.0
Apr.	0.1	2.8	2.8
May	T	T	T
June	T	T	T
July	0	0	0
Aug.	0	0	0
Sept.	0	0	0
Oct.	T	T	T
Nov.	0.1	2.8	2.8
Dec.	0.6	9.1	8.9
Annual	4.4		

a. Local Climatological Data, "Annual Summary With Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, N.C., 2002.

b. Period of record, 1931-1996.

Table 2.3.2-21

HEAVY FOG

(Chattanooga, Tennessee)

Month		Mean No. of Days With Heavy Fog[c]
Dec.		3
Jan.		3
Feb.		2
	Winter	8
Mar.		2
Apr.		2
May		2
	Spring	6
June		2
July		2
Aug.		3
	Summer	7
Sept.		4
Oct.		6
Nov.		4
	Fall	14
	Annual	36

a. Local Climatological Data, "Annual Summary With Comparative Data," Chattanooga, Tennessee, U.S. Department of Commerce, NOAA, National Climatic Center, Asheville, N.C., 1979.

b. Heavy fog is defined as fog reducing the visibility to 1/4 mile or less.

c. Period of record 49 years, through 1979. Rounding to whole days results in one-day difference between the sum of the monthly averages and the annual average.

Table 2.3.2-22

PERCENT OCCURRENCE OF ATMOSPHERIC STABILITY*

Sequoyah Nuclear Plant

January 1, 1972 - December 31, 1975

Pasquill Stability Class	Vertical Temperature Difference (Δ T)**	Percent Occurrence**
A	$\Delta T \leq -1.9^{\circ}C/100\ m$	2.91
B	$-1.9 < \Delta T \leq -1.7^{\circ}C/100\ m$	1.24
C	$-1.7 < \Delta T \leq -1.5^{\circ}C/100\ m$	3.78
D	$-1.5 < \Delta T \leq -0.5^{\circ}C/100\ m$	19.91
E	$-0.5 < \Delta T \leq 1.5^{\circ}C/100\ m$	44.36
F	$1.5 < \Delta T \leq 4.0^{\circ}C/100\ m$	20.79
G	$\Delta T > 4.0^{\circ}C/100\ m$	6.93
Total		99.92

*Temperature instruments 9 and 46 meters above ground.

**Valid ΔT = 91.33 percent of total hours in period; percent occurrences are percentages of valid ΔT occurrences.

TABLE 2.3.2-23

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS A (DELTA T<=-1.9 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.01	0.01	0.03	0.04	0.04	0.0	0.0	0.0	0.13
NNE	0.0	0.04	0.19	0.20	0.16	0.01	0.0	0.0	0.60
NE	0.0	0.08	0.20	0.15	0.13	0.0	0.0	0.0	0.56
ENE	0.0	0.03	0.03	0.01	0.0	0.0	0.0	0.0	0.07
E	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01
ESE	0.0	0.01	0.01	0.0	0.0	0.01	0.0	0.0	0.03
SE	0 0	0.01	0.02	0.0	0.0	0.0	0.0	0.0	0.03
SSE	0.0	0.01	0.03	0.02	0.02	0.01	0.0	0.0	0.09
S	0.0	0.01	0.04	0.06	0.05	0.01	0.0	0.0	0.17
SSW	0.0	0.01	0.09	0.18	0.16	0.01	0.0	0.0	0.45
SW	0.0	0.04	0.12	0.10	0.09	0.02	0.0	0.0	0.37
WSW	0.0	0.02	0.03	0.03	0.02	0.02	0.0	0.0	0.12
W	0.0	0.01	0.0	0.01	0.02	0.0	0.0	0.0	0.04
WNW	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.02
NW	0.0	0.01	0.01	0.01	0.05	0.01	0.0	0.0	0.09
NNW	0.0	0.01	0.0	0.02	0.08	0.01	0.0	0.0	0.12
SUBTOTAL	0.01	0.31	0.80	0.83	0.83	0.12	0.0	0.0	2.90

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS A	958
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS A	934
TOTAL HOURS CALM	4 = 0.01 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 6.5 MPH

TABLE 2.3.2-24

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS B (-1.9< DELTA T<=-1.7 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.01	0.0	0.01	0.03	0.0	0.0	0.0	0.05
NNE	0.0	0.02	0.10	0.10	0.08	0.0	0.0	0.0	0.30
NE	0.0	0.03	0.12	0.04	0.02	0.0	0.0	0.0	0.21
ENE	0.0	0.01	0.02	0.0	0.0	0.0	0.0	0.0	0.03
E	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01
ESE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SE	0 0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.01	0.01	0.0	0.01	0.0	0.0	0.0	0.03
S	0.0	0.03	0.01	0.03	0.03	0.0	0.0	0.0	0.10
SSW	0.0	0.01	0.03	0.07	0.09	0.0	0.0	0.0	0.20
SW	0.0	0.01	0.06	0.06	0.05	0.0	0.0	0.0	0.18
WSW	0.0	0.0	0.01	0.0	0.01	0.0	0.0	0.0	0.02
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.01	0.0	0.02	0.0	0.0	0.0	0.03
NW	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.03
NNW	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.0	0.03
SUBTOTAL	0.0	0.15	0.38	0.32	0.39	0.0	0.0	0.0	1.24

TOTAL HOURS OF VALID STABILITY OBSERVATIONS 32723
TOTAL HOURS OF STABILITY CLASS B 416
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS B 411
TOTAL HOURS CALM 1 < 0.01 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 6.4 MPH

TABLE 2.3.2-25

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS C (-1.7< DELTA T<=-1.5 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND	WIND SPEED(MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.01	0.03	0.03	0.02	0.0	0.0	0.0	0.09
NNE	0.0	0.08	0.25	0.21	0.22	0.0	0.0	0.0	0.76
NE	0.0	0.10	0.31	0.09	0.07	0.0	0.0	0.0	0.57
ENE	0.0	0.05	0.03	0.01	0.0	0.0	0.0	0.0	0.09
E	0.0	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.04
ESE	0.0	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.03
SE	0 0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.02	0.04	0.0	0.03	0.0	0.0	0.0	0.09
S	0.0	0.04	0.07	0.09	0.07	0.02	0.0	0.0	0.29
SSW	0.0	0.04	0.16	0.27	0.24	0.04	0.0	0.0	0.75
SW	0.0	0.05	0.13	0.20	0.12	0.02	0.0	0.0	0.52
WSW	0.0	0.02	0.02	0.05	0.03	0.01	0.01	0.0	0.14
W	0.0	0.01	0.01	0.01	0.02	0.01	0.0	0.0	0.06
WNW	0.0	0.0	0.01	0.02	0.02	0.0	0.0	0.0	0.05
NW	0.01	0.0	0.0	0.02	0.05	0.01	0.0	0.0	0.09
NNW	0.0	0.01	0.04	0.03	0.09	0.01	0.0	0.0	0.18
SUBTOTAL	0.01	0.47	1.14	1.04	0.98	0.12	0.01	0.0	3.77

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS C	1237
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS C	1214
TOTAL HOURS CALM	2 = 0.01 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 6.3 MPH

TABLE 2.3.2-26

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS D (-1.5< DELTA T<=-0.5 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.01	0.24	0.22	0.16	0.17	0.0	0.0	0.0	0.80
NNE	0.06	0.73	1.03	0.84	0.78	0.07	0.0	0.0	3.51
NE	0.02	0.76	0.88	0.42	0.42	0.05	0.0	0.0	2.55
ENE	0.01	0.21	0.11	0.03	0.0	0.0	0.0	0.0	0.36
E	0.01	0.12	0.03	0.02	0.01	0.0	0.0	0.0	0.19
ESE	0.01	0.06	0.02	0.0	0.0	0.0	0.0	0.0	0.09
SE	0.0	0.12	0.08	0.0	0.0	0.0	0.0	0.0	0.20
SSE	0.0	0.15	0.15	0.05	0.06	0.01	0.01	0.0	0.43
S	0.01	0.31	0.53	0.38	0.25	0.02	0.0	0.0	1.50
SSW	0.01	0.44	1.25	0.95	0.70	0.07	0.0	0.0	3.42
SW	0.01	0.47	1.17	1.03	0.52	0.03	0.01	0.0	3.24
WSW	0.0	0.22	0.34	0.18	0.21	0.07	0.01	0.0	1.03
W	0.01	0.06	0.08	0.10	0.19	0.02	0.01	0.0	0.47
WNW	0.01	0.06	0.05	0.11	0.18	0.01	0.0	0.0	0.42
NW	0.0	0.08	0.08	0.22	0.31	0.03	0.0	0.0	0.72
NNW	0.01	0.15	0.14	0.25	0.36	0.02	0.0	0.0	0.93
SUBTOTAL	0.18	4.18	6.16	4.74	4.16	0.40	0.04	0.0	19.86

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS D	6567
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS D	6345
TOTAL HOURS CALM	16 = 0.05 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 5.8 MPH

TABLE 2.3.2-27

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS E (-0.5< DELTA T<=1.5 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.23	1.26	0.83	0.39	0.27	0.0	0.0	0.0	2.98
NNE	0.31	2.83	2.46	1.07	0.92	0.03	0.0	0.0	7.62
NE	0.15	1.03	0.71	0.31	0.18	0.01	0.0	0.0	2.39
ENE	0.12	0.48	0.16	0.04	0.0	0.0	0.0	0.0	0.80
E	0.14	0.24	0.05	0.01	0.01	0.0	0.0	0.0	0.45
ESE	0.09	0.11	0.01	0.01	0.01	0.01	0.0	0.0	0.24
SE	0.10	0.37	0.06	0.01	0.01	0.0	0.0	0.0	0.55
SSE	0.11	0.58	0.24	0.13	0.23	0.04	0.02	0.0	1.35
S	0.17	1.33	1.49	0.91	1.05	0.08	0.0	0.0	5.03
SSW	0.10	1.67	2.32	1.67	1.45	0.11	0.0	0.0	7.32
SW	0.17	1.59	2.07	1.30	0.99	0.10	0.0	0.0	6.22
WSW	0.13	0.87	0.55	0.35	0.40	0.06	0.0	0.0	2.36
W	0.10	0.42	0.28	0.21	0.22	0.03	0.0	0.0	1.26
WNW	0.14	0.37	0.22	0.19	0.27	0.02	0.0	0.0	1.21
NW	0.10	0.50	0.37	0.43	0.38	0.02	0.0	0.0	1.80
NNW	0.15	0.80	0.68	0.57	0.40	0.01	0.0	0.0	2.61
SUBTOTAL	2.31	14.45	12.50	7.60	6.79	0.52	0.02	0.0	44.19

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS E	14624
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS E	14146
TOTAL HOURS CALM	54 = 0.17 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 4.8 MPH

TABLE 2.3.2-28

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS F (1.5< DELTA T<=4.0 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND	WIND SPEED(MPH)								
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.22	1.42	0.45	0.04	0.0	0.0	0.0	0.0	2.13
NNE	0.35	3.69	0.86	0.05	0.0	0.0	0.0	0.0	4.95
NE	0.22	1.19	0.29	0.01	0.0	0.0	0.0	0.0	1.71
ENE	0.16	0.41	0.03	0.0	0.0	0.0	0.0	0.0	0.60
E	0.22	0.23	0.0	0.0	0.0	0.0	0.0	0.0	0.45
ESE	0.13	0.19	0.02	0.0	0.0	0.0	0.0	0.0	0.34
SE	0.15	0.24	0.02	0.0	0.0	0.0	0.0	0.0	0.41
SSE	0.16	0.38	0.07	0.03	0.01	0.0	0.0	0.0	0.65
S	0.18	0.80	0.30	0.10	0.06	0.0	0.0	0.0	1.44
SSW	0.13	1.15	0.73	0.26	0.12	0.0	0.0	0.0	2.39
SW	0.10	1.03	0.87	0.29	0.13	0.0	0.0	0.0	2.42
WSW	0.09	0.47	0.20	0.04	0.01	0.0	0.0	0.0	0.81
W	0.07	0.20	0.07	0.01	0.0	0.0	0.0	0.0	0.35
WNW	0.10	0.24	0.07	0.01	0.0	0.0	0.0	0.0	0.42
NW	0.05	0.30	0.15	0.06	0.01	0.0	0.0	0.0	0.57
NNW	0.09	0.53	0.35	0.05	0.01	0.0	0.0	0.0	1.03
SUBTOTAL	2.42	12.47	4.48	0.95	0.35	0.0	0.0	0.0	20.67

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS F	6718
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS F	6637
TOTAL HOURS CALM	39 = 0.12 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 3.0 MPH

TABLE 2.3.2-29

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY WIND DIRECTION FOR

STABILITY CLASS G (DELTA T > 4.0 C/100 M)

SEQUOYAH NUCLEAR PLANT

JAN 1, 72 - DEC 31, 75

WIND	WIND SPEED(MPH)								
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.05	0.28	0.08	0.0	0.0	0.0	0.0	0.0	0.41
NNE	0.10	0.95	0.19	0.0	0.0	0.0	0.0	0.0	1.24
NE	0.08	0.70	0.11	0.0	0.0	0.0	0.0	0.0	0.89
ENE	0.13	0.40	0.02	0.0	0.0	0.0	0.0	0.0	0.55
E	0.12	0.17	0.01	0.0	0.0	0.0	0.0	0.0	0.30
ESE	0.10	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.17
SE	0.09	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.16
SSE	0.15	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.35
S	0.09	0.37	0.04	0.01	0.0	0.0	0.0	0.0	0.51
SSW	0.06	0.45	0.30	0.02	0.01	0.0	0.0	0.0	0.84
SW	0.03	0.40	0.40	0.04	0.0	0.0	0.0	0.0	0.87
WSW	0.01	0.10	0.06	0.0	0.0	0.0	0.0	0.0	0.17
W	0.03	0.08	0.02	0.0	0.0	0.0	0.0	0.0	0.13
WNW	0.01	0.03	0.01	0.0	0.01	0.0	0.0	0.0	0.06
NW	0.01	0.05	0.03	0.0	0.0	0.0	0.0	0.0	0.09
NNW	0.02	0.08	0.03	0.0	0.0	0.0	0.0	0.0	0.13
SUBTOTAL	1.08	4.40	1.30	0.07	0.02	0.0	0.0	0.0	6.87

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32723
TOTAL HOURS OF STABILITY CLASS G	2203
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS G	2202
TOTAL HOURS CALM	18 = 0.06 percent

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY located 1.2 km southwest of Sequoyah Nuclear Plant
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.25 and 45.99 meters
WIND SPEED AND DIRECTION MEASURED AT THE 9.73 METER LEVEL
MEAN WIND SPEED = 2.5 MPH

Table 2.3.2-30

Sequoyah Nuclear Plant -

Percent of Observations in Each Stability Class -

Hourly-Average and End-of-Hour Temperature Differences (ΔT)

(May 1975-April 1976)

	150' - 33' ΔT Vs. 33' Wind Data		300' - 33' ΔT Vs. 300' Wind Data	
Stability Class	Hourly-Average	End-of-Hour	Hourly-Average	End-of-Hour
A	1.73	3.23	0.14	0.62
B	3.20	2.96	0.89	1.12
C	2.25	2.26	2.37	2.61
D	19.24	18.00	33.55	32.63
E	41.97	42.48	41.17	41.21
F	21.56	20.22	15.06	14.80
G	9.96	10.89	6.71	6.92
Joint Recovery Rate (Wind Direction, Wind Speed, and ΔT)	97.4%	97.4%	97.1%	97.1%
Number of Hours of Inversion ΔT	4979	4898	3808	3705
Total Hours of Valid ΔT	8620	8621	8589	8590
Percent Frequency of Hours of Inversion ΔT (Inversion/Total x 100)	57.8%	56.8%	44.3%	43.1%

TABLE 2.3.2-31

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS A
DELTA T<=-1.9 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 1975 - APRIL 30, 1976

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.01	0.08	0.06	0.0	0.0	0.0	0.15
NNE	0.0	0.02	0.14	0.27	0.23	0.0	0.0	0.0	0.66
NE	0.0	0.01	0.20	0.21	0.09	0.0	0.0	0.0	0.51
ENE	0.0	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.06
E	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
ESE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.01	0.02	0.01	0.02	0.0	0.0	0.0	0.06
S	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.04
SSW	0.0	0.0	0.0	0.01	0.05	0.02	0.0	0.0	0.08
SW	0.0	0.0	0.01	0.01	0.01	0.04	0.0	0.0	0.07
WSW	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.02
W	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.01
WNW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.01
NNW	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.0	0.03
SUBTOTAL	0.0	0.05	0.47	0.62	0.53	0.06	0.0	0.0	1.73

CALM = 0.0

154 STABILITY CLASS A OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS
151 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 154 STABILITY CLASS A OCCURRENCES
ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-32

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS A
DELTA T<=-1.9 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.02	0.02	0.09	0.05	0.0	0.0	0.0	0.18
NNE	0.0	0.07	0.26	0.19	0.28	0.01	0.0	0.0	0.81
NE	0.0	0.09	0.27	0.20	0.13	0.0	0.0	0.0	0.69
ENE	0.0	0.06	0.09	0.0	0.0	0.0	0.0	0.0	0.15
E	0.0	0.05	0.05	0.0	0.0	0.0	0.0	0.0	0.10
ESE	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
SE	0.0	0.02	0.04	0.0	0.0	0.0	0.0	0.0	0.06
SSE	0.0	0.02	0.04	0.0	0.02	0.0	0.0	0.0	0.08
S	0.0	0.04	0.02	0.09	0.04	0.0	0.0	0.0	0.19
SSW	0.0	0.0	0.06	0.08	0.15	0.04	0.0	0.0	0.33
SW	0.0	0.02	0.11	0.13	0.05	0.02	0.0	0.0	0.33
WSW	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.02
W	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
WNW	0.01	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.06
NW	0.0	0.0	0.0	0.01	0.12	0.0	0.0	0.0	0.13
NNW	0.0	0.0	0.02	0.01	0.04	0.0	0.0	0.0	0.07
SUBTOTAL	0.01	0.40	1.00	0.82	0.93	0.07	0.0	0.0	3.23

CALM = 0.0

279 STABILITY CLASS A OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

276 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 279 STABILITY CLASS A OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-33

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS B
-1.9< DELTA T< =-1.7 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND	WIND SPEED (MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.02	0.04	0.07	0.01	0.0	0.0	0.14
NNE	0.0	0.08	0.29	0.15	0.20	0.0	0.0	0.0	0.72
NE	0.0	0.09	0.32	0.08	0.09	0.01	0.0	0.0	0.59
ENE	0.0	0.04	0.04	0.0	0.0	0.0	0.0	0.0	0.08
E	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.03
ESE	0.0	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.04
SE	0.0	0.02	0.04	0.0	0.0	0.0	0.0	0.0	0.06
SSE	0.0	0.02	0.01	0.01	0.01	0.0	0.0	0.0	0.05
S	0.0	0.0	0.02	0.08	0.04	0.0	0.0	0.0	0.14
SSW	0.0	0.02	0.13	0.09	0.28	0.07	0.0	0.0	0.59
SW	0.0	0.04	0.05	0.08	0.05	0.01	0.0	0.0	0.23
WSW	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.03
W	0.0	0.0	0.0	0.01	0.05	0.0	0.0	0.0	0.08
WNW	0.0	0.0	0.01	0.01	0.04	0.0	0.0	0.0	0.06
NW	0.0	0.0	0.0	0.02	0.12	0.0	0.0	0.0	0.14
NNW	0.0	0.02	0.02	0.05	0.15	0.0	0.0	0.0	0.24
SUBTOTAL	0.0	0.37	0.98	0.64	1.11	0.10	0.0	0.0	3.20

CALM = 0.0

277 STABILITY CLASS B OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

276 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 277 STABILITY CLASS B OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-34

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS B
-1.9< DELTA T<=-1.7 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.02	0.0	0.06	0.0	0.0	0.0	0.08
NNE	0.0	0.08	0.13	0.16	0.12	0.0	0.0	0.0	0.49
NE	0.0	0.15	0.28	0.07	0.08	0.0	0.0	0.0	0.58
ENE	0.0	0.01	0.02	0.0	0.0	0.0	0.0	0.0	0.03
E	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.02
ESE	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
SE	0.0	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.04
SSE	0.0	0.01	0.06	0.0	0.01	0.0	0.0	0.0	0.08
S	0.0	0.0	0.08	0.09	0.01	0.0	0.0	0.0	0.18
SSW	0.0	0.02	0.15	0.15	0.29	0.01	0.0	0.0	0.62
SW	0.0	0.01	0.11	0.18	0.13	0.01	0.0	0.0	0.44
WSW	0.0	0.0	0.02	0.04	0.0	0.01	0.0	0.0	0.07
W	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.03
WNW	0.0	0.0	0.0	0.01	0.04	0.0	0.0	0.0	0.05
NW	0.0	0.0	0.0	0.01	0.14	0.0	0.0	0.0	0.05
NNW	0.0	0.0	0.0	0.06	0.13	0.0	0.0	0.0	0.19
SUBTOTAL	0.0	0.32	0.90	0.79	0.92	0.03	0.0	0.0	2.96

CALM = 0.0

258 STABILITY CLASS B OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

256 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 258 STABILITY CLASS B OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-35

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS C
-1.7<DELTA T<=-1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.01	0.02	0.02	0.02	0.0	0.0	0.0	0.07
NNE	0.0	0.02	0.07	0.09	0.05	0.01	0.0	0.0	0.24
NE	0.0	0.09	0.12	0.05	0.04	0.0	0.0	0.0	0.30
ENE	0.0	0.05	0.05	0.0	0.0	0.0	0.0	0.0	0.10
E	0.0	0.04	0.02	0.0	0.0	0.0	0.0	0.0	0.06
ESE	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
SE	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
SSE	0.0	0.02	0.07	0.01	0.0	0.0	0.0	0.0	0.10
S	0.0	0.02	0.02	0.05	0.04	0.01	0.0	0.0	0.14
SSW	0.0	0.0	0.12	0.16	0.20	0.01	0.0	0.0	0.49
SW	0.0	0.0	0.09	0.15	0.16	0.0	0.0	0.0	0.40
WSW	0.0	0.0	0.0	0.01	0.02	0.01	0.0	0.0	0.04
W	0.0	0.0	0.02	0.01	0.01	0.0	0.0	0.0	0.04
WNW	0.0	0.0	0.04	0.01	0.04	0.0	0.0	0.0	0.09
NW	0.0	0.0	0.0	0.0	0.08	0.0	0.0	0.0	0.08
NNW	0.0	0.0	0.0	0.01	0.07	0.0	0.0	0.0	0.08
SUBTOTAL	0.0	0.25	0.66	0.57	0.73	0.04	0.0	0.0	2.25

CALM = 0.0

196 STABILITY CLASS C OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

195 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 196 STABILITY CLASS C OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-36

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS C
-1.7< DELTA T<=-1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.01	0.04	0.01	0.02	0.0	0.0	0.0	0.08
NNE	0.0	0.05	0.14	0.22	0.08	0.01	0.0	0.0	0.50
NE	0.0	0.09	0.15	0.09	0.05	0.01	0.0	0.0	0.39
ENE	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.02
E	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
ESE	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01
SE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.02	0.01	0.01	0.0	0.0	0.0	0.0	0.04
S	0.0	0.01	0.06	0.06	0.02	0.0	0.0	0.0	0.15
SSW	0.0	0.02	0.12	0.19	0.09	0.01	0.0	0.0	0.43
SW	0.0	0.04	0.08	0.11	0.06	0.0	0.0	0.0	0.29
WSW	0.0	0.04	0.05	0.01	0.04	0.0	0.0	0.0	0.14
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.0	0.03
NW	0.0	0.0	0.01	0.01	0.07	0.0	0.0	0.0	0.09
NNW	0.0	0.01	0.01	0.0	0.05	0.0	0.0	0.0	0.07
SUBTOTAL	0.0	0.33	0.68	0.72	0.50	0.03	0.0	0.0	2.26

CALM = 0.0

196 STABILITY CLASS C OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

195 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 196 STABILITY CLASS C OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-37

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS D
-1.5< DELTA T<=-0.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.18	0.29	0.21	0.27	0.0	0.0	0.0	0.95
NNE	0.0	0.51	0.81	0.64	0.40	0.05	0.0	0.0	2.41
NE	0.0	0.88	0.68	0.26	0.19	0.0	0.0	0.0	2.01
ENE	0.0	0.23	0.08	0.0	0.0	0.0	0.0	0.0	0.31
E	0.0	0.15	0.04	0.0	0.0	0.0	0.0	0.0	0.19
ESE	0.0	0.08	0.02	0.0	0.0	0.0	0.0	0.0	0.10
SE	0.0	0.13	0.07	0.0	0.0	0.0	0.0	0.0	0.20
SSE	0.0	0.22	0.25	0.09	0.05	0.0	0.0	0.0	0.61
S	0.0	0.28	0.85	0.64	0.16	0.02	0.0	0.0	1.95
SSW	0.0	0.42	1.31	1.09	0.86	0.01	0.0	0.0	3.69
SW	0.01	0.48	1.52	1.59	0.39	0.0	0.0	0.0	3.99
WSW	0.0	0.18	0.30	0.19	0.22	0.01	0.0	0.0	0.90
W	0.0	0.06	0.14	0.05	0.05	0.0	0.0	0.0	0.30
WNW	0.0	0.04	0.01	0.09	0.18	0.0	0.0	0.0	0.32
NW	0.0	0.06	0.09	0.12	0.15	0.0	0.0	0.0	0.42
NNW	0.0	0.05	0.12	0.21	0.50	0.01	0.0	0.0	0.89
SUBTOTAL	0.01	3.95	6.58	5.18	3.42	0.10	0.0	0.0	19.24

CALM = 0.0

1656 STABILITY CLASS D OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

1645 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1656 STABILITY CLASS D OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-38

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS D
-1.5< DELTA T< =-0.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND	WIND SPEED (MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.19	0.26	0.23	0.32	0.01	0.0	0.0	1.01
NNE	0.02	0.74	0.98	0.55	0.40	0.05	0.0	0.0	2.74
NE	0.0	0.67	0.55	0.22	0.15	0.0	0.0	0.0	1.59
ENE	0.01	0.27	0.11	0.0	0.0	0.0	0.0	0.0	0.39
E	0.0	0.13	0.06	0.0	0.0	0.0	0.0	0.0	0.19
ESE	0.0	0.06	0.02	0.0	0.0	0.0	0.0	0.0	0.06
SE	0.0	0.13	0.07	0.0	0.0	0.0	0.0	0.0	0.20
SSE	0.01	0.18	0.21	0.12	0.05	0.0	0.0	0.0	0.57
S	0.0	0.32	0.76	0.42	0.19	0.02	0.0	0.0	1.71
SSW	0.0	0.49	1.22	0.78	0.74	0.06	0.0	0.0	3.29
SW	0.01	0.40	1.29	1.26	0.33	0.04	0.0	0.0	3.33
WSW	0.0	0.16	0.26	0.18	0.21	0.0	0.0	0.0	0.81
W	0.0	0.07	0.12	0.09	0.08	0.0	0.0	0.0	0.36
WNW	0.0	0.06	0.07	0.08	0.16	0.0	0.0	0.0	0.37
NW	0.0	0.11	0.08	0.07	0.15	0.0	0.0	0.0	0.41
NNW	0.0	0.09	0.13	0.20	0.53	0.0	0.0	0.0	0.95
SUBTOTAL	0.05	4.07	6.19	4.20	3.31	0.18	0.0	0.0	18.00

CALM = 0.0

1548 STABILITY CLASS D OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

1536 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1548 STABILITY CLASS D OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-39

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS E
-0.5< DELTA T<= 1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.08	1.25	0.99	0.76	0.58	0.01	0.0	0.0	3.67
NNE	0.08	2.40	2.31	1.05	1.20	0.05	0.01	0.0	7.10
NE	0.04	0.78	0.49	0.20	0.12	0.01	0.0	0.0	1.64
ENE	0.11	0.53	0.11	0.01	0.0	0.0	0.0	0.0	0.76
E	0.06	0.32	0.07	0.0	0.0	0.0	0.0	0.0	0.45
ESE	0.04	0.15	0.01	0.0	0.0	0.0	0.0	0.0	0.20
SE	0.08	0.51	0.05	0.0	0.0	0.0	0.0	0.0	0.64
SSE	0.02	0.83	0.22	0.20	0.28	0.02	0.0	0.0	1.57
S	0.04	1.51	1.71	0.81	1.90	0.07	0.0	0.0	5.04
SSW	0.06	1.89	2.26	1.65	1.13	0.05	0.0	0.0	7.04
SW	0.04	1.37	1.86	0.99	0.49	0.07	0.0	0.0	4.82
WSW	0.02	0.78	0.50	0.20	0.27	0.02	0.0	0.0	1.79
W	0.02	0.55	0.30	0.16	0.07	0.01	0.0	0.0	1.11
WNW	0.04	0.36	0.16	0.12	0.11	0.0	0.0	0.0	0.79
NW	0.09	0.71	0.46	0.51	0.34	0.04	0.0	0.0	2.15
NNW	0.07	0.86	0.79	0.84	0.63	0.0	0.0	0.0	3.19
SUBTOTAL	0.89	14.80	12.29	7.50	6.12	0.35	0.01	0.0	41.96

CALM = 0.01

3630 STABILITY CLASS E OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

3592 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 3630 STABILITY CLASS E OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-40

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS E
-0.5< DELTA T<= 1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.11	1.34	1.04	0.76	0.55	0.01	0.0	0.0	3.81
NNE	0.06	2.52	2.09	1.08	1.16	0.04	0.01	0.0	7.02
NE	0.06	0.91	0.54	0.20	0.12	0.01	0.0	0.0	1.84
ENE	0.08	0.43	0.12	0.01	0.0	0.0	0.0	0.0	0.64
E	0.06	0.33	0.01	0.0	0.0	0.0	0.0	0.0	0.40
ESE	0.05	0.19	0.01	0.0	0.0	0.0	0.0	0.0	0.25
SE	0.12	0.47	0.05	0.0	0.0	0.0	0.0	0.0	0.64
SSE	0.04	0.02	0.27	0.20	0.25	0.02	0.0	0.0	1.60
S	0.02	1.48	1.66	0.86	0.92	0.07	0.0	0.0	5.01
SSW	0.08	1.81	2.33	1.79	1.25	0.05	0.0	0.0	7.31
SW	0.04	1.39	1.90	1.19	0.53	0.05	0.0	0.01	5.11
WSW	0.04	0.71	0.50	0.19	0.27	0.04	0.0	0.0	1.75
W	0.02	0.51	0.34	0.13	0.08	0.01	0.0	0.0	1.09
WNW	0.06	0.37	0.15	0.13	0.09	0.0	0.0	0.0	0.80
NW	0.09	0.65	0.46	0.51	0.33	0.04	0.0	0.0	2.08
NNW	0.08	0.85	0.68	0.85	0.64	0.01	0.0	0.0	3.11
SUBTOTAL	1.01	14.84	12.15	7.90	6.19	0.35	0.01	0.01	42.46

CALM = 0.02

3667 STABILITY CLASS E OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

3634 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 3667 STABILITY CLASS E OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-41

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS F
1.5< DELTA T<= 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.09	1.88	0.53	0.05	0.01	0.0	0.0	0.0	2.56
NNE	0.16	4.06	1.09	0.02	0.0	0.0	0.0	0.0	5.33
NE	0.07	0.90	0.18	0.04	0.0	0.0	0.0	0.0	1.19
ENE	0.06	0.36	0.05	0.0	0.0	0.0	0.0	0.0	0.47
E	0.12	0.30	0.0	0.0	0.0	0.0	0.0	0.0	0.42
ESE	0.09	0.26	0.0	0.0	0.0	0.0	0.0	0.0	0.35
SE	0.15	0.37	0.02	0.0	0.0	0.0	0.0	0.0	0.54
SSE	0.25	0.67	0.07	0.06	0.01	0.0	0.0	0.0	1.06
S	0.11	0.91	0.44	0.05	0.02	0.0	0.0	0.0	1.53
SSW	0.12	1.39	0.74	0.34	0.09	0.0	0.0	0.0	2.68
SW	0.02	1.10	0.60	0.20	0.05	0.0	0.0	0.0	1.97
WSW	0.08	0.47	0.11	0.02	0.0	0.0	0.0	0.0	0.68
W	0.06	0.21	0.05	0.04	0.0	0.0	0.0	0.0	0.36
WNW	0.14	0.27	0.05	0.01	0.01	0.0	0.0	0.0	0.48
NW	0.02	0.42	0.21	0.07	0.01	0.0	0.0	0.0	0.73
NNW	0.07	0.72	0.34	0.05	0.01	0.0	0.0	0.0	1.19
SUBTOTAL	1.61	14.29	4.48	0.95	0.21	0.0	0.0	0.0	21.54

CALM = 0.02

1852 STABILITY CLASS F OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

1843 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1852 STABILITY CLASS F OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-42

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS F
1.5< DELTA T<= 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.07	1.59	0.42	0.07	0.02	0.0	0.0	0.0	2.17
NNE	0.20	3.58	1.19	0.04	0.05	0.0	0.0	0.0	5.06
NE	0.06	0.71	0.22	0.05	0.0	0.0	0.0	0.0	1.04
ENE	0.07	0.35	0.02	0.0	0.0	0.0	0.0	0.0	0.44
E	0.13	0.27	0.02	0.0	0.0	0.0	0.0	0.0	0.42
ESE	0.12	0.23	0.02	0.0	0.0	0.0	0.0	0.0	0.37
SE	0.12	0.34	0.01	0.0	0.0	0.0	0.0	0.0	0.47
SSE	0.16	0.68	0.06	0.05	0.05	0.0	0.0	0.0	1.00
S	0.12	0.89	0.43	0.08	0.02	0.01	0.0	0.0	1.55
SSW	0.08	1.36	0.63	0.35	0.09	0.0	0.0	0.0	2.51
SW	0.01	1.02	0.68	0.15	0.06	0.0	0.0	0.0	1.92
WSW	0.07	0.50	0.09	0.02	0.01	0.0	0.0	0.0	0.69
W	0.08	0.19	0.05	0.04	0.0	0.0	0.0	0.0	0.34
WNW	0.07	0.20	0.06	0.01	0.0	0.0	0.0	0.0	0.34
NW	0.01	0.41	0.19	0.11	0.01	0.0	0.0	0.0	0.73
NNW	0.06	0.67	0.39	0.04	0.0	0.0	0.0	0.0	1.16
SUBTOTAL	1.41	12.99	4.48	1.01	0.31	0.01	0.0	0.0	20.21

CALM = 0.01

1739 STABILITY CLASS F OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

1728 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1739 STABILITY CLASS F OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-43

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS G
DELTA T > 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.06	0.41	0.13	0.01	0.0	0.0	0.0	0.0	0.61
NNE	0.07	1.75	0.50	0.02	0.0	0.0	0.0	0.0	2.34
NE	0.12	0.72	0.11	0.01	0.0	0.0	0.0	0.0	0.96
ENE	0.15	0.48	0.0	0.0	0.0	0.0	0.0	0.0	0.63
E	0.21	0.29	0.0	0.0	0.0	0.0	0.0	0.0	0.50
ESE	0.19	0.11	0.02	0.0	0.0	0.0	0.0	0.0	0.32
SE	0.07	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.19
SSE	0.09	0.40	0.0	0.0	0.0	0.0	0.0	0.0	0.49
S	0.09	0.71	0.05	0.0	0.0	0.0	0.0	0.0	0.85
SSW	0.02	0.98	0.51	0.0	0.0	0.0	0.0	0.0	1.51
SW	0.02	0.44	0.56	0.04	0.0	0.0	0.0	0.0	1.06
WSW	0.01	0.12	0.02	0.0	0.0	0.0	0.0	0.0	0.15
W	0.02	0.04	0.01	0.0	0.0	0.0	0.0	0.0	0.07
WNW	0.02	0.06	0.01	0.0	0.01	0.0	0.0	0.0	0.10
NW	0.0	0.06	0.01	0.01	0.0	0.0	0.0	0.0	0.08
NNW	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.08
SUBTOTAL	1.14	6.77	1.93	0.09	0.01	0.0	0.0	0.0	9.94

CALM = 0.02

855 STABILITY CLASS G OCCURRENCES OUT OF TOTAL 8620 VALID TEMPERATURE DIFFERENCE READINGS

855 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 855 STABILITY CLASS G OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-44

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS G
DELTA T > 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.08	0.56	0.20	0.0	0.0	0.0	0.0	0.0	0.82
NNE	0.04	1.73	0.42	0.01	0.0	0.0	0.0	0.0	2.20
NE	0.11	0.85	0.08	0.01	0.0	0.0	0.0	0.0	1.05
ENE	0.15	0.54	0.01	0.0	0.0	0.0	0.0	0.0	0.70
E	0.20	0.32	0.0	0.0	0.0	0.0	0.0	0.0	0.52
ESE	0.15	0.12	0.01	0.0	0.0	0.0	0.0	0.0	0.28
SE	0.07	0.20	0.01	0.0	0.0	0.0	0.0	0.0	0.28
SSE	0.15	0.44	0.01	0.01	0.0	0.0	0.0	0.0	0.61
S	0.09	0.69	0.08	0.0	0.0	0.0	0.0	0.0	0.86
SSW	0.04	1.00	0.56	0.01	0.0	0.0	0.0	0.0	1.61
SW	0.04	0.55	0.55	0.05	0.0	0.0	0.0	0.0	1.19
WSW	0.01	0.13	0.02	0.0	0.0	0.0	0.0	0.0	0.16
W	0.02	0.08	0.01	0.0	0.0	0.0	0.0	0.0	0.11
WNW	0.06	0.09	0.0	0.0	0.01	0.0	0.0	0.0	0.16
NW	0.0	0.08	0.04	0.01	0.0	0.0	0.0	0.0	0.13
NNW	0.0	0.12	0.05	0.01	0.01	0.0	0.0	0.0	0.19
SUBTOTAL	1.19	7.50	2.05	0.11	0.02	0.0	0.0	0.0	10.87

CALM = 0.02

934 STABILITY CLASS G OCCURRENCES OUT OF TOTAL 8621 VALID TEMPERATURE DIFFERENCE READINGS

933 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 934 STABILITY CLASS G OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 150 FEET ABOVE GROUND
WIND INSTRUMENTS 33 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-45

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS A
DELTA T<=-1.9 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.02
NNE	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.04
NE	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.03
ENE	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.02
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01
SSW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WSW	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.01
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01
SUBTOTAL	0.0	0.0	0.0	0.0	0.07	0.07	0.0	0.0	0.14

CALM = 0.0

13 STABILITY CLASS A OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

13 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 13 STABILITY CLASS A OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-46

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS A
DELTA T<=-1.9 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.03
NNE	0.0	0.0	0.0	0.0	0.06	0.04	0.0	0.0	0.10
NE	0.0	0.0	0.01	0.0	0.06	0.04	0.0	0.0	0.11
ENE	0.0	0.0	0.01	0.0	0.06	0.0	0.0	0.0	0.07
E	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
ESE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.01
S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSW	0.0	0.0	0.0	0.0	0.05	0.0	0.01	0.0	0.06
SW	0.0	0.01	0.0	0.01	0.02	0.01	0.0	0.0	0.05
WSW	0.01	0.0	0.0	0.01	0.04	0.0	0.0	0.0	0.06
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.02
NW	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.02
NNW	0.0	0.0	0.0	0.0	0.04	0.01	0.01	0.0	0.06
SUBTOTAL	0.01	0.01	0.05	0.03	0.35	0.15	0.02	0.0	0.62

CALM = 0.0

54 STABILITY CLASS A OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

54 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 54 STABILITY CLASS A OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-47

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS B
-1.9< DELTA T<=-1.7 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND	WIND SPEED (MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.01	0.05	0.06	0.0	0.0	0.12
NNE	0.0	0.0	0.0	0.0	0.15	0.02	0.01	0.0	0.18
NE	0.0	0.0	0.0	0.02	0.11	0.07	0.0	0.0	0.20
ENE	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.0	0.03
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.03
SE	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
SSE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.02
SSW	0.0	0.0	0.0	0.0	0.02	0.05	0.01	0.0	0.08
SW	0.0	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.03
WSW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.04
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.01	0.04	0.0	0.0	0.05
NNW	0.0	0.0	0.0	0.0	0.05	0.04	0.01	0.0	0.10
SUBTOTAL	0.0	0.0	0.03	0.05	0.42	0.32	0.03	0.04	0.89

CALM = 0.0

78 STABILITY CLASS B OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

77 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 78 STABILITY CLASS B OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-48

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS B
-1.9 < DELTA T<=-1.7 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND		WIND SPEED (MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.0	0.05	0.02	0.0	0.0	0.07
NNE	0.0	0.0	0.01	0.0	0.11	0.02	0.02	0.0	0.16
NE	0.0	0.0	0.02	0.04	0.08	0.06	0.0	0.0	0.20
ENE	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.03
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.02
SE	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0	0.0	0.0	0.01	0.01	0.02	0.01	0.0	0.05
SSW	0.0	0.0	0.0	0.02	0.07	0.14	0.0	0.01	0.24
SW	0.0	0.0	0.0	0.04	0.07	0.08	0.0	0.0	0.19
WSW	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.02	0.03
W	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.01
WNW	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.02
NW	0.0	0.0	0.0	0.0	0.01	0.04	0.0	0.0	0.05
NNW	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.03
SUBTOTAL	0.0	0.0	0.09	0.13	0.43	0.41	0.03	0.03	1.12

CALM = 0.0

100 STABILITY CLASS B OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

99 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 100 STABILITY CLASS B OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS
*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-49

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS C
-1.7 < DELTA T<=-1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND	WIND SPEED (MPH)							
DIRECTION	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.01	0.09	0.08	0.06	0.0	0.24
NNE	0.0	0.0	0.05	0.02	0.18	0.09	0.01	0.0	0.35
NE	0.0	0.01	0.02	0.02	0.22	0.16	0.02	0.0	0.45
ENE	0.0	0.01	0.04	0.02	0.02	0.0	0.0	0.0	0.09
E	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02
ESE	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.02
SE	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02
SSE	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.02
S	0.0	0.0	0.0	0.0	0.04	0.01	0.01	0.01	0.07
SSW	0.0	0.0	0.0	0.01	0.14	0.21	0.04	0.02	0.42
SW	0.0	0.0	0.0	0.02	0.13	0.14	0.01	0.0	0.30
WSW	0.0	0.0	0.0	0.0	0.02	0.0	0.01	0.0	0.03
W	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.03
WNW	0.0	0.0	0.0	0.0	0.01	0.05	0.0	0.0	0.06
NW	0.0	0.0	0.0	0.0	0.06	0.08	0.01	0.0	0.15
NNW	0.0	0.01	0.0	0.0	0.02	0.07	0.0	0.0	0.10
SUBTOTAL	0.0	0.04	0.15	0.13	0.95	0.90	0.17	0.03	2.37

CALM = 0.0

208 STABILITY CLASS C OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

208 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 208 STABILITY CLASS C OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-50

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS C
-1.7< DELTA T<= -1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.0	0.0	0.04	0.12	0.06	0.04	0.0	0.26
NNE	0.0	0.01	0.05	0.04	0.23	0.12	0.0	0.0	0.45
NE	0.0	0.05	0.01	0.07	0.11	0.14	0.04	0.0	0.42
ENE	0.0	0.0	0.01	0.01	0.0	0.0	0.01	0.0	0.03
E	0.0	0.0	0.05	0.01	0.0	0.0	0.0	0.0	0.06
ESE	0.0	0.01	0.01	0.02	0.0	0.0	0.0	0.0	0.04
SE	0.0	0.0	0.02	0.01	0.0	0.01	0.0	0.0	0.04
SSE	0.0	0.01	0.0	0.02	0.02	0.0	0.0	0.0	0.05
S	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.03
SSW	0.0	0.02	0.01	0.05	0.13	0.15	0.01	0.01	0.38
SW	0.0	0.0	0.06	0.09	0.22	0.06	0.0	0.0	0.43
WSW	0.0	0.0	0.01	0.02	0.07	0.0	0.01	0.01	0.12
W	0.0	0.02	0.0	0.01	0.0	0.01	0.0	0.0	0.04
WNW	0.0	0.0	0.0	0.0	0.0	0.05	0.0	0.0	0.05
NW	0.0	0.0	0.0	0.0	0.0	0.06	0.01	0.0	0.07
NNW	0.0	0.0	0.0	0.0	0.02	0.12	0.0	0.0	0.14
SUBTOTAL	0.0	0.12	0.23	0.39	0.94	0.79	0.12	0.02	2.61

CALM = 0.0

225 STABILITY CLASS C OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

225 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 225 STABILITY CLASS C OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-51

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS D
-1.5< DELTA T<=-0.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.01	0.13	0.25	0.22	0.68	0.96	0.29	0.01	2.55
NNE	0.0	0.29	0.55	0.74	1.63	0.84	0.14	0.0	4.19
NE	0.0	0.50	0.60	0.56	0.90	0.55	0.09	0.0	3.20
ENE	0.0	0.32	0.38	0.20	0.19	0.01	0.11	0.0	1.21
E	0.0	0.21	0.25	0.08	0.05	0.02	0.01	0.0	0.62
ESE	0.0	0.18	0.12	0.05	0.04	0.0	0.0	0.0	0.39
SE	0.0	0.12	0.33	0.04	0.02	0.01	0.0	0.0	0.52
SSE	0.0	0.18	0.27	0.14	0.11	0.12	0.0	0.0	0.82
S	0.0	0.38	0.36	0.28	0.45	0.46	0.22	0.04	2.19
SSW	0.0	0.34	0.93	0.81	1.91	1.00	0.21	0.05	5.25
SW	0.01	0.25	1.34	1.29	2.06	0.46	0.08	0.04	5.53
WSW	0.0	0.22	0.59	0.49	0.54	0.26	0.07	0.0	2.17
W	0.01	0.16	0.11	0.09	0.25	0.21	0.07	0.02	0.92
WNW	0.0	0.04	0.05	0.05	0.28	0.25	0.05	0.0	0.72
NW	0.0	0.04	0.09	0.08	0.47	0.64	0.13	0.04	1.49
NNW	0.0	0.05	0.08	0.12	0.63	0.70	0.20	0.0	1.78
SUBTOTAL	0.03	3.41	6.30	5.24	10.21	6.49	1.67	0.20	33.55

CALM = 0.0

2873 STABILITY CLASS D OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

2857 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 2873 STABILITY CLASS D OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-52

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS D
-1.5< DELTA T<=-0.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.01	0.09	0.23	0.20	0.61	1.02	0.32	0.01	2.49
NNE	0.0	0.30	0.61	0.75	1.63	0.88	0.20	0.0	4.37
NE	0.0	0.48	0.56	0.57	1.05	0.57	0.11	0.0	3.34
ENE	0.0	0.30	0.38	0.22	0.16	0.01	0.07	0.0	1.14
E	0.0	0.23	0.19	0.07	0.05	0.02	0.01	0.0	0.57
ESE	0.01	0.18	0.12	0.06	0.04	0.0	0.0	0.0	0.41
SE	0.0	0.13	0.27	0.01	0.01	0.0	0.0	0.0	0.42
SSE	0.0	0.18	0.27	0.09	0.08	0.08	0.0	0.0	0.70
S	0.0	0.41	0.34	0.28	0.36	0.47	0.20	0.04	2.10
SSW	0.0	0.27	1.00	0.74	1.79	1.04	0.21	0.05	5.10
SW	0.0	0.26	1.30	1.14	1.88	0.46	0.08	0.05	5.17
WSW	0.0	0.16	0.57	0.46	0.42	0.25	0.08	0.0	1.94
W	0.01	0.12	0.12	0.08	0.27	0.22	0.08	0.02	0.92
WNW	0.0	0.05	0.05	0.05	0.30	0.19	0.05	0.0	0.69
NW	0.0	0.06	0.07	0.08	0.49	0.64	0.11	0.02	1.47
NNW	0.0	0.07	0.05	0.13	0.66	0.69	0.20	0.0	1.80
SUBTOTAL	0.03	3.29	6.13	4.93	9.80	6.54	1.72	0.19	32.63

CALM = 0.0

2800 STABILITY CLASS D OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

2785 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 2800 STABILITY CLASS D OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-53

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS E
-0.5< DELTA T<= 1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.06	0.23	0.22	0.27	0.89	0.70	0.13	0.0	2.50
NNE	0.0	0.41	0.84	0.89	2.11	1.10	0.22	0.04	5.61
NE	0.01	0.46	0.67	0.73	1.10	0.27	0.18	0.02	3.44
ENE	0.01	0.33	0.29	0.08	0.18	0.06	0.0	0.0	0.95
E	0.01	0.14	0.14	0.08	0.11	0.02	0.0	0.0	0.50
ESE	0.02	0.23	0.06	0.07	0.0	0.01	0.0	0.0	0.39
SE	0.01	0.21	0.12	0.06	0.05	0.02	0.0	0.0	0.47
SSE	0.02	0.27	0.14	0.11	0.35	0.23	0.07	0.0	1.19
S	0.02	0.47	0.36	0.39	0.96	1.15	0.39	0.12	3.86
SSW	0.04	0.41	1.30	1.29	2.93	2.41	0.49	0.07	8.94
SW	0.01	0.43	1.11	1.27	2.20	0.71	0.25	0.05	6.03
WSW	0.05	0.38	0.52	0.46	0.75	0.20	0.05	0.0	2.41
W	0.02	0.13	0.15	0.25	0.25	0.15	0.04	0.0	0.99
WNW	0.01	0.18	0.09	0.09	0.30	0.08	0.0	0.0	1.75
NW	0.0	0.14	0.18	0.15	0.52	0.35	0.09	0.0	1.43
NNW	0.0	0.26	0.16	0.16	0.76	0.35	0.02	0.0	1.71
SUBTOTAL	0.29	4.68	6.35	6.35	13.46	7.81	1.93	0.30	41.17

CALM = 0.0

3542 STABILITY CLASS E OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

3515 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 3542 STABILITY CLASS E OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-54

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS E
-0.5< DELTA T<= 1.5 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.05	0.32	0.23	0.33	0.93	0.68	0.13	0.0	2.67
NNE	0.0	0.39	0.76	0.82	2.16	1.04	0.16	0.04	5.37
NE	0.01	0.49	0.66	0.68	1.01	0.26	0.15	0.02	3.28
ENE	0.01	0.32	0.27	0.06	0.20	0.09	0.02	0.0	0.97
E	0.0	0.13	0.16	0.07	0.09	0.02	0.0	0.0	0.47
ESE	0.01	0.22	0.06	0.06	0.0	0.01	0.0	0.0	0.36
SE	0.01	0.20	0.13	0.06	0.06	0.04	0.0	0.0	0.50
SSE	0.02	0.27	0.12	0.13	0.33	0.28	0.07	0.0	1.22
S	0.01	0.41	0.38	0.38	1.00	1.13	0.41	0.13	3.85
SSW	0.04	0.45	1.24	1.31	2.99	2.39	0.50	0.07	8.99
SW	0.02	0.42	1.10	1.38	2.25	0.74	0.25	0.05	6.21
WSW	0.05	0.43	0.48	0.56	0.76	0.21	0.04	0.0	2.53
W	0.01	0.15	0.16	0.22	0.26	0.13	0.02	0.0	0.95
WNW	0.01	0.14	0.07	0.08	0.28	0.11	0.0	0.0	0.69
NW	0.0	0.12	0.20	0.15	0.53	0.35	0.12	0.01	1.48
NNW	0.0	0.26	0.19	0.16	0.71	0.33	0.02	0.0	1.67
SUBTOTAL	0.25	4.72	6.21	6.45	13.56	7.81	1.89	0.32	41.21

CALM = 0.0

3542 STABILITY CLASS E OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

3516 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 3542 STABILITY CLASS E OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-55

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS F
1.5< DELTA T<= 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.0	0.19	0.15	0.30	0.49	0.13	0.0	0.0	1.26
NNE	0.01	0.21	0.40	0.50	1.24	0.36	0.01	0.0	2.73
NE	0.0	0.18	0.42	0.41	0.23	0.0	0.0	0.0	1.24
ENE	0.01	0.06	0.09	0.08	0.06	0.06	0.0	0.0	0.36
E	0.01	0.05	0.05	0.02	0.01	0.0	0.0	0.0	0.14
ESE	0.0	0.02	0.05	0.0	0.0	0.0	0.0	0.0	0.07
SE	0.0	0.06	0.02	0.04	0.01	0.02	0.0	0.0	0.15
SSE	0.0	0.13	0.12	0.01	0.14	0.09	0.0	0.0	0.49
S	0.0	0.25	0.19	0.12	0.61	0.19	0.0	0.0	1.36
SSW	0.01	0.20	0.29	0.40	1.20	0.35	0.01	0.0	2.46
SW	0.01	0.22	0.53	0.64	0.79	0.09	0.0	0.0	2.28
WSW	0.01	0.20	0.27	0.42	0.26	0.04	0.0	0.0	1.20
W	0.02	0.07	0.11	0.13	0.20	0.01	0.0	0.0	0.54
WNW	0.01	0.07	0.01	0.02	0.01	0.02	0.0	0.0	0.14
NW	0.0	0.06	0.05	0.05	0.02	0.02	0.0	0.0	0.20
NNW	0.01	0.12	0.09	0.08	0.11	0.02	0.0	0.01	0.44
SUBTOTAL	0.10	2.09	2.84	3.22	5.38	1.40	0.02	0.01	15.06

CALM = 0.0

1294 STABILITY CLASS F OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS
1288 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1294 STABILITY CLASS F OCCURRENCES
ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-56

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS F
1.5< DELTA T< = 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.02	0.14	0.14	0.28	0.48	0.12	0.0	0.0	1.18
NNE	0.01	0.20	0.42	0.53	1.09	0.39	0.01	0.0	2.65
NE	0.0	0.11	0.43	0.39	0.28	0.0	0.0	0.0	1.21
ENE	0.01	0.11	0.11	0.06	0.07	0.02	0.0	0.0	0.38
E	0.02	0.05	0.04	0.04	0.02	0.0	0.0	0.0	0.17
ESE	0.0	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.04
SE	0.0	0.08	0.04	0.05	0.01	0.01	0.0	0.0	0.19
SSE	0.0	0.12	0.13	0.02	0.16	0.07	0.0	0.0	0.50
S	0.01	0.29	0.20	0.13	0.63	0.21	0.01	0.0	1.48
SSW	0.01	0.23	0.26	0.41	1.13	0.29	0.02	0.0	2.35
SW	0.01	0.21	0.52	0.54	0.74	0.11	0.01	0.0	2.14
WSW	0.0	0.19	0.30	0.30	0.26	0.04	0.0	0.0	1.09
W	0.02	0.08	0.09	0.12	0.18	0.02	0.0	0.0	0.51
WNW	0.01	0.09	0.04	0.04	0.02	0.01	0.0	0.0	0.21
NW	0.0	0.07	0.05	0.02	0.05	0.04	0.0	0.0	0.23
NNW	0.02	0.12	0.11	0.05	0.12	0.04	0.0	0.01	0.47
SUBTOTAL	0.14	2.11	2.90	2.98	5.24	1.37	0.05	0.01	14.80

CALM = 0.0

1270 STABILITY CLASS F OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

1262 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 1270 STABILITY CLASS F OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.2-57

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS G
DELTA T > 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.02	0.04	0.06	0.15	0.28	0.01	0.0	0.0	0.56
NNE	0.0	0.06	0.11	0.25	0.29	0.14	0.0	0.0	0.85
NE	0.01	0.07	0.05	0.05	0.01	0.0	0.0	0.0	0.19
ENE	0.0	0.06	0.02	0.01	0.01	0.0	0.0	0.0	0.10
E	0.0	0.04	0.01	0.01	0.0	0.0	0.0	0.0	0.06
ESE	0.01	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.08
SE	0.01	0.09	0.02	0.02	0.0	0.01	0.0	0.0	0.15
SSE	0.01	0.02	0.02	0.08	0.0	0.0	0.0	0.0	0.13
S	0.01	0.16	0.21	0.13	0.33	0.01	0.01	0.0	0.86
SSW	0.01	0.22	0.25	0.32	0.73	0.21	0.0	0.0	1.74
SW	0.0	0.11	0.19	0.21	0.45	0.07	0.0	0.0	1.03
WSW	0.0	0.11	0.08	0.06	0.02	0.0	0.0	0.0	0.27
W	0.01	0.08	0.06	0.01	0.05	0.0	0.0	0.0	0.21
WNW	0.01	0.07	0.06	0.02	0.0	0.0	0.01	0.0	0.17
NW	0.0	0.04	0.01	0.01	0.01	0.0	0.0	0.0	0.07
NNW	0.02	0.09	0.04	0.05	0.04	0.0	0.0	0.0	0.24
SUBTOTAL	0.12	1.33	1.19	1.38	2.22	0.45	0.02	0.0	6.71

CALM = 0.0

581 STABILITY CLASS G OCCURRENCES OUT OF TOTAL 8589 VALID TEMPERATURE DIFFERENCE READINGS

574 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 581 STABILITY CLASS G OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"HOURLY AVERAGE TEMPERATURE"

TABLE 2.3.2-58

JOINT PERCENTAGE FREQUENCIES OF WIND DIRECTION AND WIND SPEED
FOR DIFFERENT STABILITY CLASSES*

STABILITY CLASS G
DELTA T > 4.0 DEG. C/100M
SEQUOYAH NUCLEAR PLANT METEOROLOGICAL FACILITY
MAY 1, 75 - APRIL 30, 76

WIND DIRECTION	WIND SPEED (MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.01	0.04	0.07	0.13	0.30	0.02	0.0	0.0	0.57
NNE	0.0	0.07	0.09	0.27	0.32	0.12	0.0	0.0	0.87
NE	0.01	0.09	0.05	0.05	0.02	0.0	0.0	0.0	0.22
ENE	0.0	0.04	0.02	0.05	0.01	0.0	0.0	0.0	0.12
E	0.0	0.04	0.01	0.01	0.0	0.0	0.0	0.0	0.06
ESE	0.01	0.07	0.02	0.0	0.0	0.0	0.0	0.0	0.10
SE	0.01	0.07	0.02	0.02	0.0	0.01	0.0	0.0	0.13
SSE	0.01	0.02	0.05	0.07	0.0	0.01	0.0	0.0	0.16
S	0.01	0.14	0.22	0.12	0.36	0.01	0.0	0.0	0.86
SSW	0.01	0.19	0.26	0.30	0.74	0.22	0.0	0.0	1.72
SW	0.0	0.12	0.20	0.23	0.47	0.05	0.0	0.0	1.07
WSW	0.0	0.12	0.07	0.07	0.06	0.0	0.0	0.0	0.32
W	0.02	0.07	0.05	0.05	0.05	0.0	0.0	0.0	0.24
WNW	0.01	0.07	0.06	0.02	0.0	0.0	0.01	0.0	0.17
NW	0.0	0.02	0.01	0.04	0.0	0.0	0.0	0.0	0.07
NNW	0.01	0.08	0.04	0.07	0.04	0.0	0.0	0.0	0.24
SUBTOTAL	0.11	1.25	1.24	1.50	2.37	0.44	0.01	0.0	6.92

CALM = 0.0

599 STABILITY CLASS G OCCURRENCES OUT OF TOTAL 8590 VALID TEMPERATURE DIFFERENCE READINGS

592 VALID WIND DIRECTION - WIND SPEED READINGS OUT OF TOTAL 599 STABILITY CLASS G OCCURRENCES

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF NET VALID READINGS

*METEOROLOGICAL FACILITY LOCATED .74 MILES SW OF SEQUOYAH NUCLEAR PLANT
TEMPERATURE INSTRUMENTS 33 AND 300 FEET ABOVE GROUND
WIND INSTRUMENTS 300 FEET ABOVE GROUND
"END OF HOUR TEMPERATURE READINGS"

TABLE 2.3.4-1

DISTANCES FROM RELEASE ZONES OR POINTS TO EXCLUSION AREA BOUNDARY

Sequoyah Nuclear Plant

Sector	Distance From Release Zone 1[a] (Meters)	Distance From Release Zone 2[b] (Meters)	Distance From Release Zone 3[c] (Meters)
N	945	899	899
NNE	732	732	732
NE	701	863	701
ENE	556	600	556
E	564	604	564
ESE	610	692	610
SE	640	811	640
SSE	701	899	701
S	869	1049	869
SSW	983	1125	975
SW	1280	1372	1256
WSW	914	936	823
W	671	823	524
WNW	655	619	509
NW	663	637	524
NNW	732	710	771

a. Release Zone 1 - Auxiliary building vent exhaust and shield building vent exhaust.

b. Release Zone 2 - Radioactive chemical hood exhaust.

c. Release Zone 3 - Condenser air ejector exhaust.

TABLE 2.3.4-2

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT EXCLUSION AREA BOUNDARY DUE TO GROUND-LEVEL RELEASES FROM RELEASE ZONE 1*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.900E-02 - 0.999E-02	1	0.00	0.00
0.800E-02 - 0.899E-02	2	0.01	0.01
0.700E-02 - 0.799E-02	2	0.01	0.02
0.600E-02 - 0.699E-02	8	0.03	0.04
0.500E-02 - 0.599E-02	3	0.01	0.05
0.400E-02 - 0.499E-02	30	0.09	0.14
0.300E-02 - 0.399E-02	39	0.12	0.27
0.200E-02 - 0.299E-02	120	0.38	0.64
0.100E-02 - 0.199E-02	906	2.84	3.48
0.900E-03 - 0.999E-03	324	1.02	4.50
0.800E-03 - 0.899E-03	390	1.22	5.72
0.700E-03 - 0.799E-03	545	1.71	7.43
0.600E-03 - 0.699E-03	834	2.62	10.05
0.500E-03 - 0.599E-03	1198	3.76	13.80
0.400E-03 - 0.499E-03	1867	5.85	19.66
0.300E-03 - 0.399E-03	2782	8.72	28.38
0.200E-03 - 0.299E-03	3966	12.44	40.82
0.100E-03 - 0.199E-03	7864	24.66	65.48
0.900E-04 - 0.999E-04	1272	3.99	69.47
0.800E-04 - 0.899E-04	1236	3.88	73.34
0.700E-04 - 0.799E-04	1471	4.61	77.96
0.600E-04 - 0.699E-04	1415	4.44	82.40
0.500E-04 - 0.599E-04	1234	3.87	86.26
0.400E-04 - 0.499E-04	1050	3.29	89.56
0.300E-04 - 0.399E-04	750	2.35	91.91
0.200E-04 - 0.299E-04	661	2.07	93.98
0.100E-04 - 0.199E-04	673	2.11	96.09
0.900E-05 - 0.999E-05	52	0.16	96.26
0.800E-05 - 0.899E-05	61	0.19	96.45
0.700E-05 - 0.799E-05	72	0.23	96.67
0.600E-05 - 0.699E-05	60	0.19	96.86
0.500E-05 - 0.599E-05	69	0.22	97.08
0.400E-05 - 0.499E-05	106	0.33	97.41
0.300E-05 - 0.399E-05	122	0.38	97.79
0.200E-05 - 0.299E-05	187	0.59	98.38
0.100E-05 - 0.199E-05	239	0.75	99.13
<= 0.999E-06	278	0.87	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.859E-03 SEC/M3, 50TH PERCENTILE= 0.163E-03 SEC/M3, AVERAGE= 0.269E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 1 - Auxiliary building vent exhaust and shield building vent.

TABLE 2.3.4-3

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT EXCLUSION AREA BOUNDARY DUE TO GROUND-LEVEL RELEASES FROM RELEASE ZONE 2*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.800E-02 - 0.899E-02	1	0.00	0.00
0.700E-02 - 0.799E-02	2	0.01	0.01
0.600E-02 - 0.699E-02	7	0.02	0.03
0.500E-02 - 0.599E-02	5	0.02	0.05
0.400E-02 - 0.499E-02	18	0.06	0.10
0.300E-02 - 0.399E-02	26	0.08	0.19
0.200E-02 - 0.299E-02	126	0.40	0.58
0.100E-02 - 0.199E-02	766	2.40	2.98
0.900E-03 - 0.999E-03	245	0.77	3.75
0.800E-03 - 0.899E-03	373	1.17	4.92
0.700E-03 - 0.799E-03	470	1.47	6.39
0.600E-03 - 0.699E-03	710	2.23	8.62
0.500E-03 - 0.599E-03	939	2.94	11.57
0.400E-03 - 0.499E-03	1641	5.15	16.71
0.300E-03 - 0.399E-03	2643	8.23	24.94
0.200E-03 - 0.299E-03	3878	12.16	37.10
0.100E-03 - 0.199E-03	7483	23.47	60.56
0.900E-04 - 0.999E-04	1295	4.06	64.62
0.800E-04 - 0.899E-04	1336	4.19	68.81
0.700E-04 - 0.799E-04	1490	4.67	73.49
0.600E-04 - 0.699E-04	1547	4.85	78.34
0.500E-04 - 0.599E-04	1565	4.91	83.24
0.400E-04 - 0.499E-04	1360	4.26	87.51
0.300E-04 - 0.399E-04	1010	3.17	90.68
0.200E-04 - 0.299E-04	817	2.56	93.24
0.100E-04 - 0.199E-04	778	2.44	95.68
0.900E-05 - 0.999E-05	62	0.19	95.87
0.800E-05 - 0.899E-05	76	0.24	96.11
0.700E-05 - 0.799E-05	67	0.21	96.32
0.600E-05 - 0.699E-05	74	0.23	96.55
0.500E-05 - 0.599E-05	75	0.24	96.79
0.400E-05 - 0.499E-05	70	0.22	97.01
0.300E-05 - 0.399E-05	129	0.40	97.41
0.200E-05 - 0.299E-05	184	0.58	97.99
0.100E-05 - 0.199E-05	219	0.69	98.68
<= 0.999E-06	422	1.32	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.795E-03 SEC/M3, 50TH PERCENTILE= 0.145E-03 SEC/M3, AVERAGE= 0.243E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 2 - Radioactive chemical hood exhaust.

TABLE 2.3.4-4

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT EXCLUSION AREA BOUNDARY DUE TO GROUND-LEVEL RELEASES FROM RELEASE ZONE 3*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.100E-01 - 0.199E-01	1	0.00	0.00
0.900E-02 - 0.999E-02	1	0.00	0.01
0.800E-02 - 0.899E-02	2	0.01	0.01
0.700E-02 - 0.799E-02	1	0.00	0.02
0.600E-02 - 0.699E-02	5	0.02	0.03
0.500E-02 - 0.599E-02	19	0.06	0.09
0.400E-02 - 0.499E-02	26	0.08	0.17
0.300E-02 - 0.399E-02	63	0.20	0.37
0.200E-02 - 0.299E-02	176	0.55	0.92
0.100E-02 - 0.199E-02	972	3.05	3.97
0.900E-03 - 0.999E-03	294	0.92	4.89
0.800E-03 - 0.899E-03	421	1.32	6.21
0.700E-03 - 0.799E-03	524	1.64	7.86
0.600E-03 - 0.699E-03	849	2.66	10.52
0.500E-03 - 0.599E-03	1194	3.74	14.26
0.400E-03 - 0.499E-03	1819	5.70	19.97
0.300E-03 - 0.399E-03	2806	8.80	28.77
0.200E-03 - 0.299E-03	3981	12.48	41.25
0.100E-03 - 0.199E-03	7836	24.57	65.82
0.900E-04 - 0.999E-04	1253	3.93	69.75
0.800E-04 - 0.899E-04	1221	3.83	73.58
0.700E-04 - 0.799E-04	1449	4.54	78.12
0.600E-04 - 0.699E-04	1415	4.44	82.56
0.500E-04 - 0.599E-04	1222	3.83	86.39
0.400E-04 - 0.499E-04	1051	3.30	89.69
0.300E-04 - 0.399E-04	705	2.21	91.90
0.200E-04 - 0.299E-04	665	2.09	93.99
0.100E-04 - 0.199E-04	683	2.14	96.13
0.900E-05 - 0.999E-05	54	0.17	96.30
0.800E-05 - 0.899E-05	62	0.19	96.49
0.700E-05 - 0.799E-05	58	0.18	96.67
0.600E-05 - 0.699E-05	69	0.22	96.89
0.500E-05 - 0.599E-05	58	0.18	96.07
0.400E-05 - 0.499E-05	102	0.32	97.39
0.300E-05 - 0.399E-05	131	0.41	97.80
0.200E-05 - 0.299E-05	196	0.61	98.42
0.100E-05 - 0.199E-05	238	0.75	99.16
<= 0.999E-06	267	0.84	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.892E-03 SEC/M3, 50TH PERCENTILE= 0.164E-03 SEC/M3, AVERAGE= 0.279E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 3 - Condenser air ejector exhaust.

TABLE 2.3.4-5

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT 556 METERS (MINIMUM EXCLUSIVE AREA BOUNDARY DISTANCE) DUE TO GROUND-LEVEL RELEASES FROM
RELEASE ZONE 1*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.900E-02 - 0.999E-02	18	0.06	0.06
0.400E-02 - 0.499E-02	82	0.26	0.31
0.300E_02 - 0.399E-02	103	0.32	0.64
0.200E-02 - 0.299E-02	346	1.09	1.72
0.100E-02 - 0.199E-02	1963	6.16	7.88
0.900E-03 - 0.999E-03	649	2.04	9.91
0.800E-03 - 0.899E-03	700	2.20	12.11
0.700E-03 - 0.799E-03	810	2.54	14.65
0.600E-03 - 0.699E-03	1319	4.14	18.78
0.500E-03 - 0.599E-03	1514	4.75	23.53
0.400E-03 - 0.499E-03	2327	7.30	30.83
0.300E-03 - 0.399E-03	3063	9.61	40.43
0.200E-03 - 0.299E-03	4622	14.49	54.93
0.100E-03 - 0.199E-03	8358	26.21	81.14
0.900E-04 - 0.999E-04	1050	3.29	84.43
0.800E-04 - 0.899E-04	835	2.62	87.05
0.700E-04 - 0.799E-04	748	2.35	89.39
0.600E-04 - 0.699E-04	643	2.02	91.41
0.500E-04 - 0.599E-04	483	1.51	92.93
0.400E-04 - 0.499E-04	359	1.13	94.05
0.300E-04 - 0.399E-04	381	1.19	95.25
0.200E-04 - 0.299E-04	357	1.12	96.37
0.100E-04 - 0.199E-04	397	1.24	97.61
0.900E-05 - 0.999E-05	55	0.17	97.78
0.800E-05 - 0.899E-05	87	0.27	98.06
0.700E-05 - 0.799E-05	91	0.29	98.34
0.600E-05 - 0.699E-05	130	0.41	98.75
0.500E-05 - 0.599E-05	166	0.52	99.27
0.400E-05 - 0.499E-05	132	0.41	99.68
0.300E-05 - 0.399E-05	84	0.26	99.95
0.200E-05 - 0.299E-05	16	0.05	100.00
0.100E-05 - 0.199E-05	1	0.00	100.00
<= 0.999E-06	0	0.00	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.147E-02 SEC/M3, 50TH PERCENTILE= 0.234E-03 SEC/M3, AVERAGE= 0.396E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 1 - Auxiliary building vent exhaust and shield building vent.

TABLE 2.3.4-6

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT 600 METERS (MINIMUM EXCLUSION AREA BOUNDARY DISTANCE) DUE TO GROUND-LEVEL RELEASES FROM
RELEASE ZONE 2*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.800E-02 - 0.899E-02	18	0.06	0.06
0.400E-02 - 0.499E-02	59	0.19	0.24
0.300E-02 - 0.399E-02	50	0.16	0.40
0.200E-02 - 0.299E-02	261	0.82	1.22
0.100E-02 - 0.199E-02	1715	5.38	6.59
0.900E-03 - 0.999E-03	566	1.77	8.37
0.800E-03 - 0.899E-03	621	1.95	10.32
0.700E-03 - 0.799E-03	842	2.64	12.96
0.600E-03 - 0.699E-03	1143	3.58	16.54
0.500E-03 - 0.599E-03	1574	4.94	21.48
0.400E-03 - 0.499E-03	2424	7.60	29.08
0.300E-03 - 0.399E-03	2915	9.14	38.22
0.200E-03 - 0.299E-03	4422	13.87	52.09
0.100E-03 - 0.199E-03	8359	26.21	78.30
0.900E-04 - 0.999E-04	1067	3.35	81.65
0.800E-04 - 0.899E-04	1054	3.31	84.95
0.700E-04 - 0.799E-04	944	2.96	87.91
0.600E-04 - 0.699E-04	707	2.22	90.13
0.500E-04 - 0.599E-04	655	2.05	92.18
0.400E-04 - 0.499E-04	417	1.31	93.49
0.300E-04 - 0.399E-04	391	1.23	94.72
0.200E-04 - 0.299E-04	427	1.34	96.05
0.100E-04 - 0.199E-04	381	1.19	97.25
0.900E-05 - 0.999E-05	64	0.20	97.45
0.800E-05 - 0.899E-05	68	0.21	97.66
0.700E-05 - 0.799E-05	87	0.27	97.94
0.600E-05 - 0.699E-05	102	0.32	98.26
0.500E-05 - 0.599E-05	157	0.49	98.75
0.400E-05 - 0.499E-05	202	0.63	99.38
0.300E-05 - 0.399E-05	137	0.43	99.81
0.200E-05 - 0.299E-05	57	0.18	99.99
0.100E-05 - 0.199E-05	3	0.01	100.00
<= 0.999E-06	0	0.0	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.130E-02 SEC/M3, 50TH PERCENTILE= 0.215E-03 SEC/M3, AVERAGE= 0.365E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 2 - Radioactive chemical hood exhaust.

TABLE 2.3.4-7

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT 509 METERS (MINIMUM EXCLUSION AREA BOUNDARY DISTANCE) DUE TO GROUND-LEVEL RELEASES FROM
RELEASE ZONE 3*

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
80.100E-01 - 0.199E-01	18	0.06	0.06
0.500E-02 - 0.599E-02	59	0.19	0.24
0.400E-02 - 0.499E-02	50	0.16	0.40
0.300E-02 - 0.399E-02	160	0.50	0.90
0.200E-02 - 0.299E-02	429	1.35	2.25
0.100E-02 - 0.199E-02	2329	7.30	9.55
0.900E-03 - 0.999E-03	421	1.32	10.87
0.800E-03 - 0.899E-03	830	2.60	13.47
0.700E-03 - 0.799E-03	816	2.56	16.03
0.600E-03 - 0.699E-03	1324	4.15	20.18
0.500E-03 - 0.599E-03	1914	6.00	26.18
0.400E-03 - 0.499E-03	2466	7.73	33.92
0.300E-03 - 0.399E-03	3004	9.42	43.34
0.200E-03 - 0.299E-03	5067	15.89	59.23
0.100E-03 - 0.199E-03	7962	24.97	84.20
0.900E-04 - 0.999E-04	821	2.57	86.77
0.800E-04 - 0.899E-04	709	2.22	88.99
0.700E-04 - 0.799E-04	596	1.87	90.86
0.600E-04 - 0.699E-04	533	1.67	92.53
0.500E-04 - 0.599E-04	341	1.07	93.60
0.400E-04 - 0.499E-04	351	1.10	94.70
0.300E-04 - 0.399E-04	339	1.06	95.77
0.200E-04 - 0.299E-04	283	0.89	96.65
0.100E-04 - 0.199E-04	437	1.37	98.02
0.900E-05 - 0.999E-05	74	0.23	98.26
0.800E-05 - 0.899E-05	102	0.32	98.58
0.700E-05 - 0.799E-05	123	0.39	98.96
0.600E-05 - 0.699E-05	126	0.40	99.36
0.500E-05 - 0.599E-05	101	0.32	99.67
0.400E-05 - 0.499E-05	73	0.23	99.90
0.300E-05 - 0.399E-05	28	0.09	99.99
0.200E-05 - 0.299E-05	2	0.01	100.00
0.100E-05 - 0.199E-05	1	0.00	100.00
<= 0.999E-06	0	0.0	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.162E-02 SEC/M3, 50TH PERCENTILE= 0.258E-03 SEC/M3, AVERAGE= 0.435E-03 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND
*Release Zone 3 - Condenser air ejector exhaust.

TABLE 2.3.4-8

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 1-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT OUTER BOUNDARY OF LOW POPULATION ZONE DUE TO GROUND-LEVEL RELEASES FROM A LOCATION REPRESENTATIVE OF
RELEASE ZONE 1, RELEASE ZONE 2, AND RELEASE ZONE 3

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.100E-02 - 0.199E-02	18	0.06	0.06
0.500E-03 - 0.599E-03	20	0.06	0.12
0.400E-03 - 0.499E-03	62	0.19	0.31
0.300E-03 - 0.399E-03	91	0.29	0.60
0.200E-03 - 0.299E-03	342	1.07	1.67
0.100E-03 - 0.199E-03	1734	5.44	7.11
0.900E-04 - 0.999E-04	338	1.06	8.17
0.800E-04 - 0.899E-04	575	1.80	9.97
0.700E-04 - 0.799E-04	602	1.89	11.86
0.600E-04 - 0.699E-04	968	3.04	14.90
0.500E-04 - 0.599E-04	1059	3.32	18.22
0.400E-04 - 0.499E-04	1754	5.50	23.72
0.300E-04 - 0.399E-04	1799	5.64	29.36
0.200E-04 - 0.299E-04	2793	8.76	38.12
0.100E-04 - 0.199E-04	6560	20.57	58.69
0.900E-05 - 0.999E-05	1118	3.51	62.19
0.800E-05 - 0.899E-05	1438	4.51	66.70
0.700E-05 - 0.799E-05	1413	4.43	71.13
0.600E-05 - 0.699E-05	1518	4.76	75.89
0.500E-05 - 0.599E-05	1618	5.07	80.97
0.400E-05 - 0.499E-05	1485	4.66	85.63
0.300E-05 - 0.399E-05	1196	3.75	89.38
0.200E-05 - 0.299E-05	887	2.78	92.16
0.100E-05 - 0.199E-05	654	2.05	94.21
<= 0.999E-06	1847	5.79	100.00
TOTALS	31889	100.00	

PERCENT OF THE POSSIBLE 35064 HOURLY OBSERVATIONS WHICH WERE VALID = 90.95
5TH PERCENTILE= 0.139E-03 SEC/M3, 50TH PERCENTILE= 0.142E-04 SEC/M3, AVERAGE= 0.319E-04 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND

TABLE 2.3.4-9

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 8-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT OUTER BOUNDARY OF LOW POPULATION ZONE DUE TO GROUND-LEVEL RELEASES FROM A LOCATION REPRESENTATIVE OF
RELEASE ZONE 1, RELEASE ZONE 2, AND RELEASE ZONE 3

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.300E-03 - 0.399E-03	8	0.03	0.03
0.200E-03 - 0.299E-03	32	0.12	0.15
0.100E-03 - 0.199E-03	203	0.76	0.91
0.900E-04 - 0.999E-04	71	0.27	1.17
0.800E-04 - 0.899E-04	126	0.47	1.65
0.700E-04 - 0.799E-04	182	0.68	2.23
0.600E-04 - 0.699E-04	380	1.42	3.75
0.500E-04 - 0.599E-04	545	2.04	5.79
0.400E-04 - 0.499E-04	881	3.29	9.08
0.300E-04 - 0.399E-04	1723	6.44	15.52
0.200E-04 - 0.299E-04	2944	11.01	26.53
0.100E-04 - 0.199E-04	6078	22.73	49.27
0.900E-05 - 0.999E-05	985	3.68	52.95
0.800E-05 - 0.899E-05	1124	4.20	57.15
0.700E-05 - 0.799E-05	1377	5.15	62.30
0.600E-05 - 0.699E-05	1475	5.52	67.82
0.500E-05 - 0.599E-05	1767	6.61	74.43
0.400E-05 - 0.499E-05	1926	7.20	81.63
0.300E-05 - 0.399E-05	2031	7.60	89.23
0.200E-05 - 0.299E-05	1726	6.45	95.68
0.100E-05 - 0.199E-05	960	3.59	99.27
0.900E-06 - 0.999E-06	39	0.15	99.42
0.800E-06 - 0.899E-06	46	0.17	99.59
0.700E-06 - 0.799E-06	29	0.11	99.70
0.600E-06 - 0.699E-06	29	0.11	99.81
0.500E-06 - 0.599E-06	18	0.07	99.87
0.400E-06 - 0.499E-06	11	0.04	99.91
0.300E-06 - 0.399E-06	11	0.04	99.95
0.200E-06 - 0.299E-06	3	0.01	99.97
0.100E-06 - 0.199E-06	2	0.01	99.97
<= 0.999E-06	7	0.03	100.00
TOTALS	26739	100.00	

PERCENT OF THE POSSIBLE 35057 8-HOUR OBSERVATIONS WHICH WERE VALID = 76.27
5TH PERCENTILE= 0.539E-04 SEC/M3, 50TH PERCENTILE= 0.980E-05 SEC/M3, AVERAGE= 0.169E-04 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND

TABLE 2.3.4-10

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION

CALCULATED 16-HOUR-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT OUTER BOUNDARY OF LOW POPULATION ZONE DUE TO GROUND-LEVEL RELEASES FROM A LOCATION REPRESENTATIVE OF
RELEASE ZONE 1, RELEASE ZONE 2, AND RELEASE ZONE 3

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.300E-04 - 0.399E-04	26	0.09	0.09
0.200E-04 - 0.299E-04	61	0.22	0.32
0.100E-04 - 0.199E-04	439	1.60	1.92
0.900E-05 - 0.999E-05	151	0.55	2.47
0.800E-05 - 0.899E-05	272	0.99	3.46
0.700E-05 - 0.799E-05	513	1.87	5.33
0.600E-05 - 0.699E-05	842	3.07	8.39
0.500E-05 - 0.599E-05	1313	4.78	13.18
0.400E-05 - 0.499E-05	2167	7.89	21.07
0.300E-05 - 0.399E-05	3694	13.46	34.53
0.200E-05 - 0.299E-05	6680	24.34	58.86
0.100E-05 - 0.199E-05	9097	33.14	92.00
0.900E-06 - 0.999E-06	619	2.26	94.26
0.800E-06 - 0.899E-06	573	2.09	96.35
0.700E-06 - 0.799E-06	388	1.41	97.76
0.600E-06 - 0.699E-06	286	1.04	98.80
0.500E-06 - 0.599E-06	161	0.59	99.39
0.400E-06 - 0.499E-06	99	0.36	99.75
0.300E-06 - 0.399E-06	61	0.22	99.97
0.200E-06 - 0.299E-06	8	0.03	100.00
<= 0.999E-07	0	0.0	100.00
TOTALS	27450	100.00	

PERCENT OF THE POSSIBLE 35049 16-HOUR OBSERVATIONS WHICH WERE VALID = 78.32
5TH PERCENTILE= 0.717E-05 SEC/M3, 50TH PERCENTILE= 0.236E-05 SEC/M3, AVERAGE= 0.299E-05 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND

TABLE 2.3.4-11

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION
CALCULATED 3-DAY-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT OUTER BOUNDARY OF LOW POPULATION ZONE DUE TO GROUND-LEVEL RELEASES FROM A LOCATION REPRESENTATIVE OF RELEASE ZONE 1, RELEASE ZONE 2, AND RELEASE ZONE 3

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.100E-04 - 0.199E-04	33	0.13	0.13
0.900E-05 - 0.999E-05	2	0.01	0.14
0.800E-05 - 0.899E-05	65	0.26	0.40
0.700E-05 - 0.799E-05	104	0.42	0.82
0.600E-05 - 0.699E-05	112	0.45	1.27
0.500E-05 - 0.599E-05	366	1.47	2.75
0.400E-05 - 0.499E-05	850	3.42	6.17
0.300E-05 - 0.399E-05	1883	7.59	13.76
0.200E-05 - 0.299E-05	6107	24.61	38.37
0.100E-05 - 0.199E-05	12251	49.36	87.73
0.900E-06 - 0.999E-06	1157	4.66	92.39
0.800E-06 - 0.899E-06	836	3.37	95.76
0.700E-06 - 0.799E-06	512	2.06	97.82
0.600E-06 - 0.699E-06	229	0.92	98.75
0.500E-06 - 0.599E-06	168	0.68	99.42
0.400E-06 - 0.499E-06	124	0.50	99.92
0.300E-06 - 0.399E-06	19	0.08	100.00
<= 0.999E-07	0	0.0	100.00
TOTALS	24818	100.00	

PERCENT OF THE POSSIBLE 34993 3-DAY OBSERVATIONS WHICH WERE VALID = 70.92
5TH PERCENTILE= 0.434E-05 SEC/M3, 50TH PERCENTILE= 0.176E-05 SEC/M3, AVERAGE= 0.201E-05 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND

TABLE 2.3.4-12

ATMOSPHERIC DISPERSION FACTORS FREQUENCY DISTRIBUTION
CALCULATED 26-DAY-AVERAGE ATMOSPHERIC DISPERSION FACTORS
AT OUTER BOUNDARY OF LOW POPULATION ZONE DUE TO GROUND-LEVEL RELEASES FROM A LOCATION REPRESENTATIVE OF
RELEASE ZONE 1, RELEASE ZONE 2, AND RELEASE ZONE 3

SEQUOYAH NUCLEAR PLANT

(BASED ON DATA COLLECTED AT THE METEOROLOGICAL STATION FROM JAN 1, 1972 THROUGH DEC 31, 1975)

ATMOSPHERIC DISPERSION FACTORS (SEC/M3)	FREQUENCY (NO. OF OBSERVATIONS)	PERCENT	CUMULATIVE PERCENT
0.300E-05 - 0.399E-05	354	1.61	1.61
0.200E-05 - 0.299E-05	2554	11.60	13.20
0.100E-05 - 0.199E-05	17288	78.50	91.71
0.900E-06 - 0.999E-06	1390	6.31	98.02
0.800E-06 - 0.899E-06	363	1.65	99.67
0.700E-06 - 0.799E-06	73	0.33	100.00
<= 0.999E-07	0	0.0	100.00
TOTALS	22022	100.00	

PERCENT OF THE POSSIBLE 34441 26-DAY OBERSERVATIONS WHICH WERE VALID = 63.94
5TH PERCENTILE = 0.271E-05 SEC/M3, 50TH PERCENTILE= 0.153E-05 SEC/M3, AVERAGE= 0.148E-05 SEC/M3
TEMPERATURE INSTRUMENTS LOCATED 46 AND 9 METERS ABOVE GROUND
WIND INSTRUMENTS LOCATED 10 METERS ABOVE GROUND

Table 2.3.4-13

Sequoyah Nuclear Plant -

Fifth Percentile Atmospheric Dispersion Factors (χ/Q's) for Comparative Data -

Hourly-Average and End-of-Hour Temperature Differences (ΔT)

(May 1975-April 1976)*

Minimum Exclusion Boundary Distance (556 meters)

Period	Hour-Average ΔT	End-of-Hour ΔT
1-hour	0.978×10^{-3}	0.985×10^{-3}
8-hour	0.392×10^{-3}	0.389×10^{-3}

Low Population Zone (LPZ) Distance (4828 meters)

Period	Hour-Average ΔT	End-of-Hour ΔT
8-hour	0.494×10^{-4}	0.484×10^{-4}
16-hour	0.613×10^{-5}	0.612×10^{-5}
3-day	0.360×10^{-5}	0.351×10^{-5}
26-day	0.267×10^{-5}	0.254×10^{-5}

*Wind direction and wind speed measured at 33 feet above ground. Temperature measured at 33 and 150 feet above ground.

TABLE 2.3.4-14

SEQUOYAH NUCLEAR PLANT

AVERAGE ANNUAL DISPERSION FACTORS,[1] χ/Q, (s/m^3)

Downwind Distances (miles)

Sector	1	2	3	4	5	10	15	20	30	40	50
N	0.2386E-05	0.8903E-06	0.4990E-06	0.3318E-06	0.2423E-06	0.9330E-07	0.5432E-07	0.3733E-07	0.2231E-07	0.1563E-07	0.1193E-07
NNE	0.3358E-05	0.1246E-05	0.6963E-06	0.4621E-06	0.3370E-06	0.1292E-06	0.7507E-07	0.5151E-07	0.3071E-07	0.2149E-07	0.1638E-07
NE	0.3160E-05	0.1169E-05	0.6523E-06	0.4325E-06	0.3152E-06	0.1207E-06	0.7003E-07	0.4803E-07	0.2861E-07	0.2001E-07	0.1625E-07
ENE	0.1324E-05	0.4874E-06	0.2713E-06	0.1796E-06	0.1309E-06	0.4998E-07	0.2899E-07	0.1988E-07	0.1184E-07	0.8283E-08	0.6314E-08
E	0.6960E-06	0.2585E-06	0.1446E-06	0.9600E-07	0.7007E-07	0.2691E-07	0.1565E-07	0.1075E-07	0.6423E-08	0.4499E-08	0.3434E-08
ESE	0.7180E-06	0.2661E-06	0.1486E-06	0.9861E-07	0.7194E-07	0.2760E-07	0.1605E-07	0.1103E-07	0.6585E-08	0.4613E-08	0.3521E-08
SE	0.8539E-06	0.3141E-06	0.1748E-06	0.1158E-06	0.8432E-07	0.3221E-07	0.1869E-07	0.1282E-07	0.7638E-08	0.5343E-08	0.4073E-08
SSE	0.1301E-05	0.4778E-06	0.2656E-06	0.1757E-06	0.1279E-06	0.4883E-07	0.2832E-07	0.1942E-07	0.1157E-07	0.8098E-08	0.6175E-08
S	0.2338E-05	0.8796E-06	0.4945E-06	0.3294E-06	0.2410E-06	0.9313E-07	0.5434E-07	0.3741E-07	0.2241E-07	0.1573E-07	0.1202E-07
SSW	0.5847E-05	0.2192E-05	0.1231E-05	0.8188E-06	0.5983E-06	0.2304E-06	0.1343E-06	0.9237E-07	0.5521E-07	0.3870E-07	0.2955E-07
SW	0.2629E-05	0.9936E-06	0.5602E-06	0.3736E-06	0.2735E-06	0.1057E-06	0.6163E-07	0.4238E-07	0.2534E-07	0.1776E-07	0.1356E-07
WSW	0.1264E-05	0.4918E-06	0.2811E-06	0.1891E-06	0.1393E-06	0.5467E-07	0.3212E-07	0.2220E-07	0.1336E-07	0.9408E-08	0.7207E-08
W	0.1031E-05	0.4016E-06	0.2296E-06	0.1544E-06	0.1137E-06	0.4464E-07	0.2623E-07	0.1814E-07	0.1092E-07	0.7692E-08	0.5894E-08
WNW	0.6277E-06	0.2446E-06	0.1398E-06	0.9406E-07	0.6927E-07	0.2720E-07	0.1599E-07	0.1105E-07	0.6658E-08	0.4690E-08	0.3594E-08
NW	0.7777E-06	0.2973E-06	0.1684E-06	0.1127E-06	0.8273E-07	0.3221E-07	0.1886E-07	0.1301E-07	0.7811E-08	0.5492E-08	0.4203E-08
NNW	0.1316E-05	0.5079E-06	0.2893E-06	0.1942E-06	0.1428E-06	0.5588E-07	0.3278E-07	0.2264E-07	0.1361E-07	0.9581E-08	0.7337E-08

1. Based on data collected at the meteorological station from January 1, 1972 through December 31, 1975.

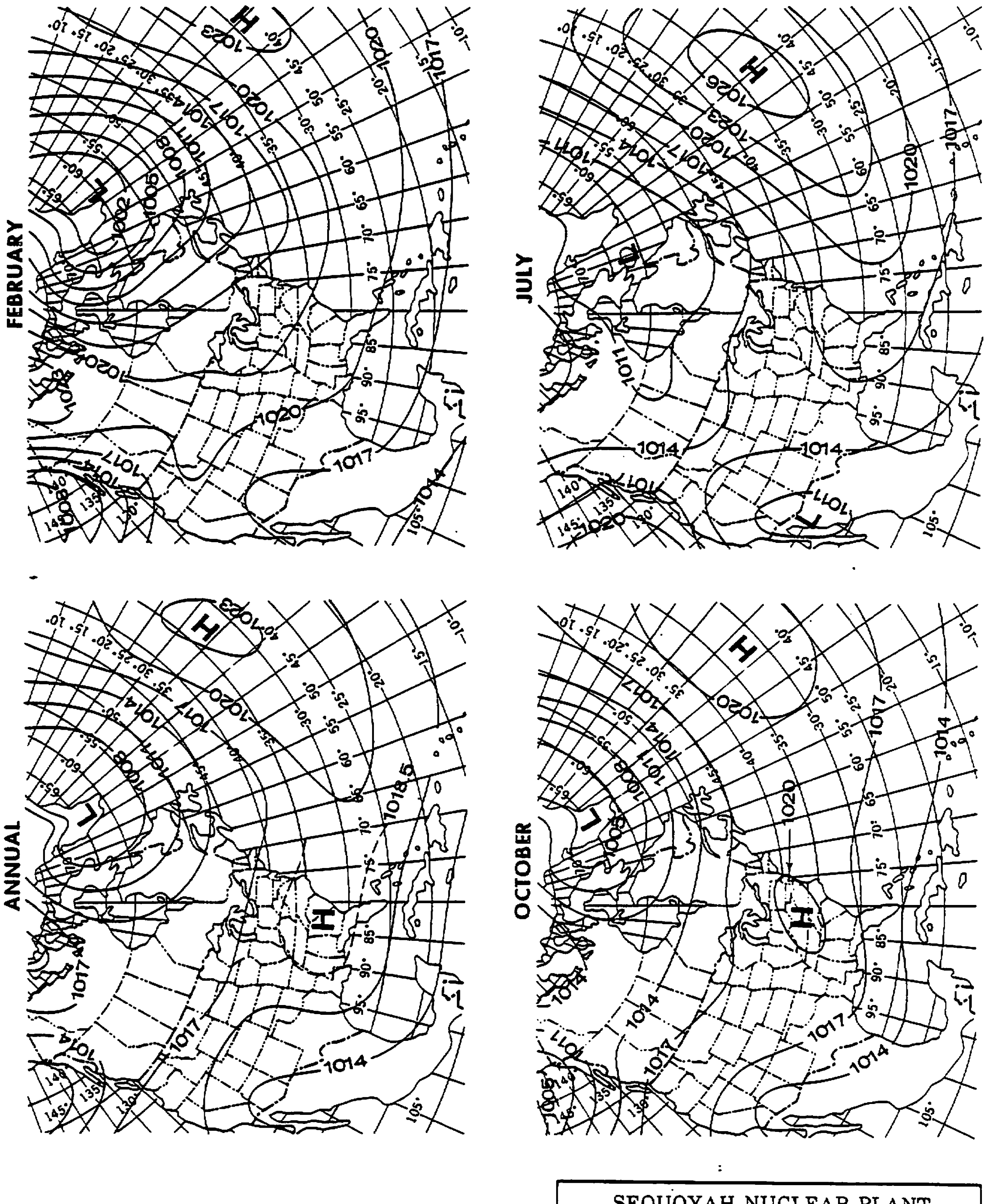

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Figure 2.3.1-1

Normal Sea Level Pressure Distribution Over North America and the North Atlantic Ocean

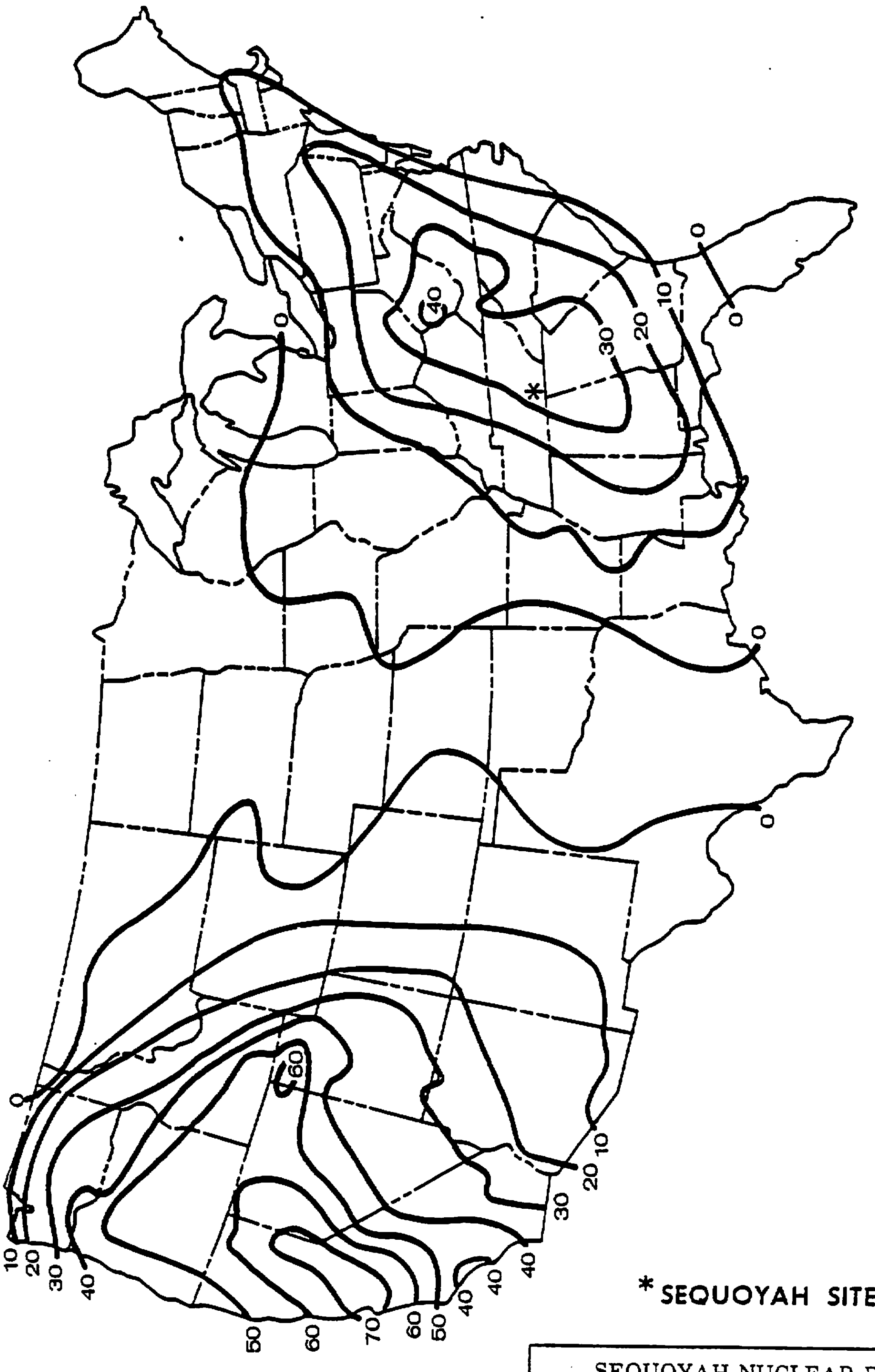

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Figure 2.3.1-2

Total Number of Forecast-Days of High Meteorological Potential for Air Pollution in a 5 Year Period

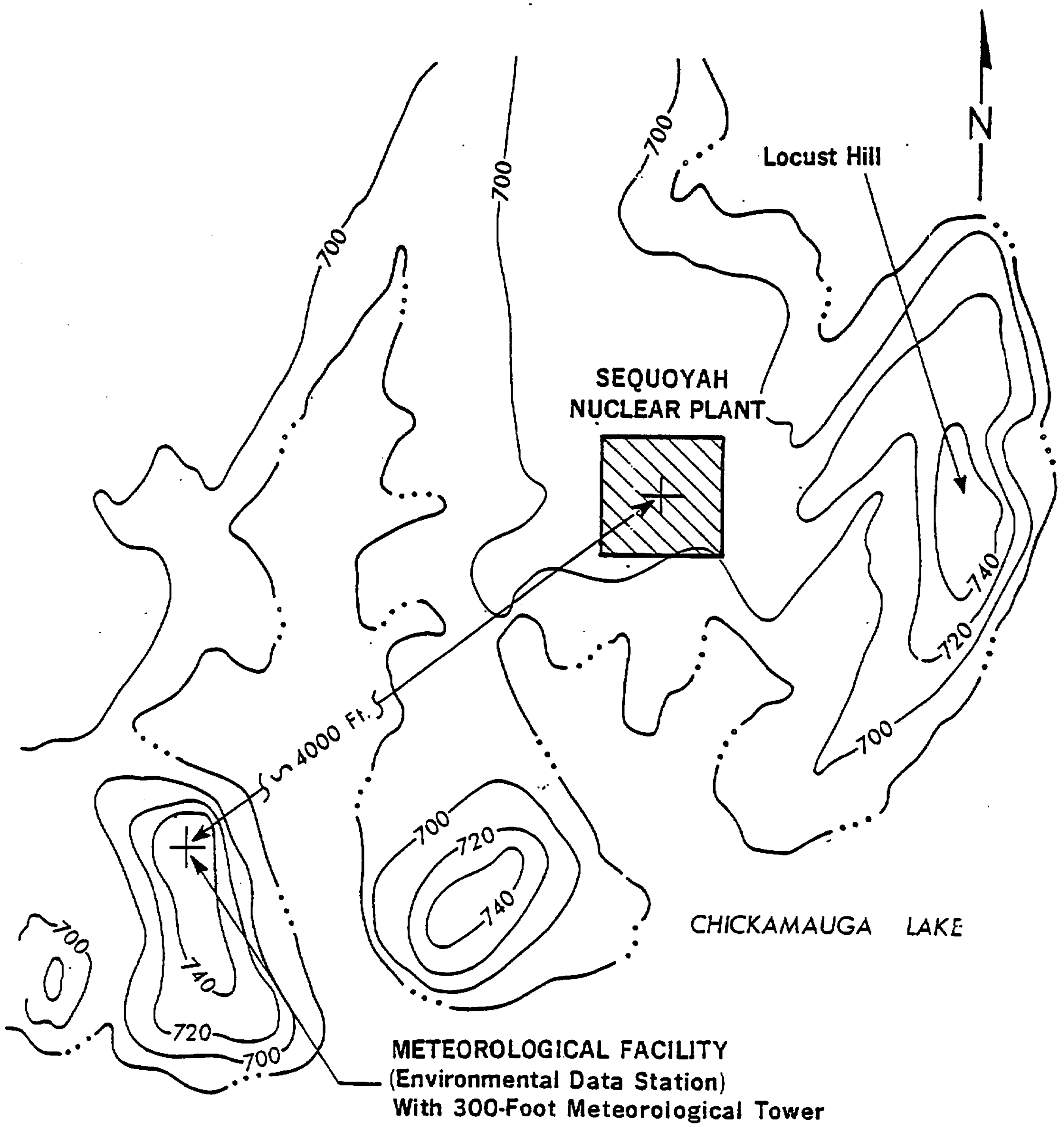

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Figure 2.3.2-1

Environmental Data Station Location

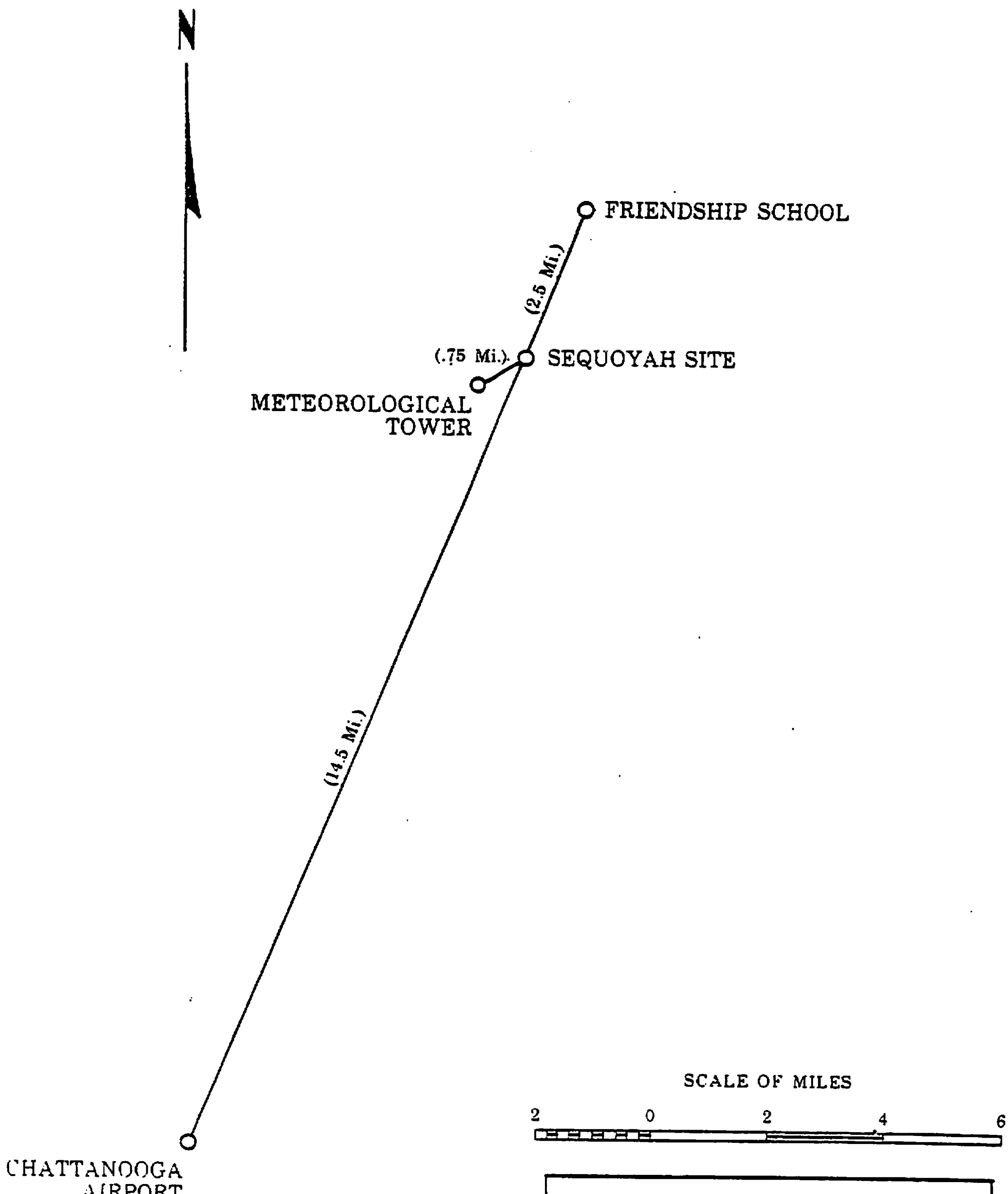

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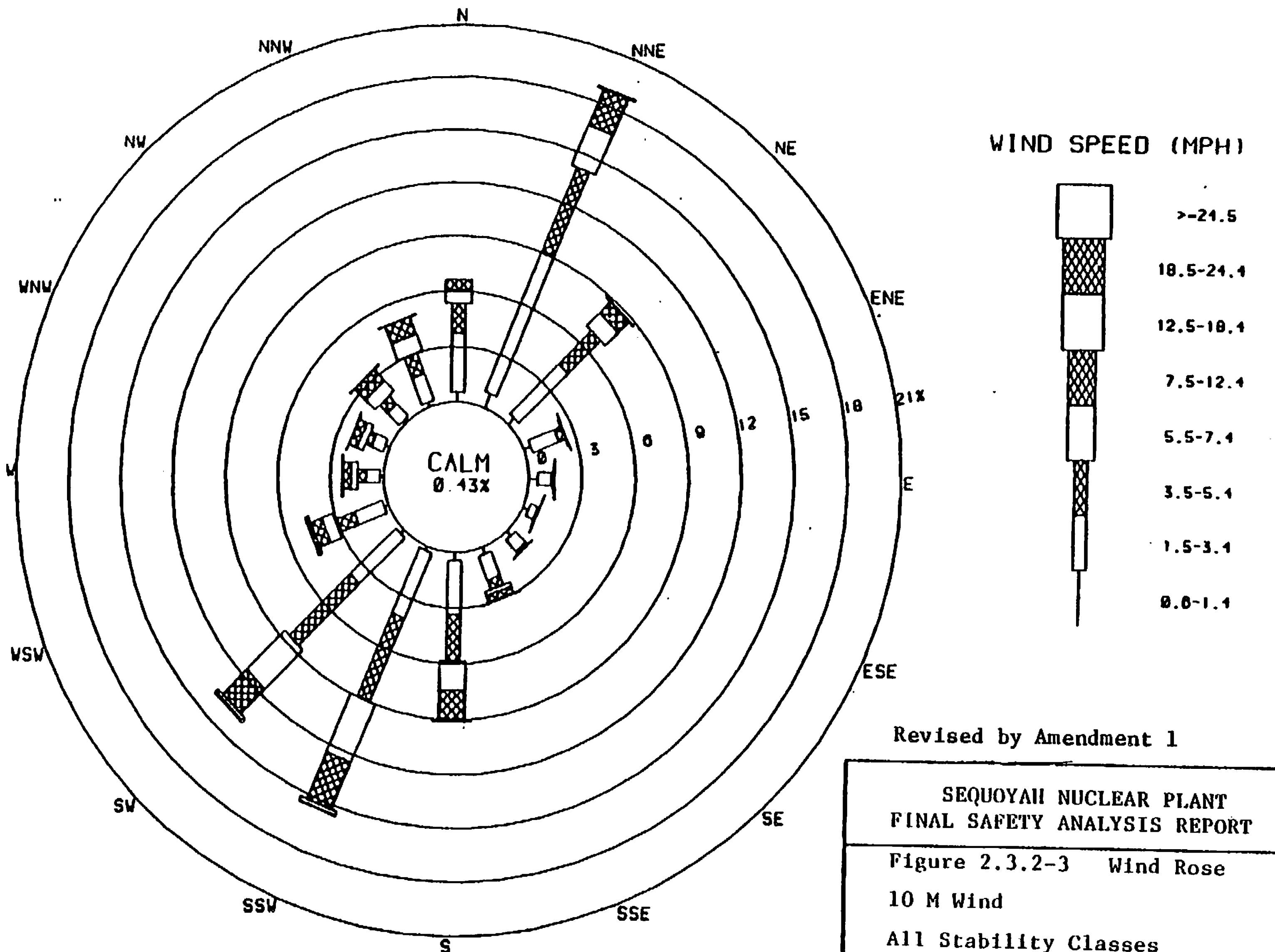
Figure 2.3.2-2

Climatological Data Sources



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SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-3 Wind Rose 10 M Wind All Stability Classes January 1, 72 - Dec 31, 75

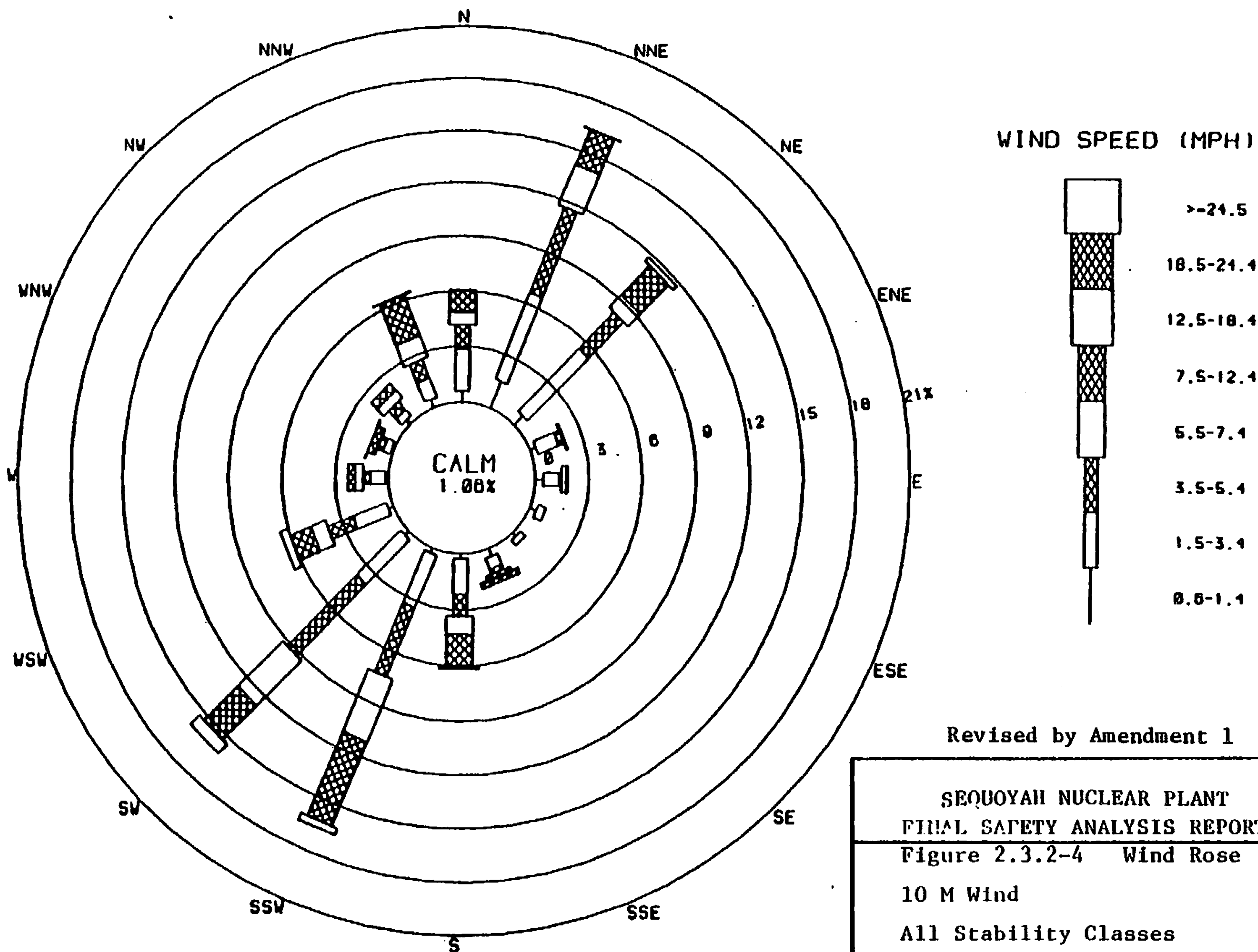

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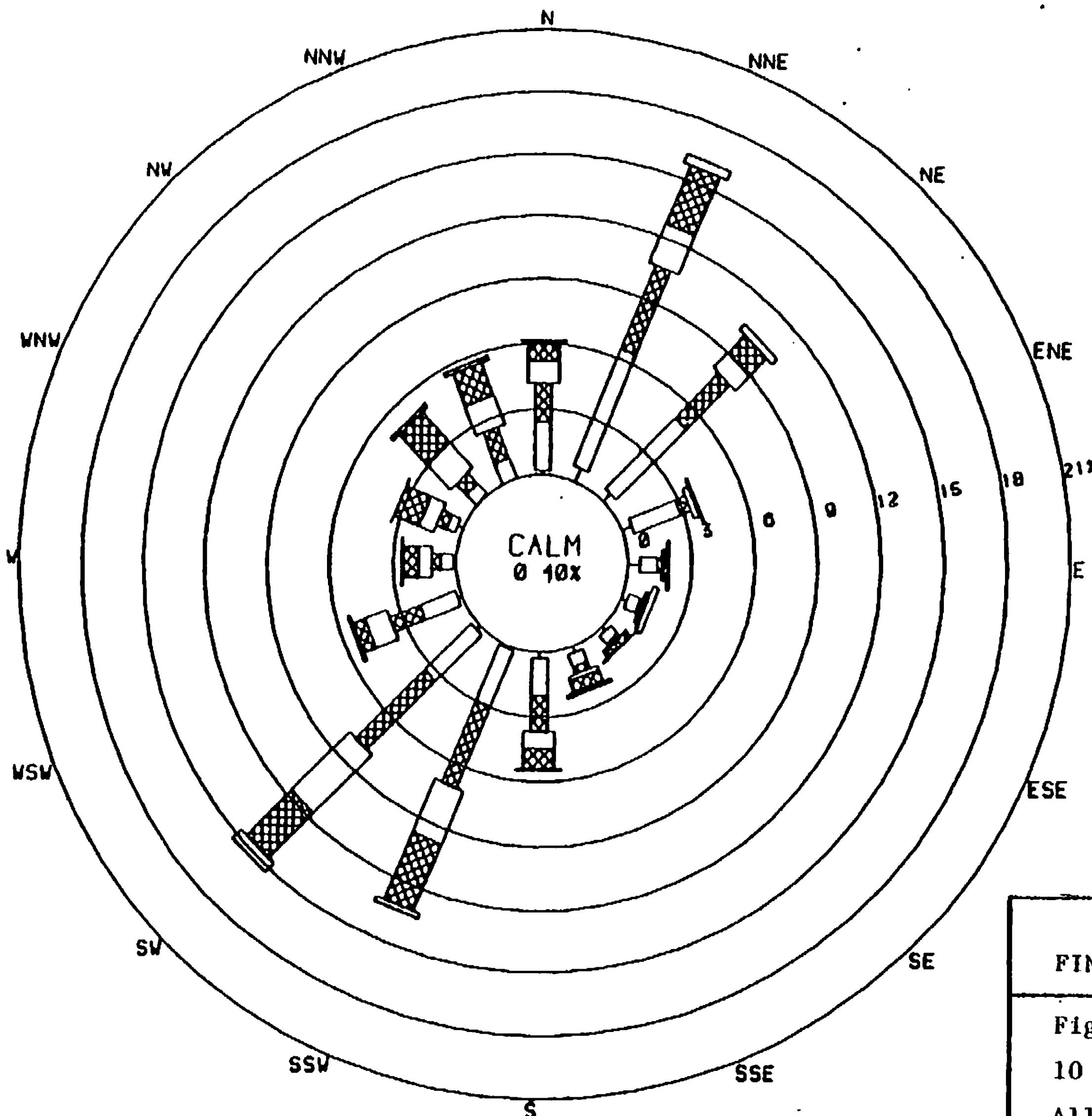
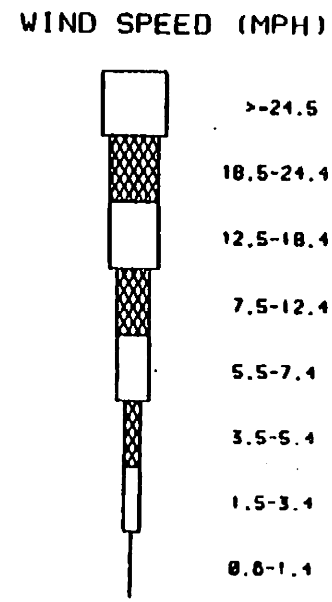
Figure 2.3.2-4 Wind Rose

10 M Wind

All Stability Classes

January (72-75)





Revised by Amendment 1

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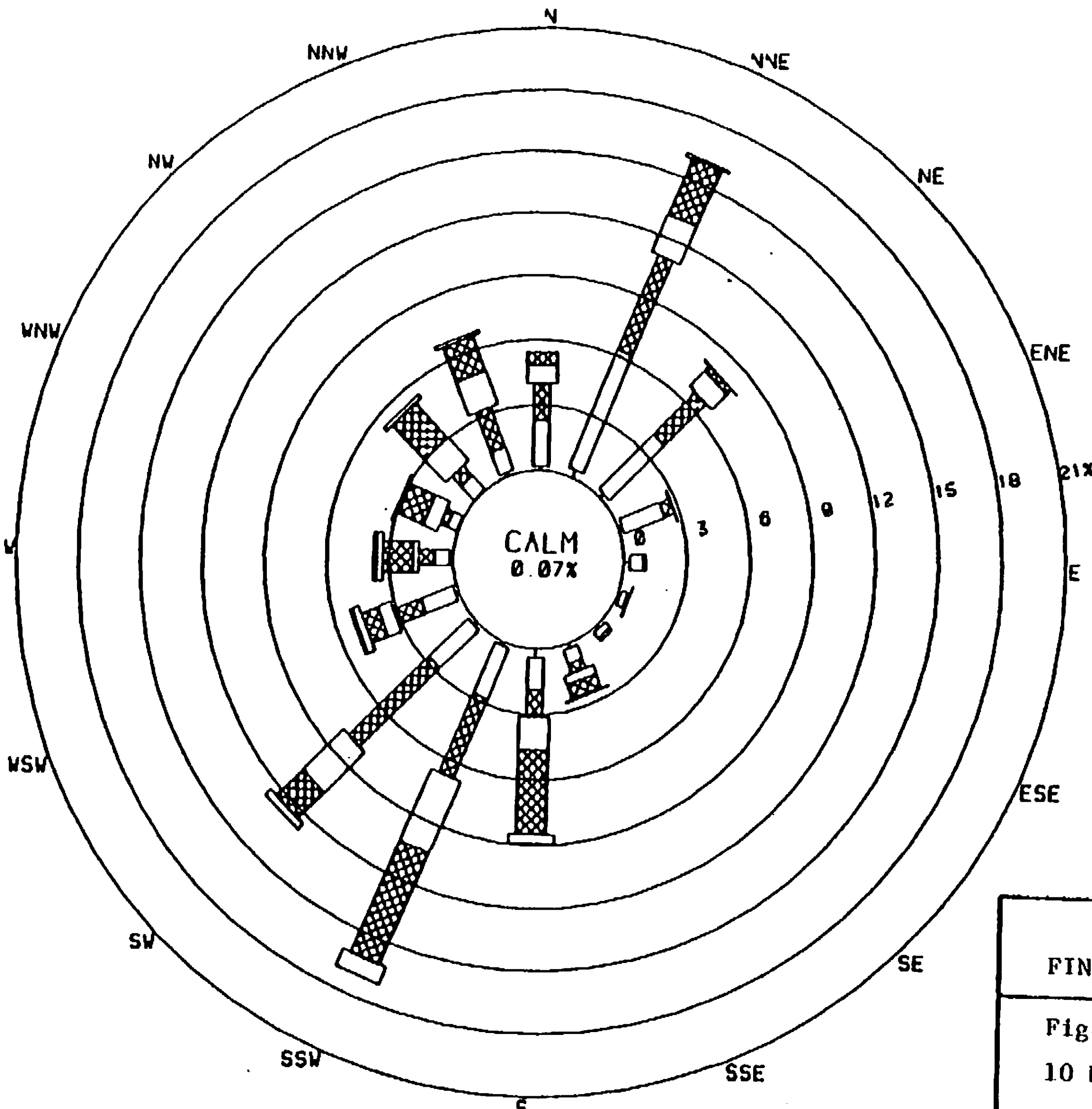
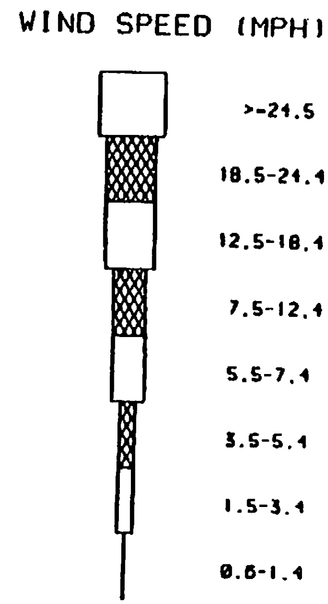
Figure 2.3.2-5 Wind Rose
10 M Wind
All Stability Classes
February (72-75)





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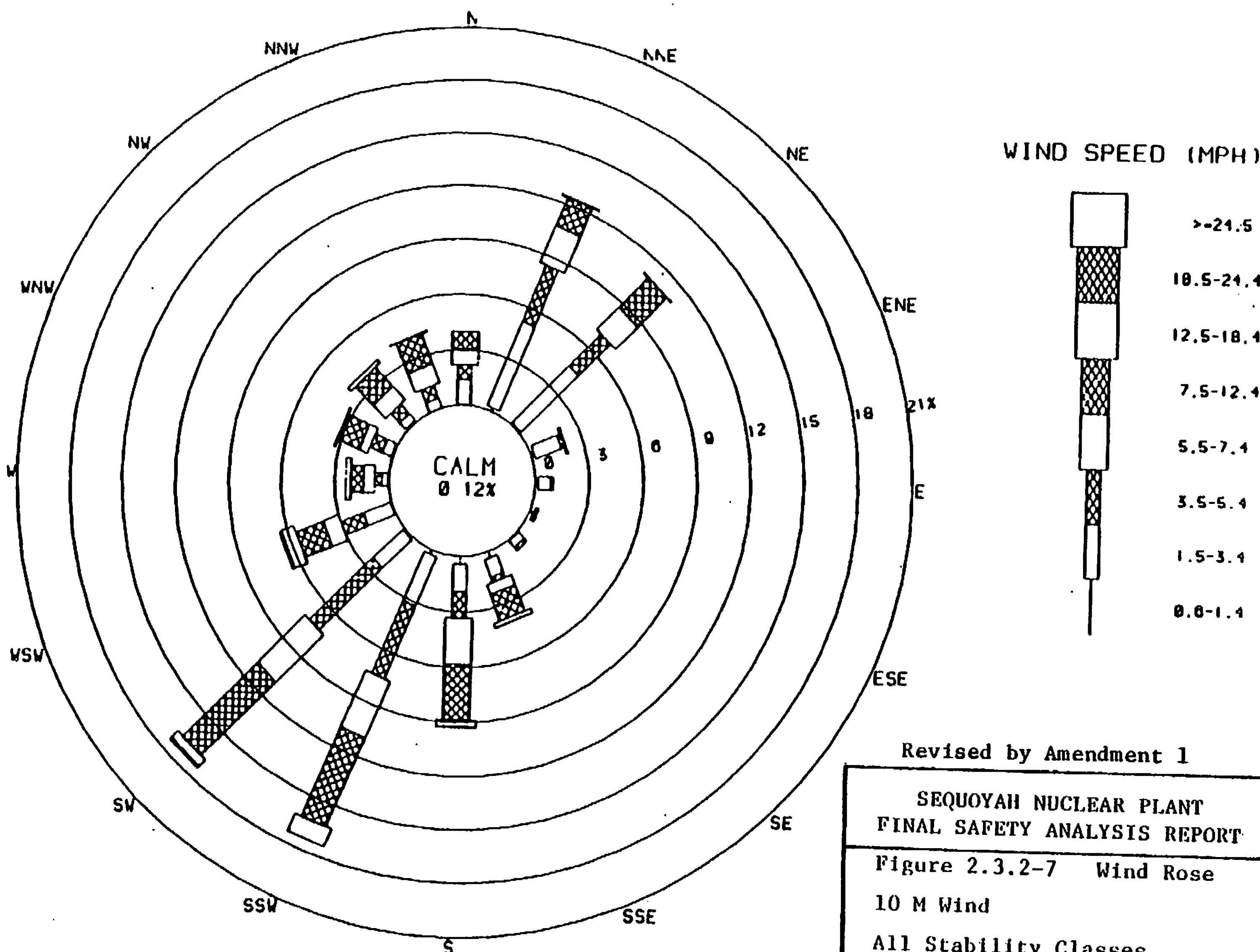
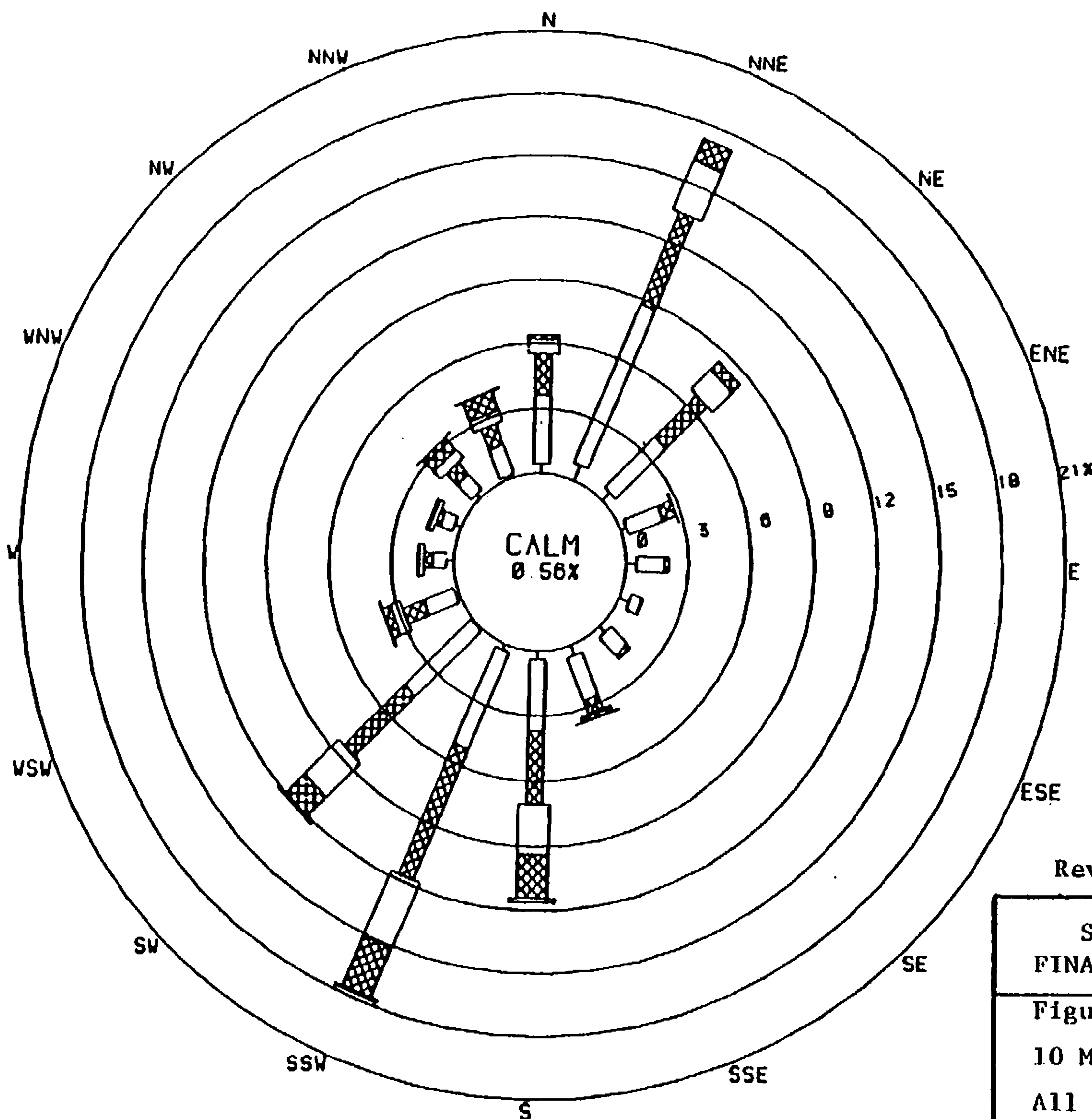
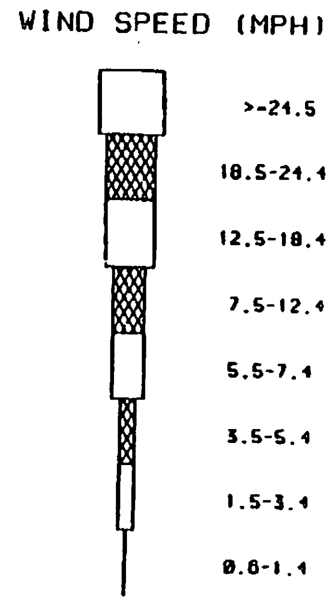
SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-6 Wind Rose 10 M Wind All Stability Classes March (72-75)



Revised by Amendment 1

SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-7 Wind Rose 10 M Wind All Stability Classes April (72-75)





Revised by Amendment 1

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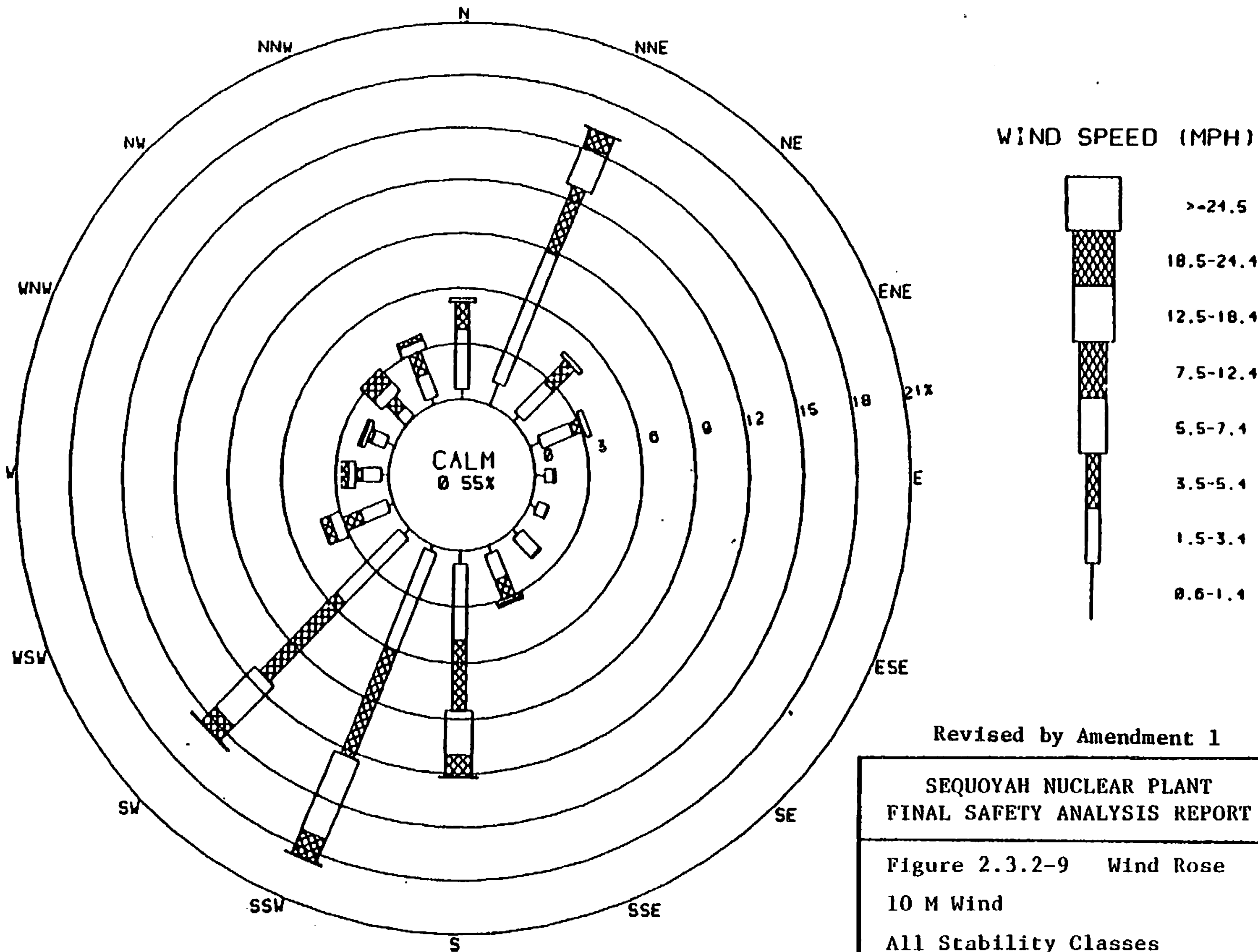
Figure 2.3.2-8 Wind Rose

10 M Wind

All Stability Classes

May (72-75)



Revised by Amendment 1

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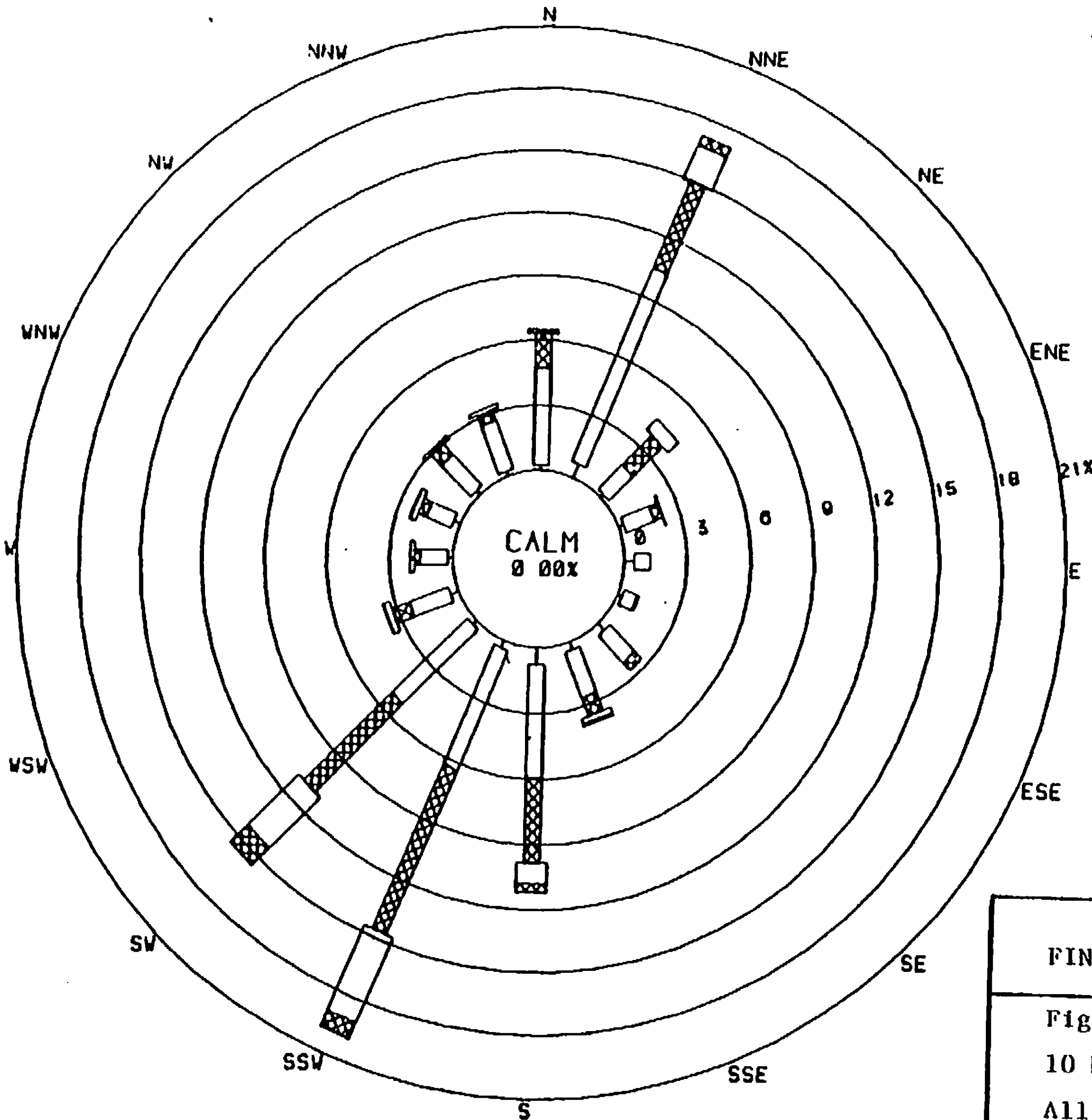
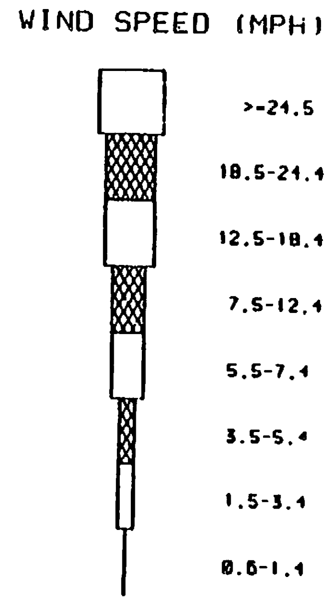
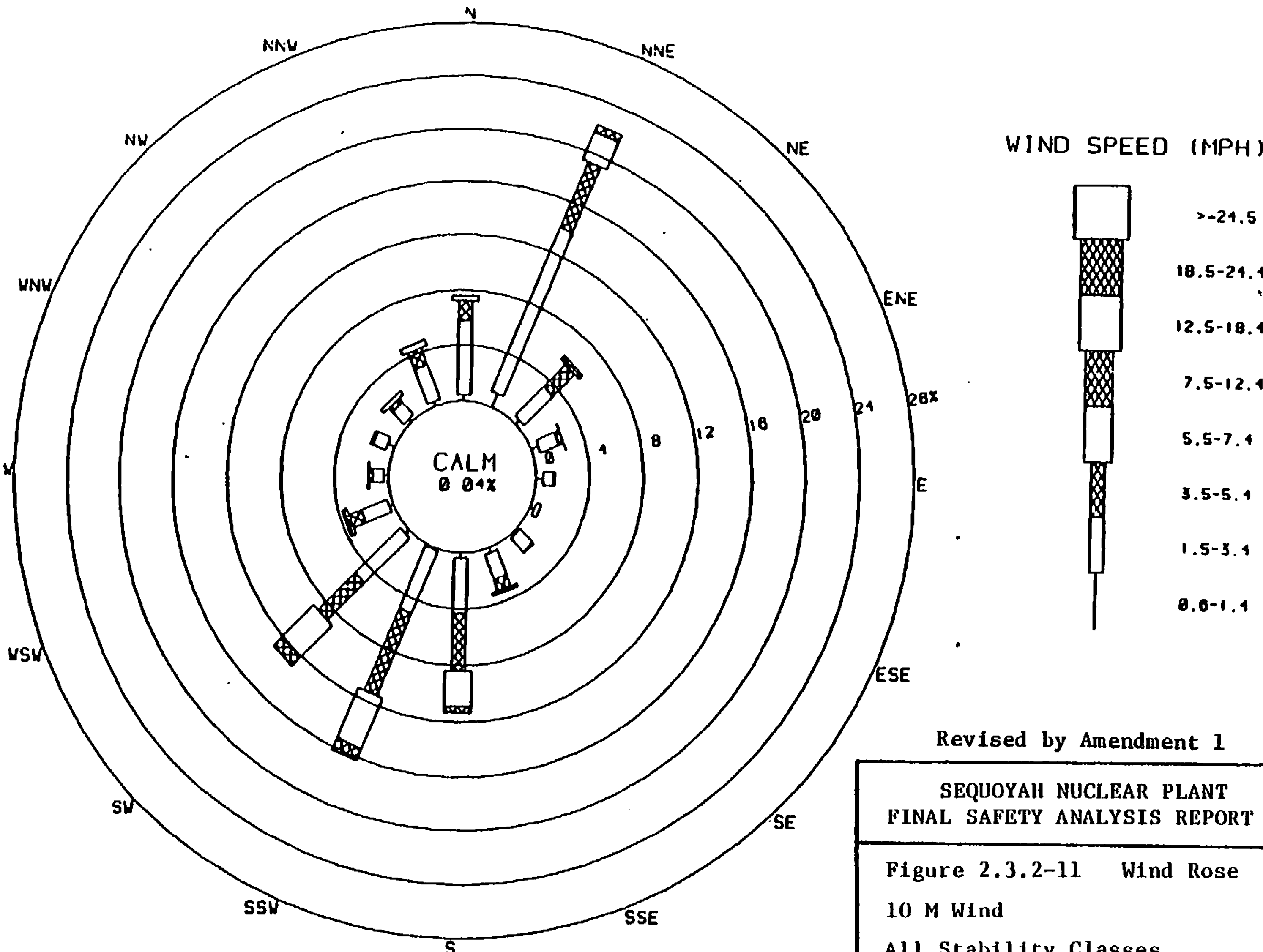
Figure 2.3.2-9 Wind Rose 10 M Wind All Stability Classes June (72-75)





Revised by Amendment 1

SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-10 Wind Rose 10 M Wind All Stability Classes July (72-75)



Revised by Amendment 1

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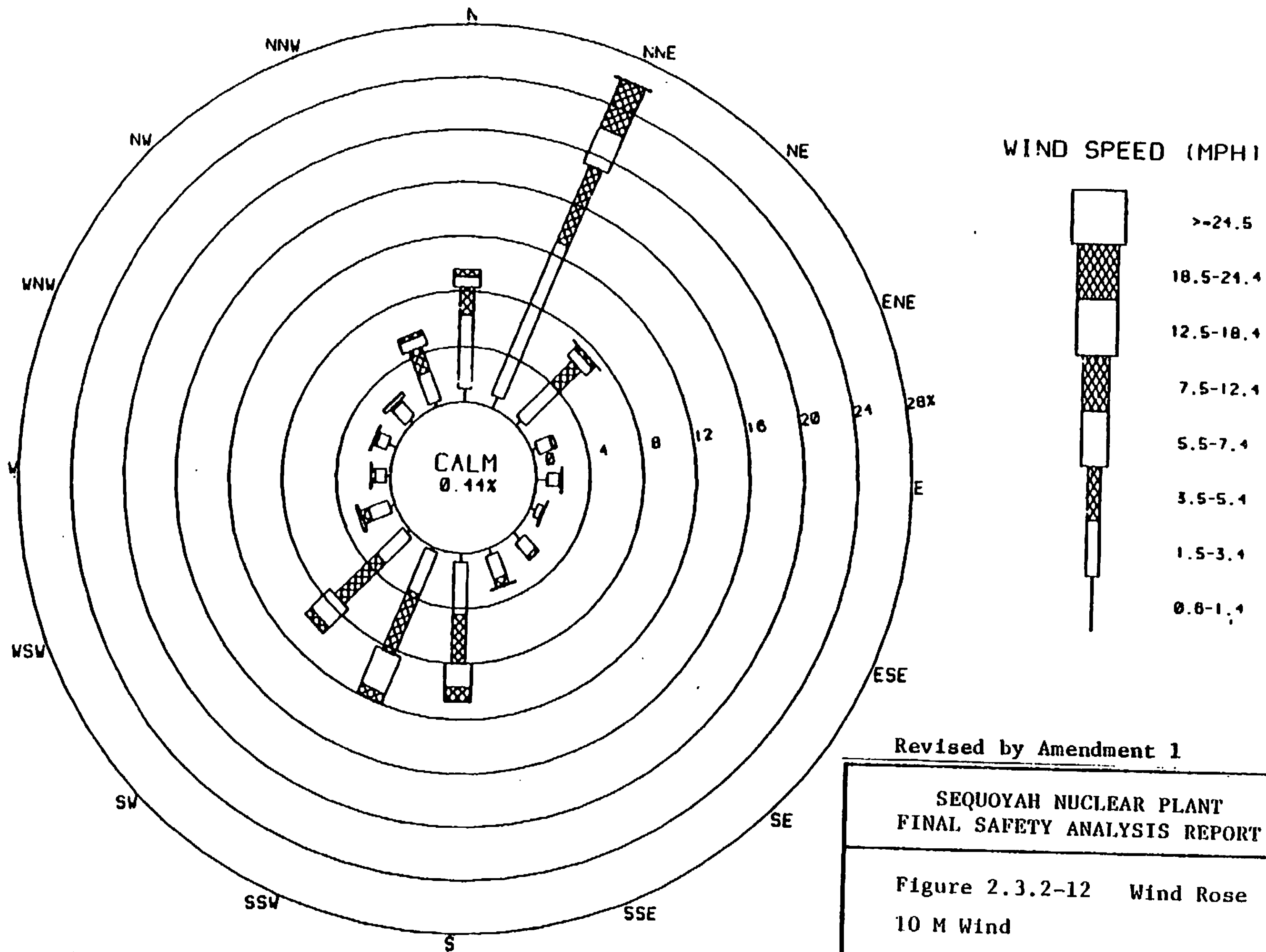
Figure 2.3.2-11 Wind Rose

10 M Wind

All Stability Classes

August (72-75)



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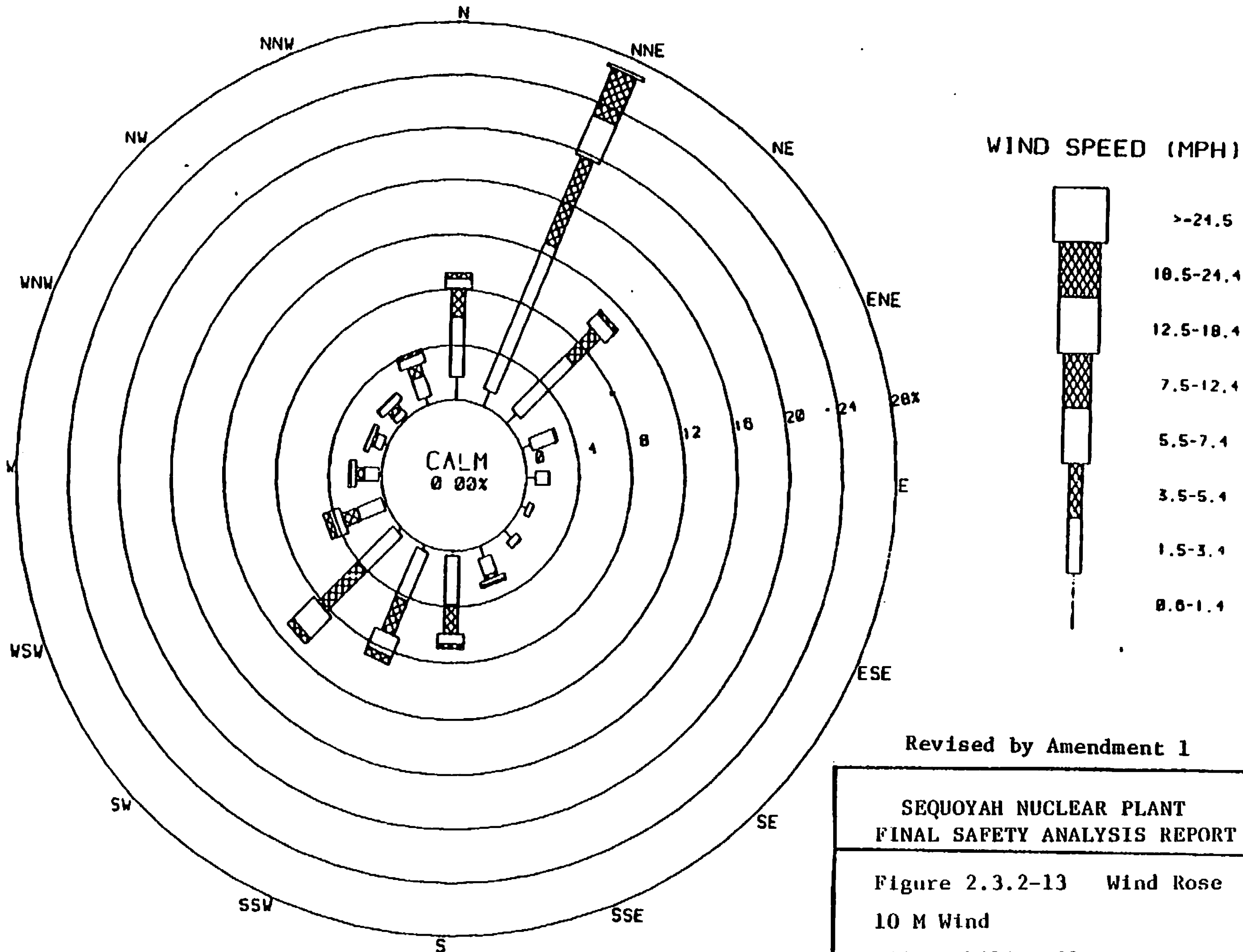
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-12 Wind Rose
10 M Wind
All Stability Classes
Sept. (72-75)



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FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-13 Wind Rose
10 M Wind
All Stability Classes
October (72-75)

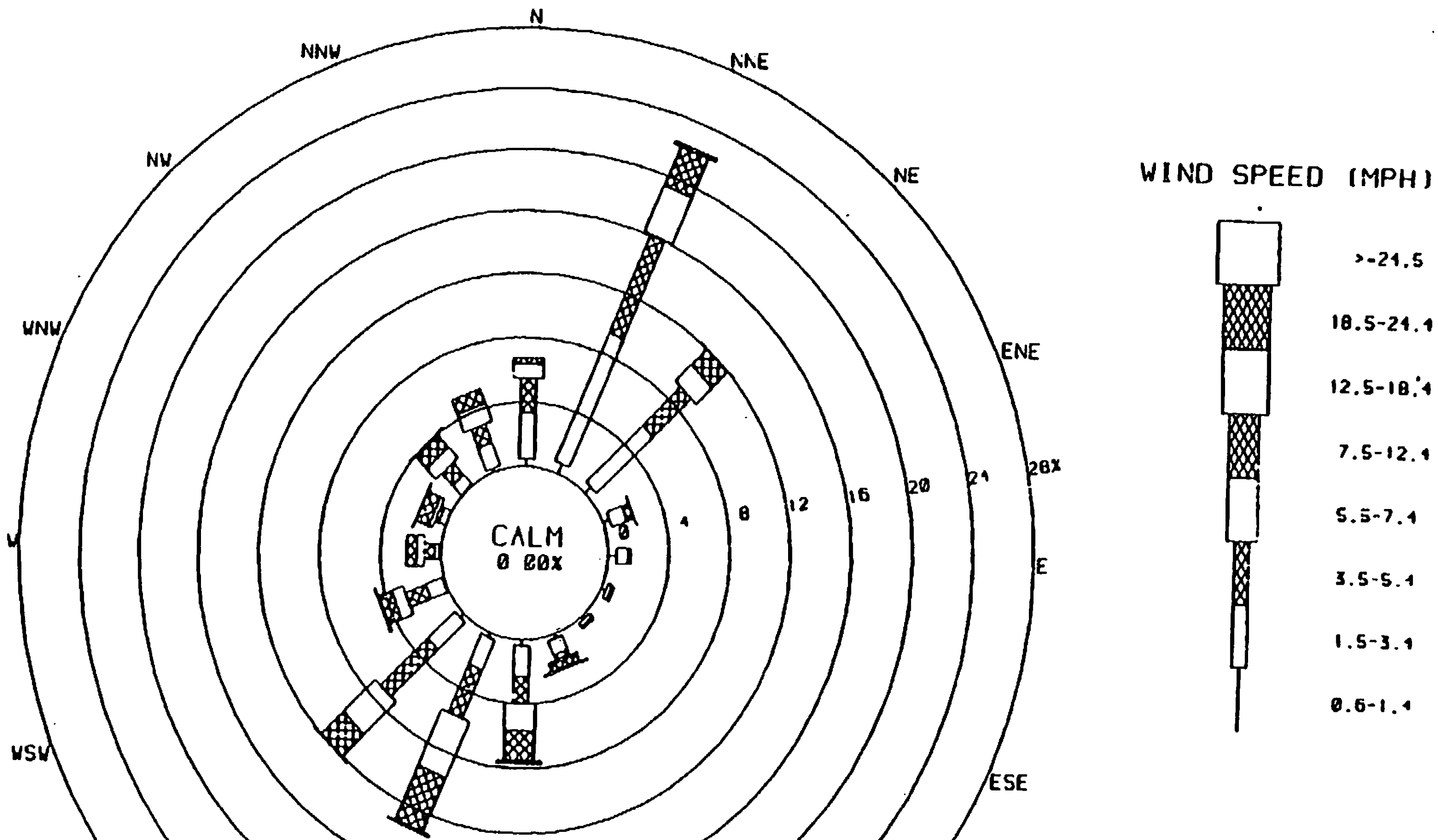

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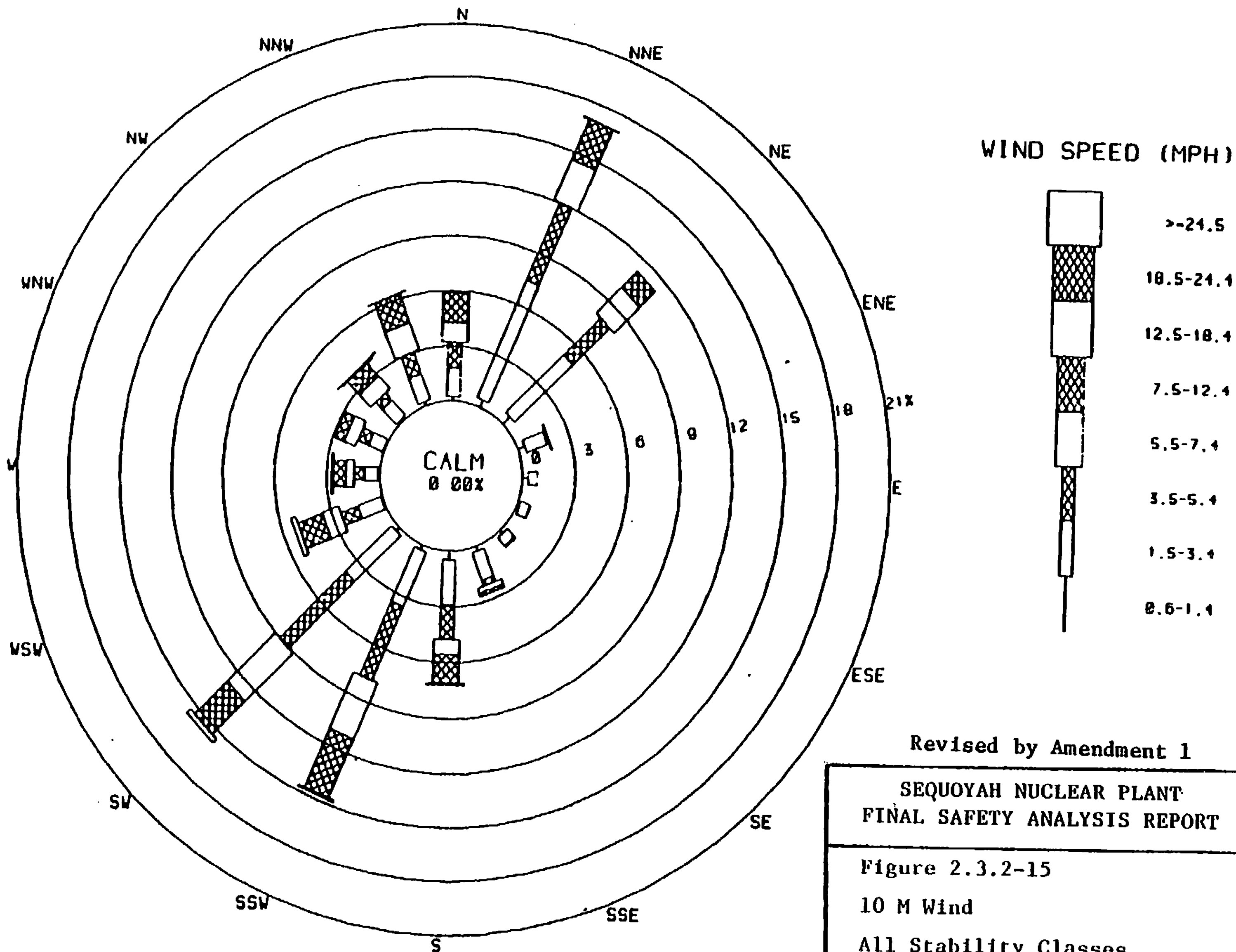
Figure 2.3.2-14

10 M Wind

All Stability Classes

November (72-75)



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SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-15 10 M Wind All Stability Classes December (72-75)

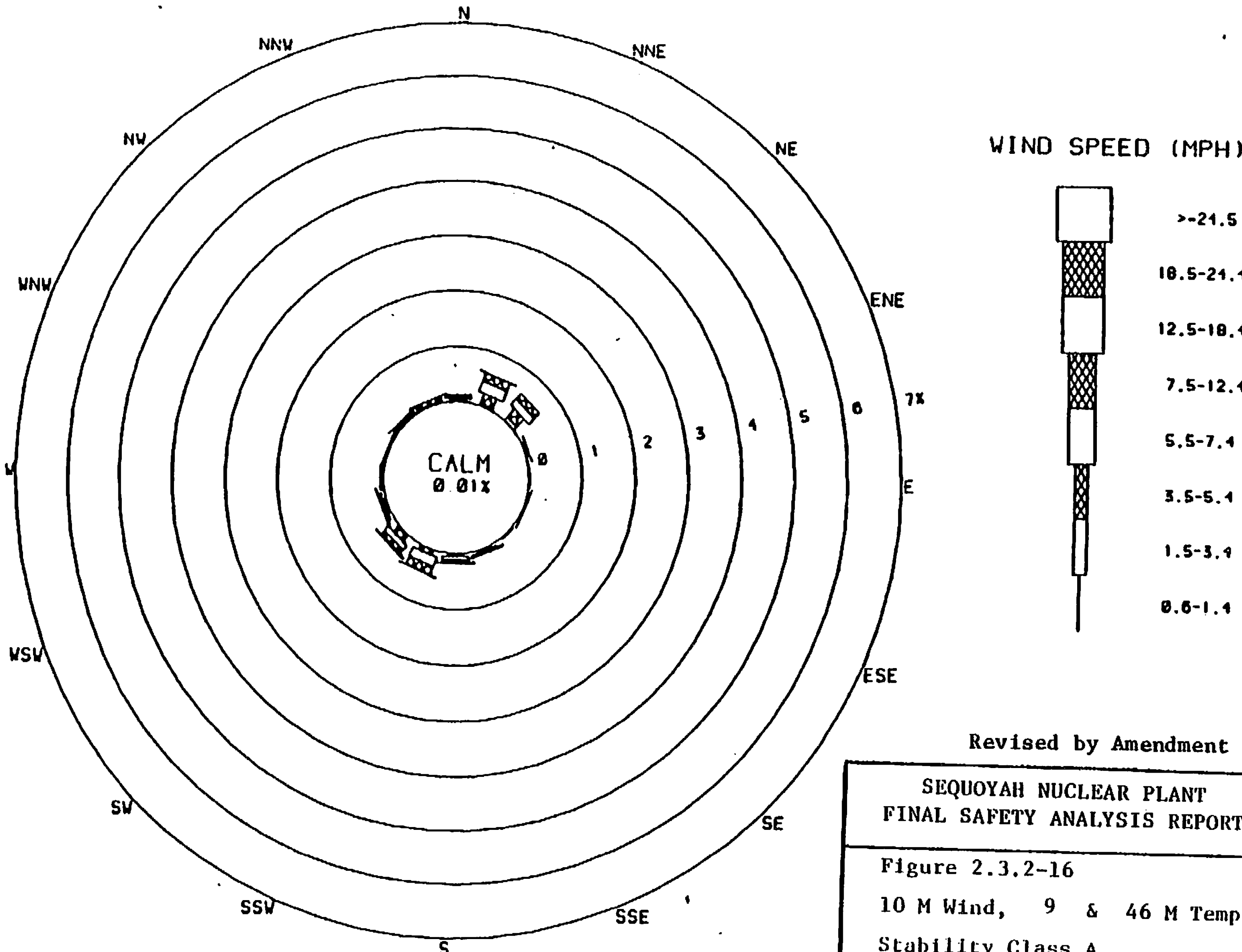

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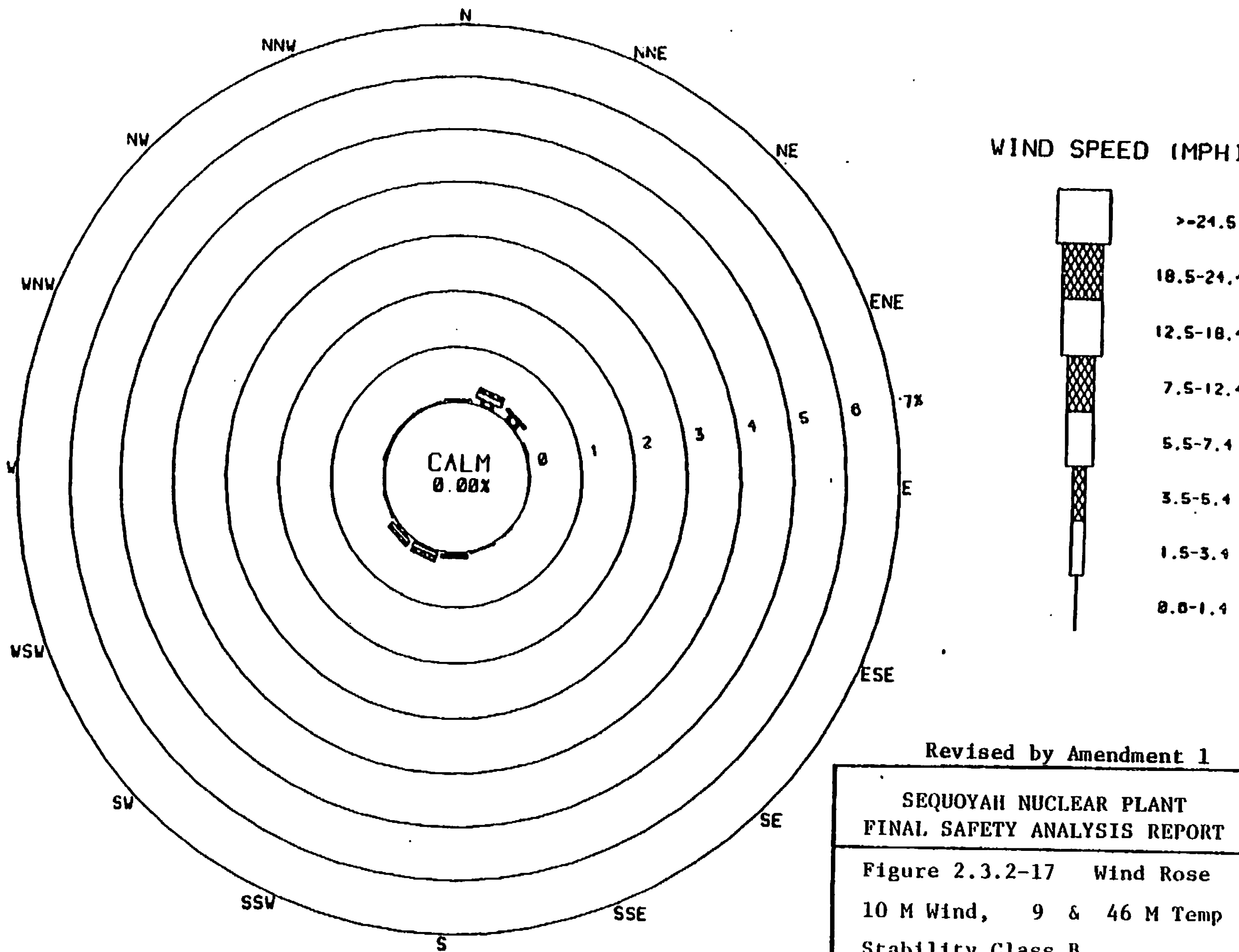
Figure 2.3.2-16

10 M Wind, 9 & 46 M Temp

Stability Class A

Jan 1, 72 - Dec 31, 75



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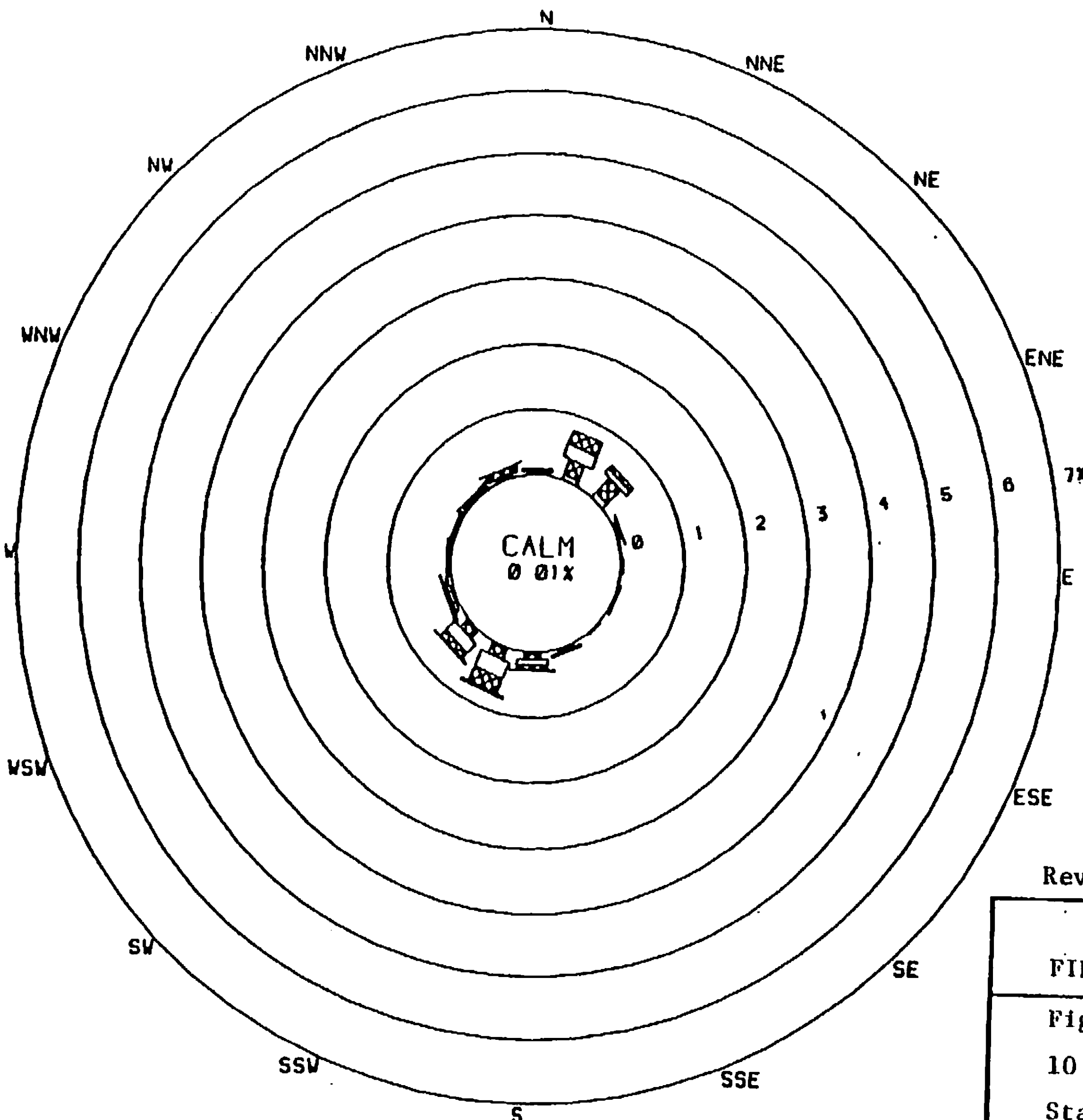
FINAL SAFETY ANALYSIS REPORT

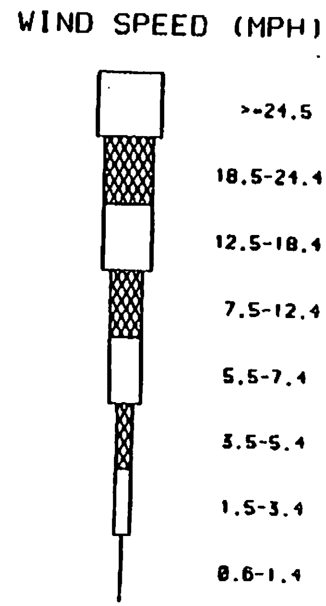
Figure 2.3.2-17 Wind Rose

10 M Wind, 9 & 46 M Temp

Stability Class B

Jan 1, 72 - Dec 31, 75





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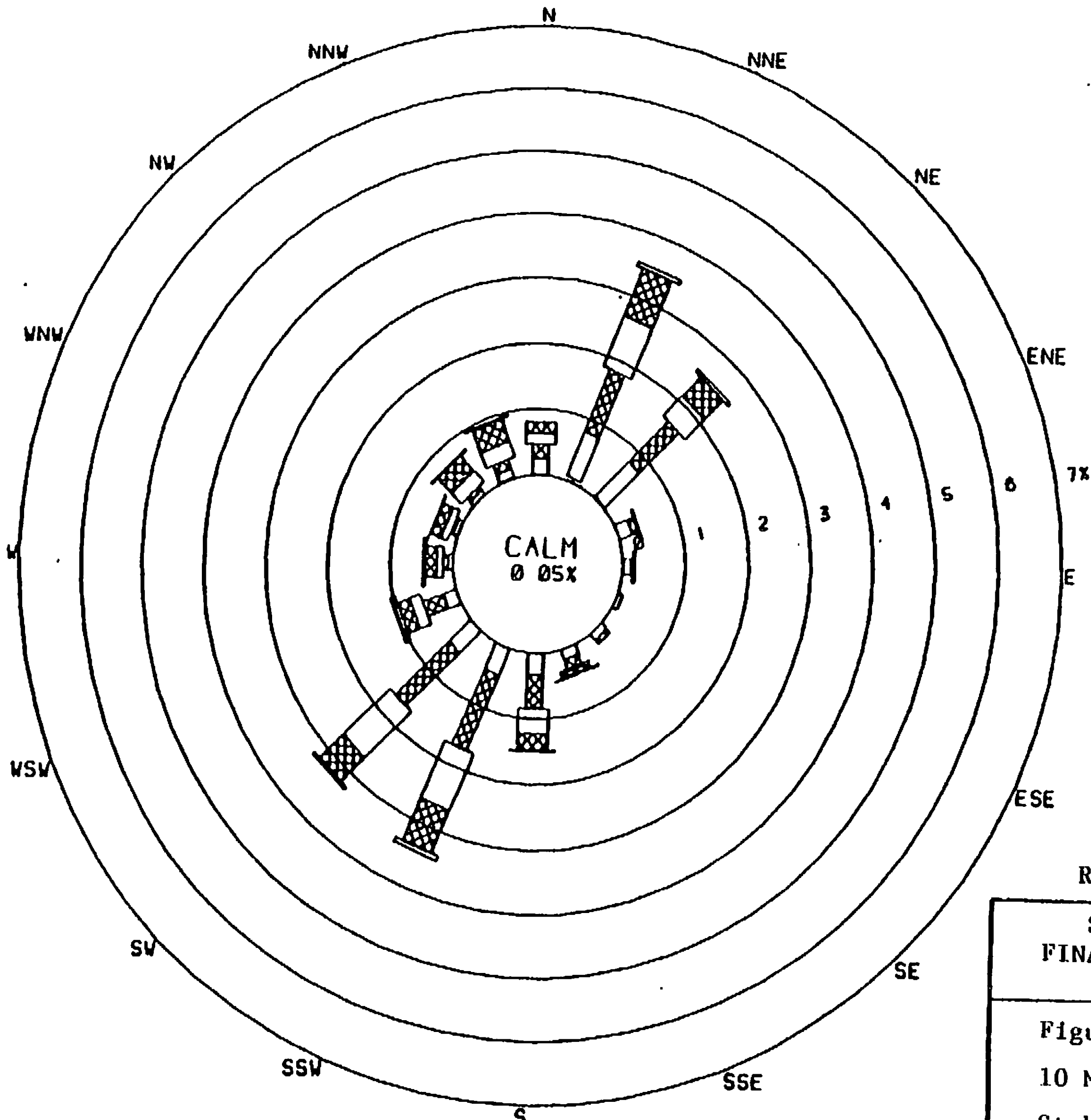
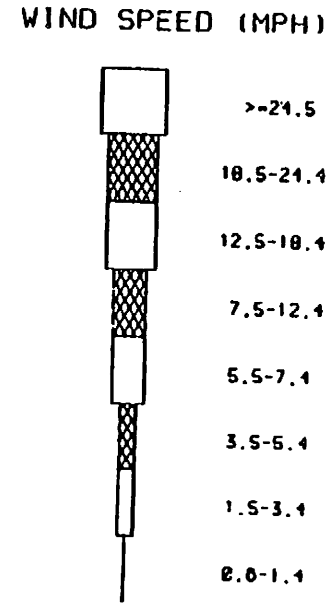
SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-18 Wind Rose 10 M Wind, 9 & 46 M Temp Stability Class C Jan 1, 72 - Dec 31, 75





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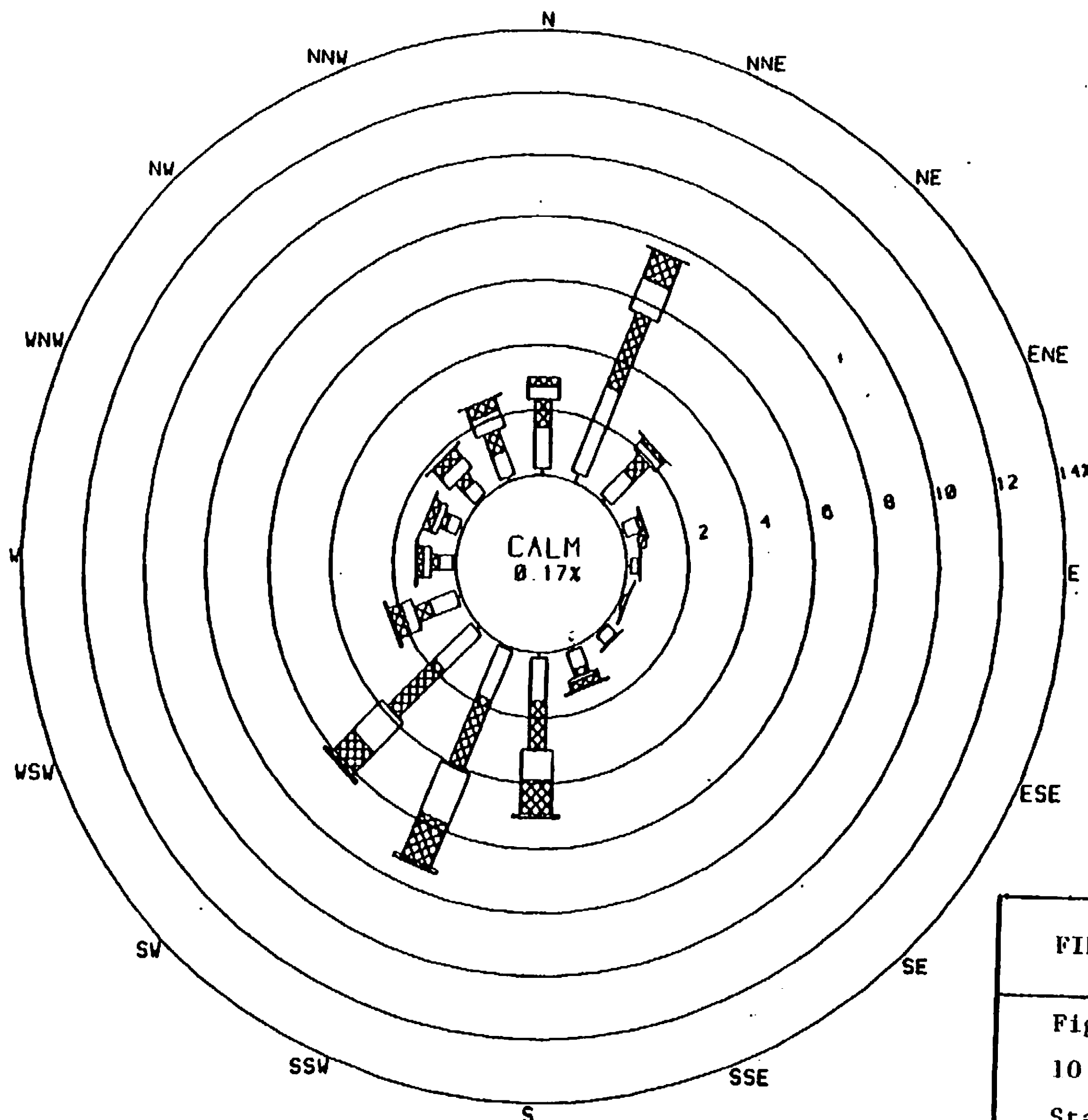
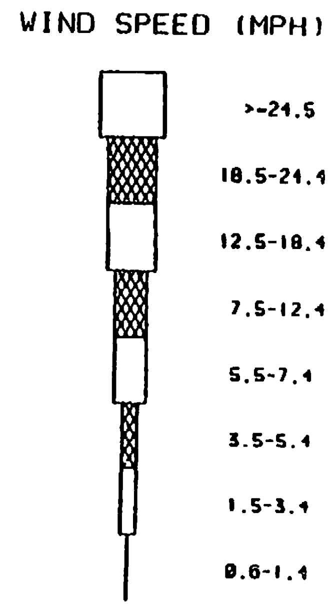
SEQUOYAH NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
Figure 2.3.2-19 Wind Rose 10 M Wind, 9 & 46 M Temp Stability Class D Jan 1, 72 - Dec 31, 75





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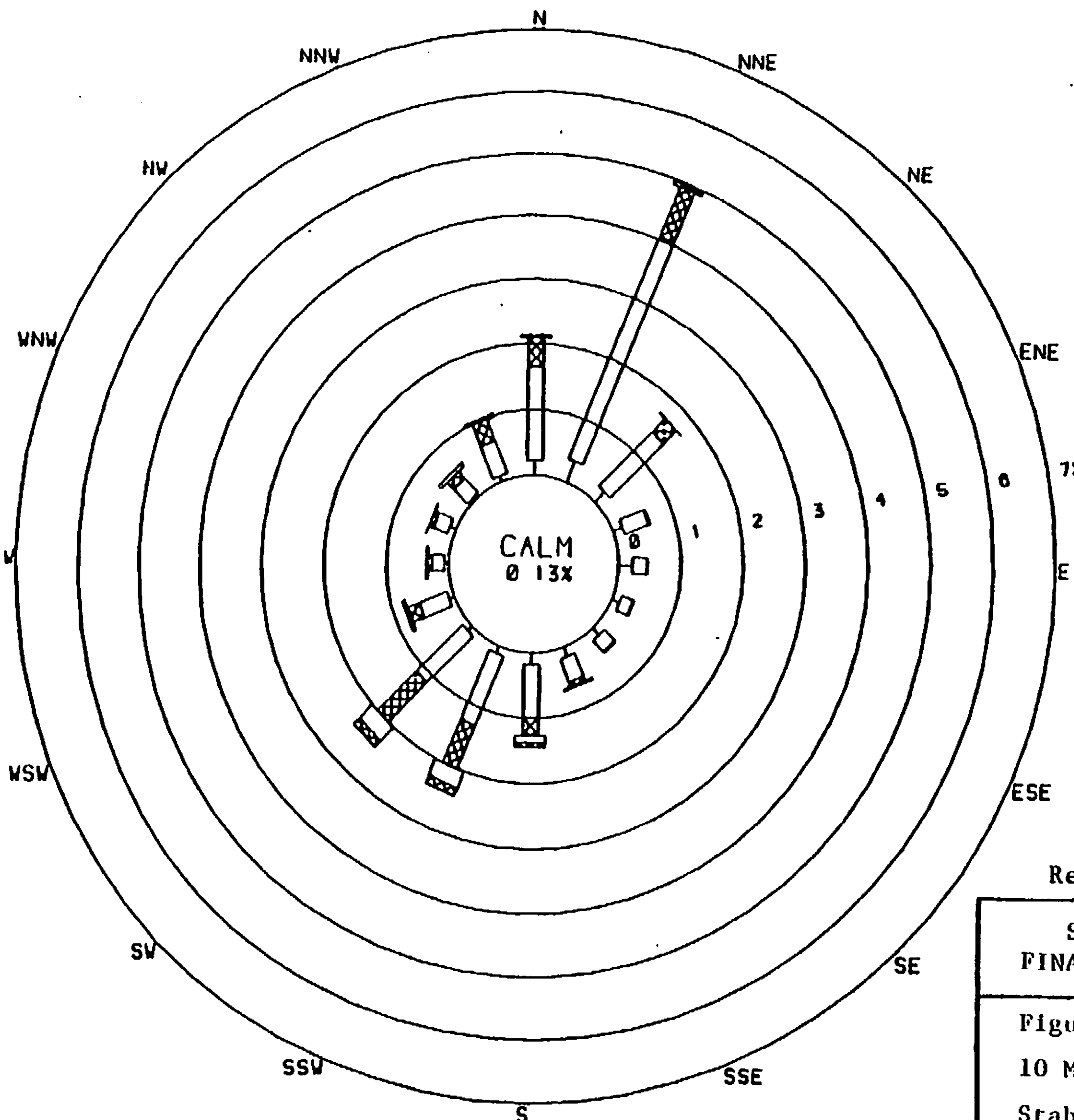
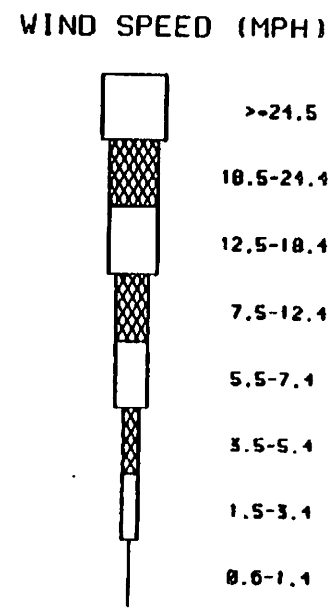
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-20 Wind Rose
10 M Wind, 9 & 46 M Temp
Stability Class E
Jan 1, 72 - Dec 31, 75





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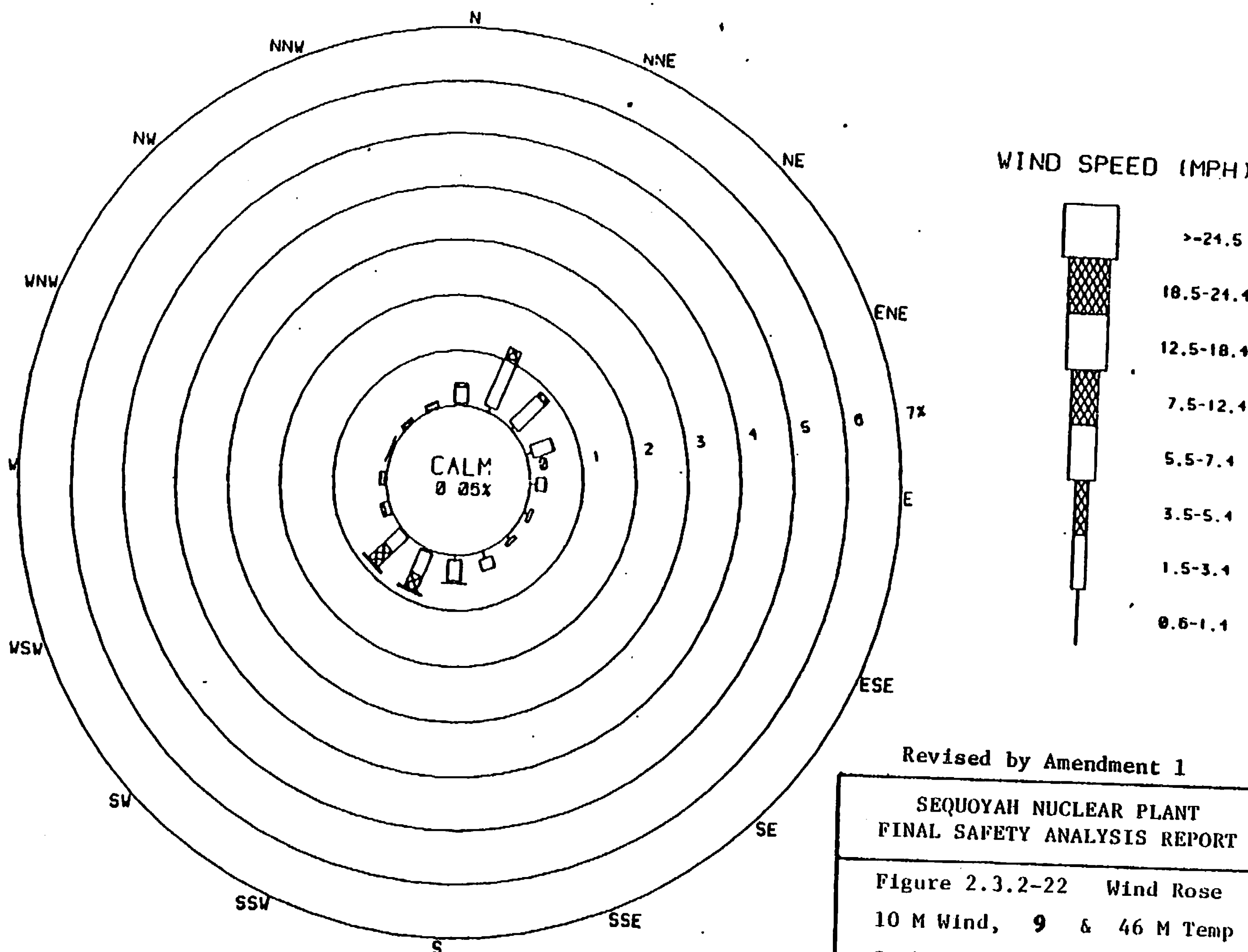
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-21 Wind Rose
10 M Wind, 9 & 46 M Temp
Stability Class F
Jan 1, 72 - Dec 31, 75



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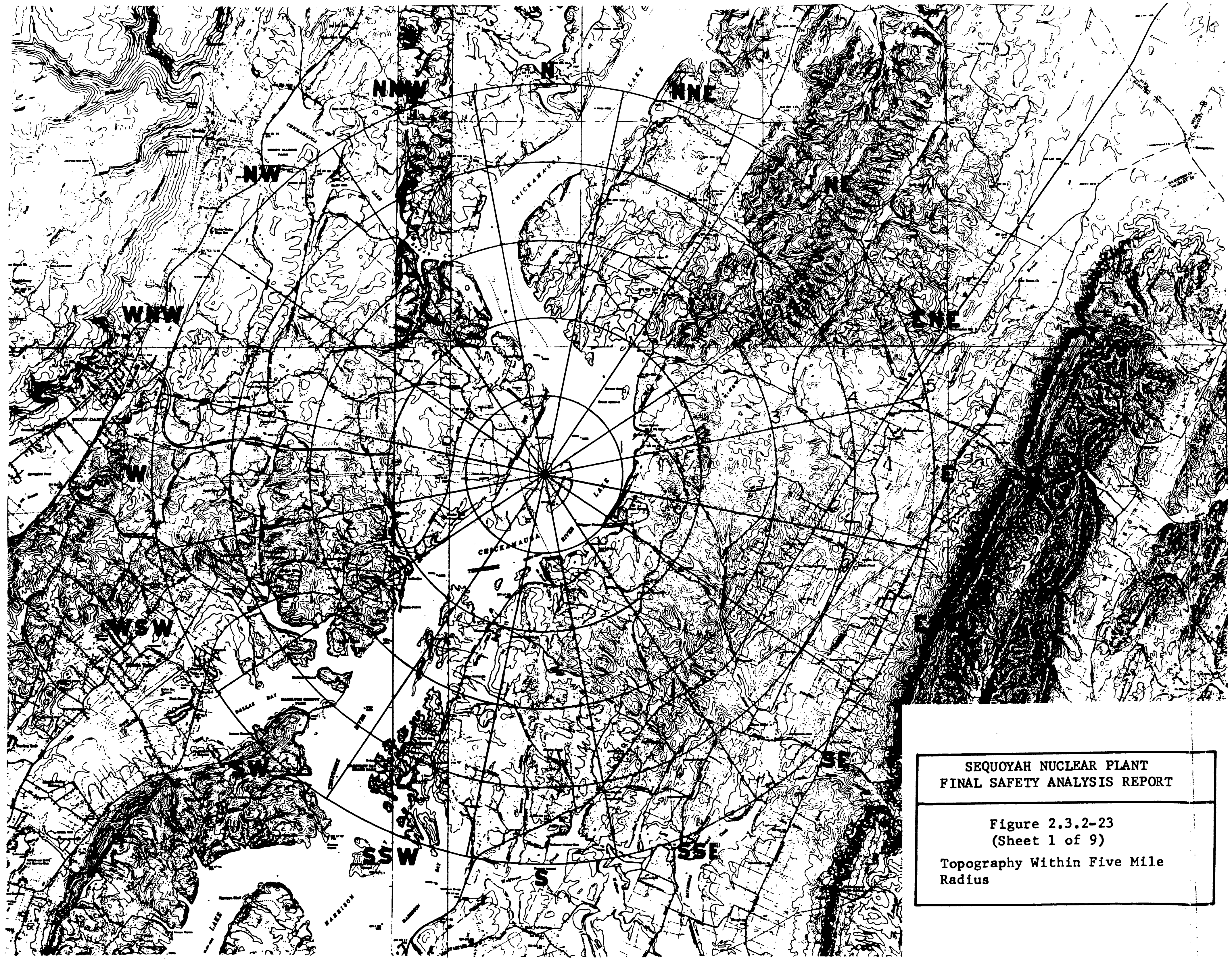
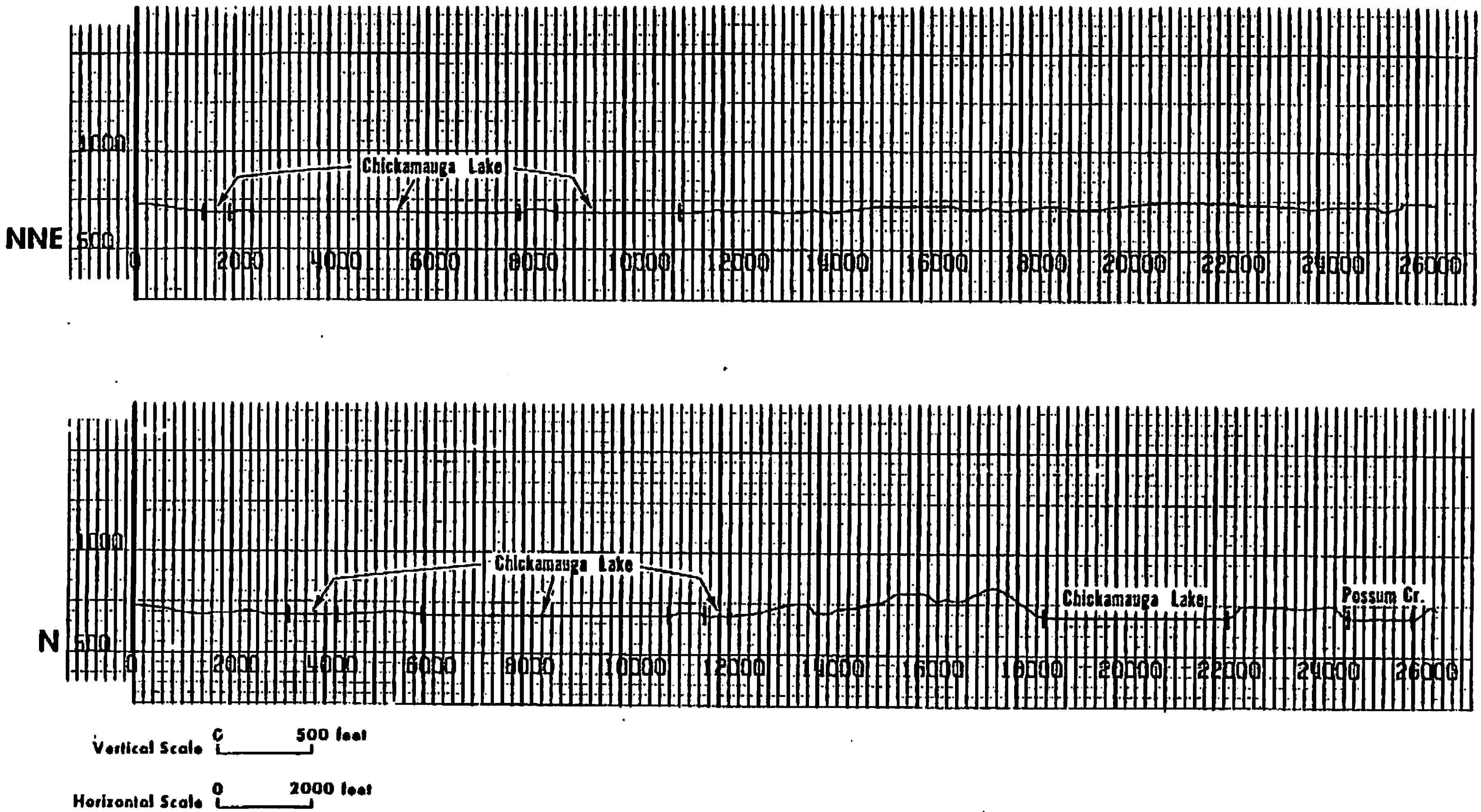
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-22 Wind Rose
10 M Wind, 9 & 46 M Temp
Stability Class G
Jan 1, 72 - Dec 31, 75



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

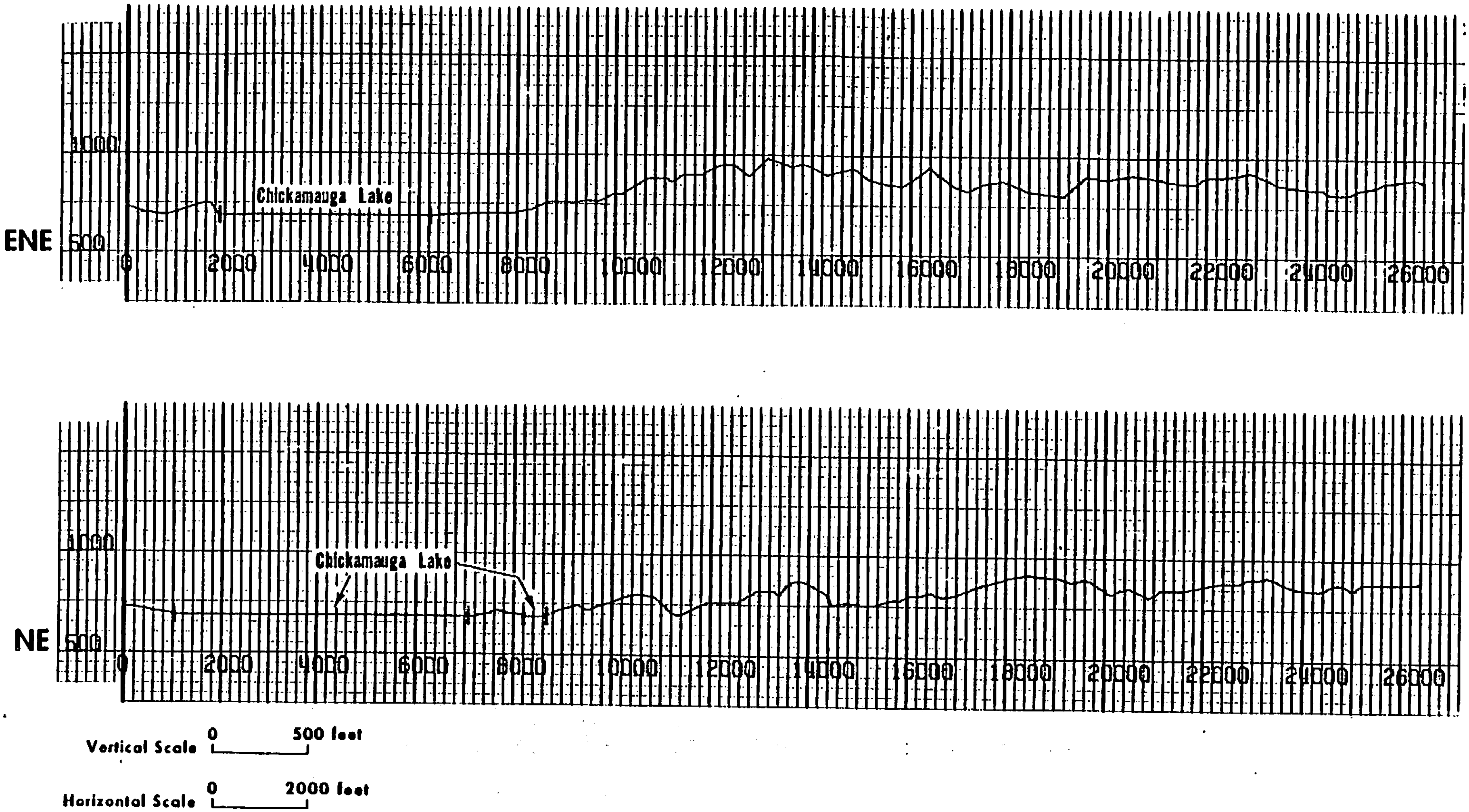
Figure 2.3.2-23
(Sheet 1 of 9)
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 2 of 9)

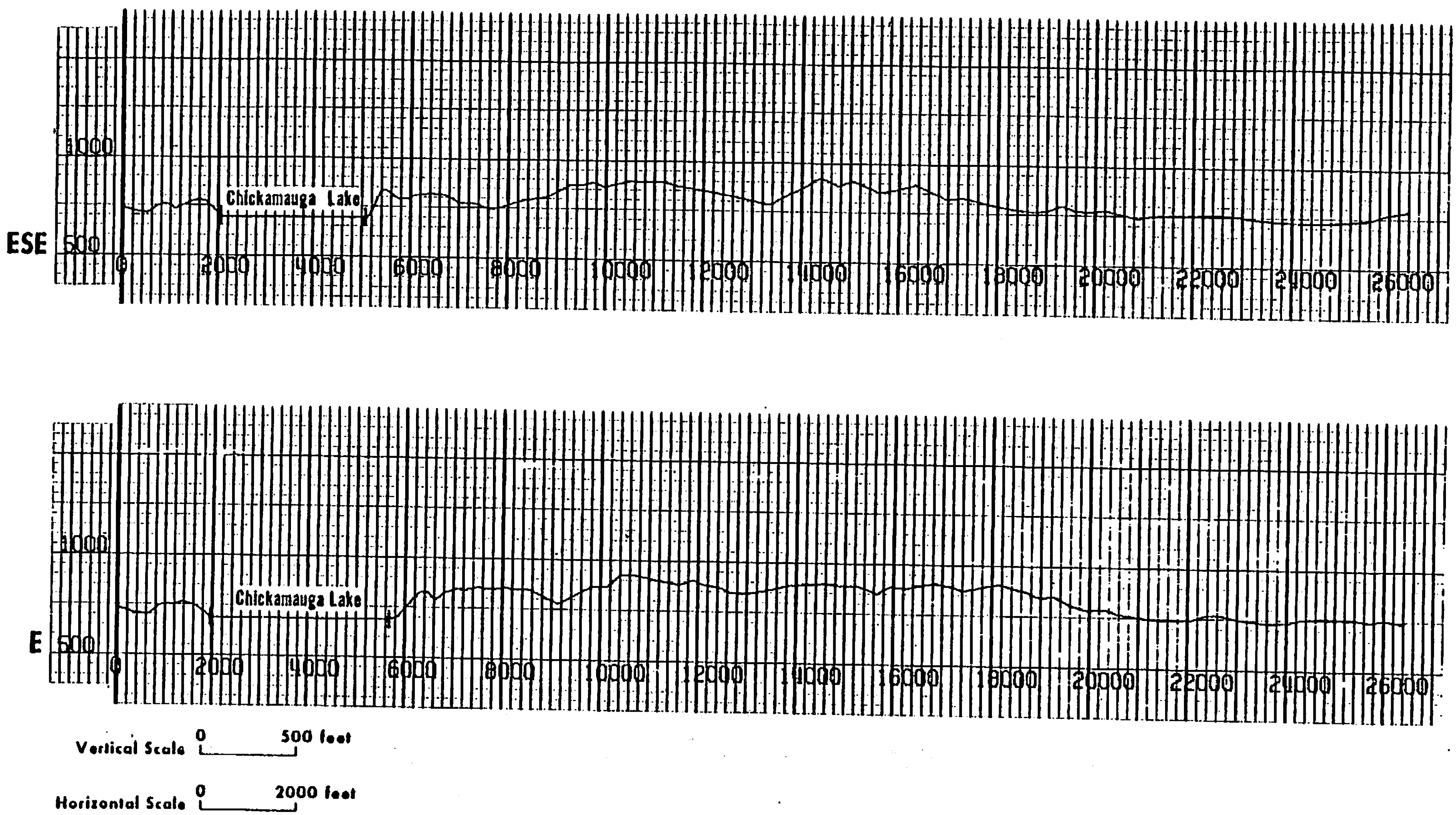
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 3 of 9)

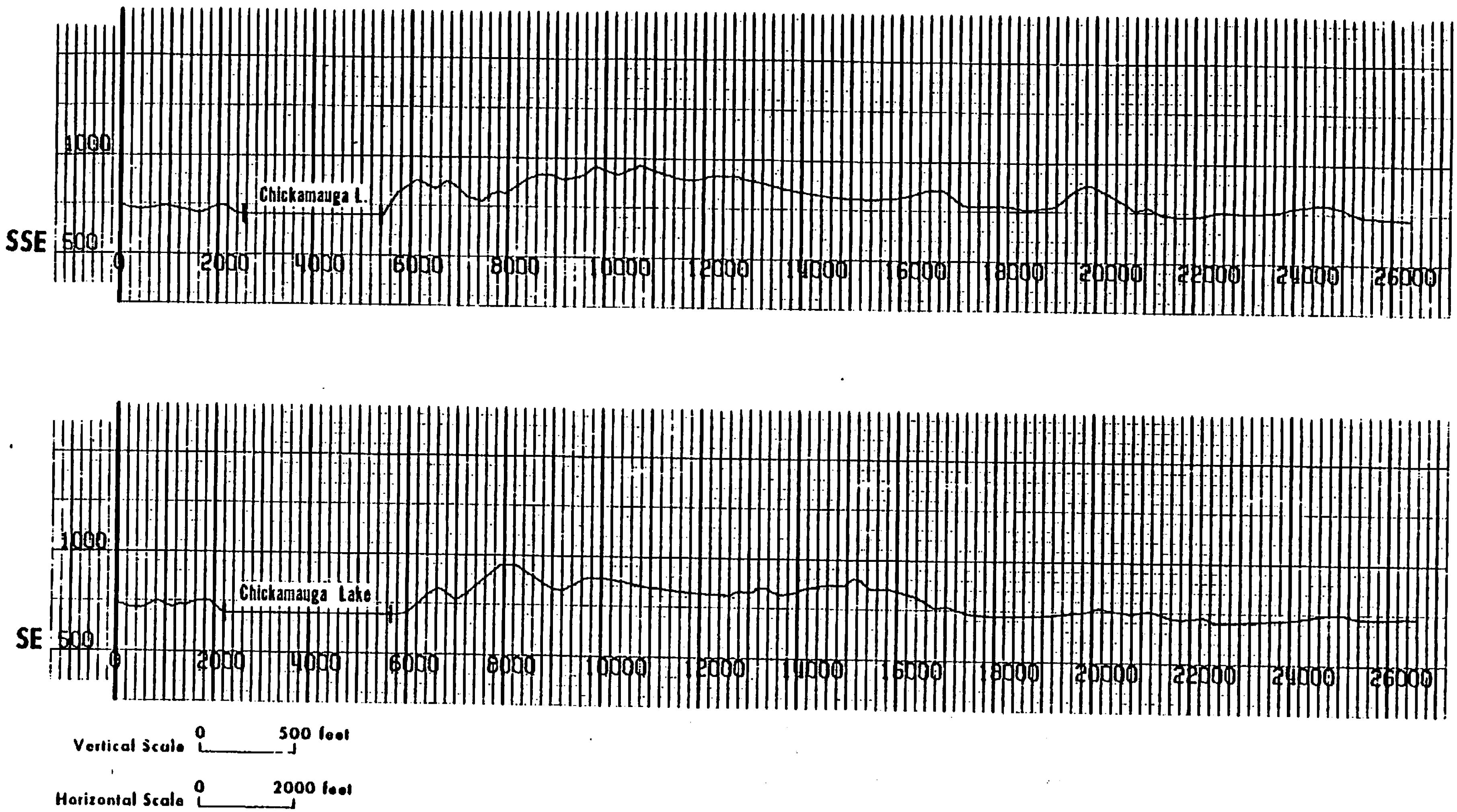
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 4 of 9)

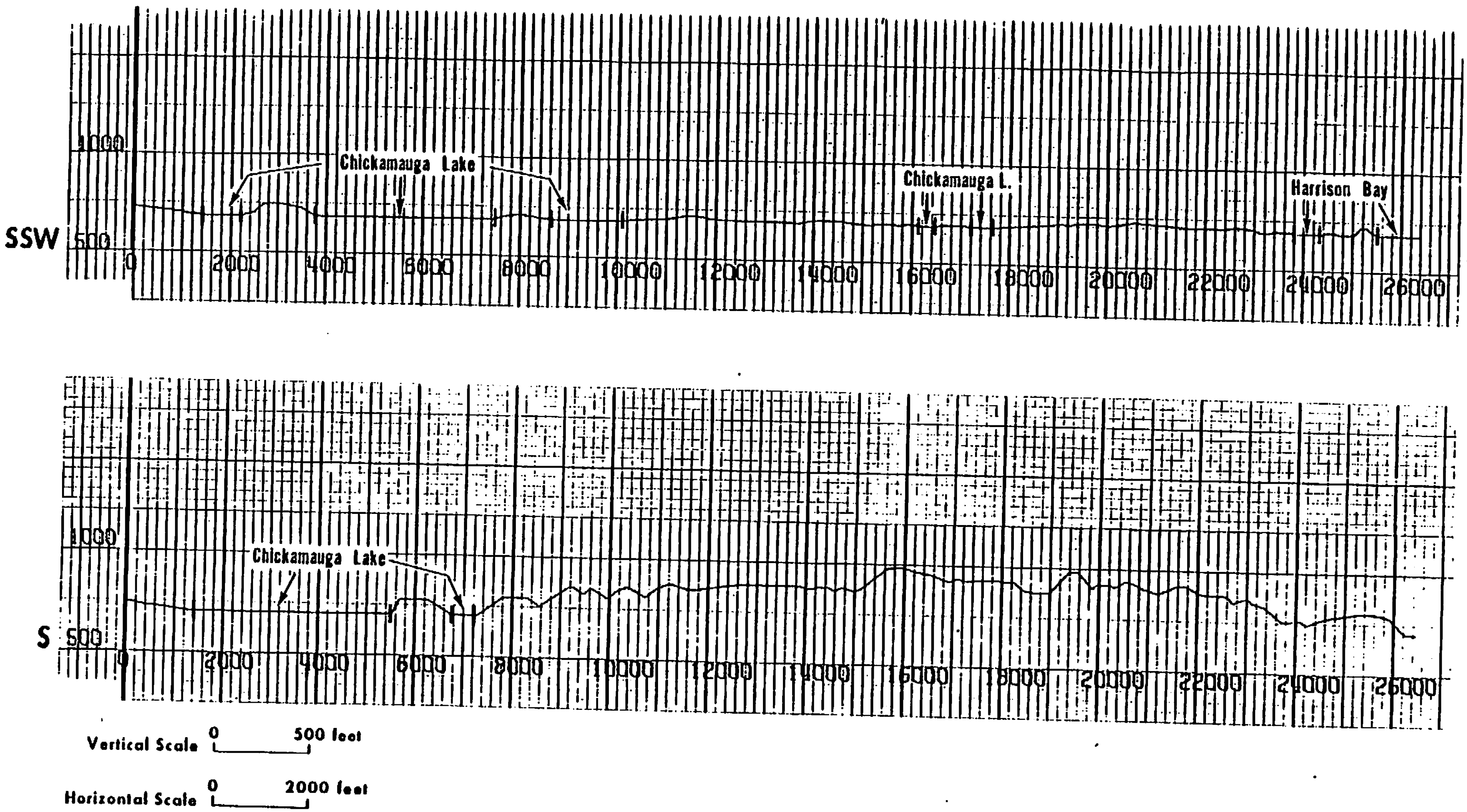
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 5 of 9)

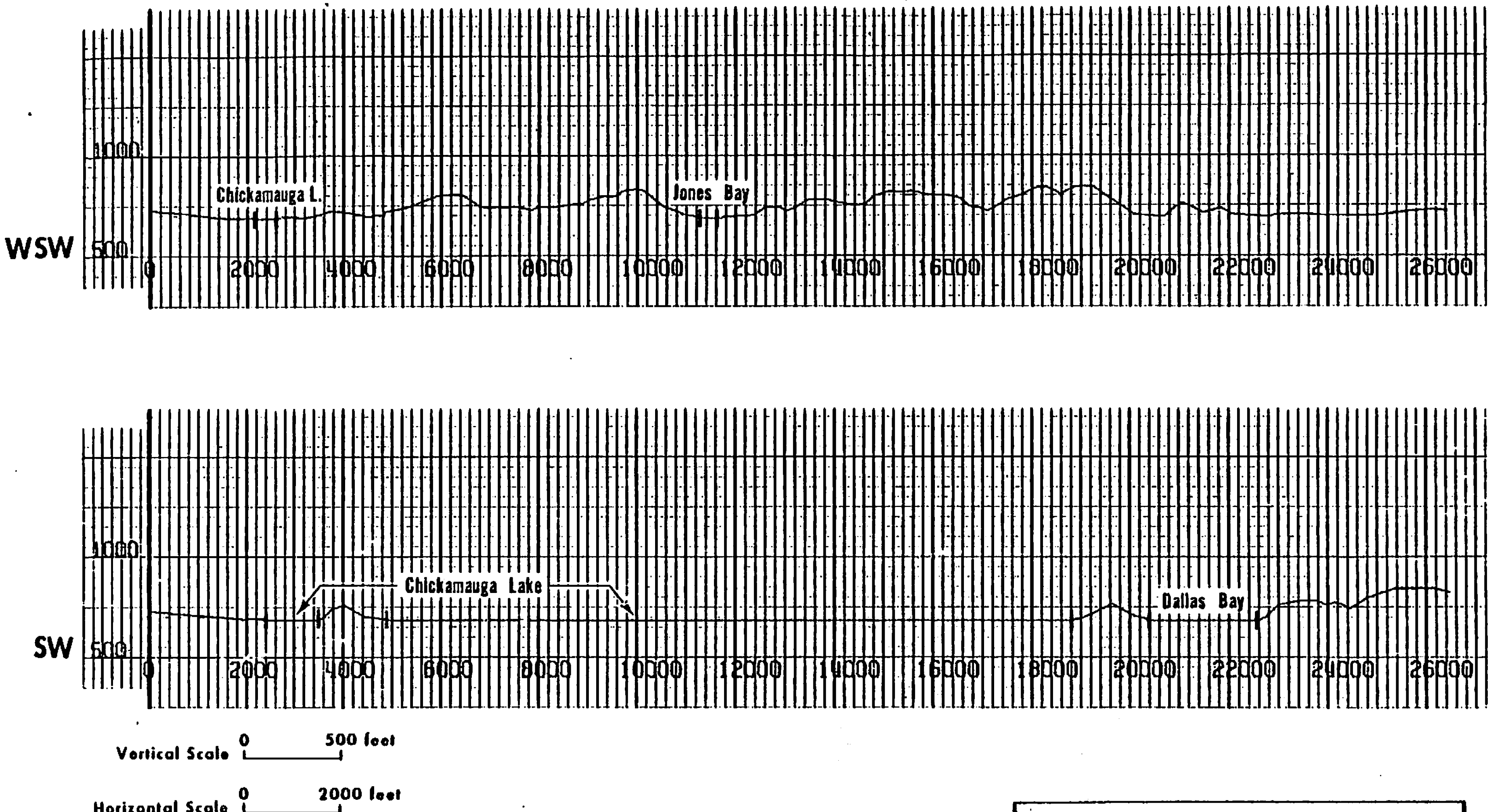
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 6 of 9)

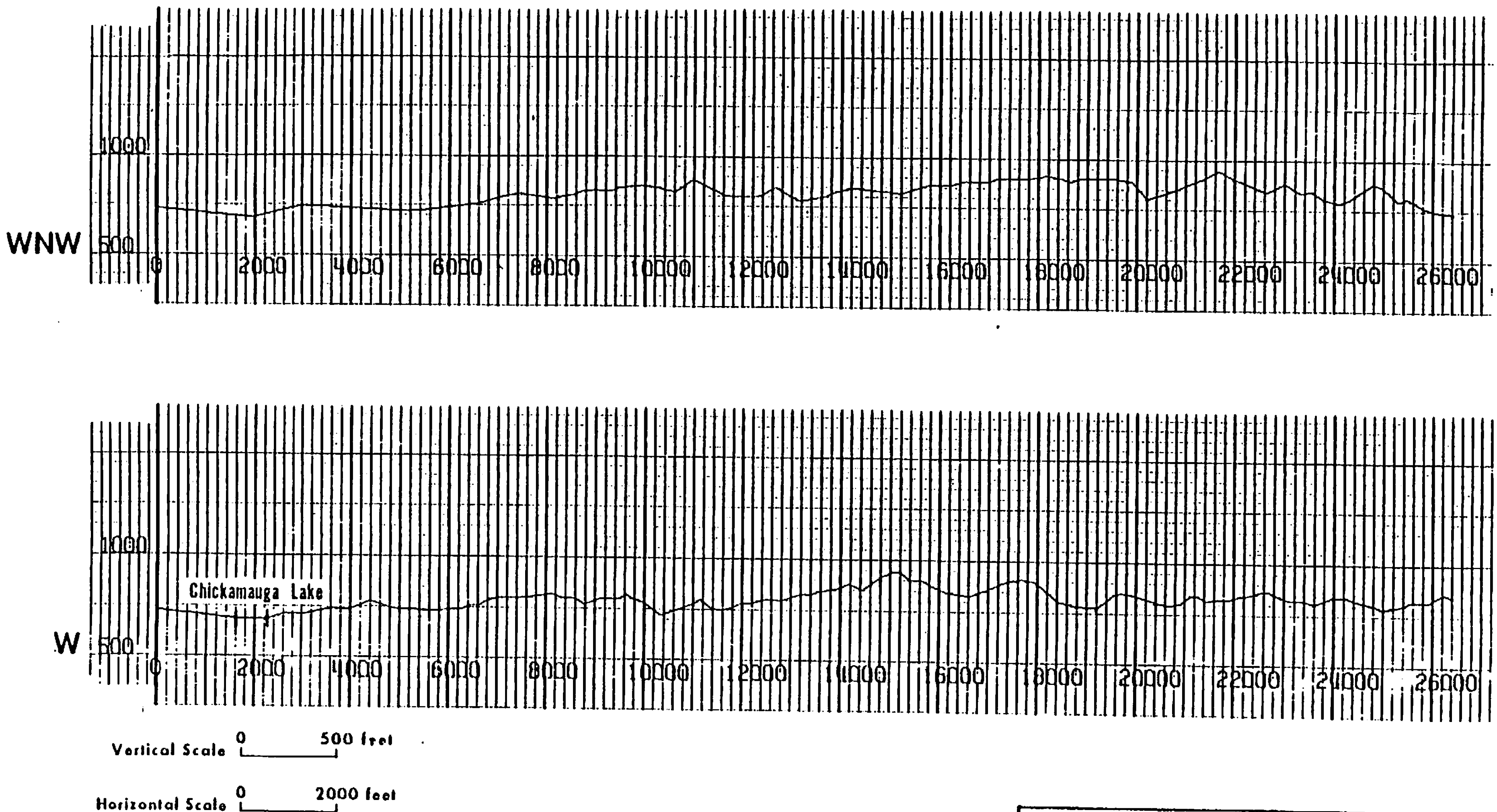
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

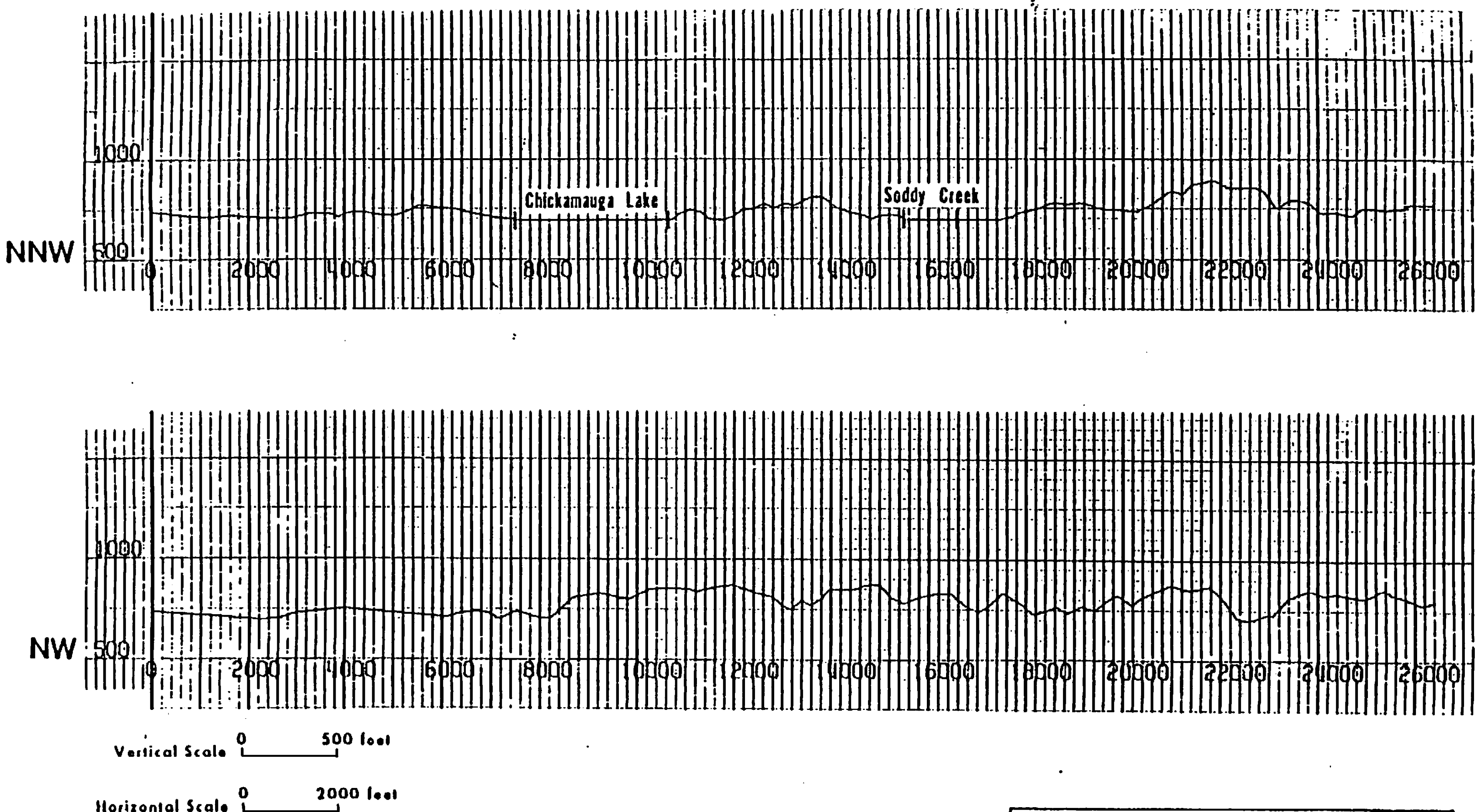
Figure 2.3.2-23
(Sheet 7 of 9)

Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 8 of 9)
Topography Within Five Mile Radius



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

Figure 2.3.2-23
(Sheet 9 of 9)

Topography Within Five Mile Radius

2.4 HYDROLOGIC ENGINEERING

2.4.1 Hydrologic Description

2.4.1.1 Site and Facilities

The location of key plant structures and their relationship to the original site topography are shown on Figure 2.1.2-1. The structures which have safety-related equipment and systems are indicated on this figure and are tabulated below, along with the elevation of major exterior accesses.

Structure	Access	Number of Accesses	Elevation
Intake pumping structure	(1) Stairwell entrance	1	705.0
	(2) Access hatches	6	705.0
	(3) Cable tunnel	1	690.0
Auxiliary and control buildings	(1) Railroad access opening	1	706.0
	(2) Doors to turbine building	2	706.0
	(3) Doors to turbine building	2	732.0
	(4) Doors to turbine building	2	685.0
	(5) Personnel lock to SB	1	690.0
	(6) General vent or intake	2	714
	(7) Doors to AEB and MSVV	4	714
Shield building	(1) Personnel lock (watertight)	1	691.0
	(2) Equipment hatch	1	730.0
	(3) Personnel lock	1	732.0
Diesel generator building	(1) Equipment access door	4	722.0
	(2) Personnel access door	1	722.0
	(3) Emergency exit	4	722.0
	(4) Emergency exit	1	740.5
ERCW intake pumping station	(1) Access door	1	725.0
	(2) Trash sluice	1	723.5
	(3) Deck drainage (sealed for flood)	1	720.0

Exterior accesses are also provided to each of the class IE electrical systems manholes and handholes at elevations varying from 700 to 724 feet MSL, depending upon the location of each structure.

The relationship of the plant site to the surrounding area can be seen in Figures 2.1.2-1 and 2.4.1-1. It can be seen from these figures that significant natural drainage features of the site have not been altered. Local surface runoff drains into the Tennessee River.

2.4.1.2 Hydrosphere

The Sequoyah Nuclear Plant (SQN) site comprises approximately 525 acres on a peninsula on the western shore of Chickamauga Lake at Tennessee River Mile (TRM) 484.5. As shown by Figure 2.4.1-1, the site is on high ground with the Tennessee River being the only potential source of flooding.

The Tennessee River above SQN site drains 20,650 square miles. The drainage area at Chickamauga Dam, 13.5 miles downstream, is 20,790 square miles. Three major tributaries--Hiwassee, Little Tennessee, and French Broad Rivers--rise to the east in the rugged Southern Appalachian Highlands. They flow northwestward through the Appalachian Divide which is essentially defined by the North Carolina-Tennessee border to join the Tennessee River which flows southwestward. The Tennessee River and its Clinch and Holston River tributaries flow southwest through the Valley and ridge physiographic province which, while not as rugged as the Southern Highlands, features a number of mountains including the Clinch and Powell Mountain chains. The drainage pattern is shown on Figure 2.1.1-1. About 20 percent of the watershed rises above elevation 3000 with a maximum elevation of 6,684 at Mt. Mitchell, North Carolina. The watershed is about 70 percent forested with much of the mountainous area being 100 percent forested.

The climate of the watershed is humid temperate. Mean annual precipitation for the Tennessee Valley is shown by Figure 2.4.1-2. Above Chickamauga Dam, annual rainfall averages 51 inches and varies from a low of 40 inches at sheltered locations in the mountains to high spots of 85 inches on the southern and eastern divide. Rainfall occurs relatively evenly throughout the year. See Section 2.3 for a discussion of rainfall.

Major flood-producing storms are of two general types; the cool-season, winter type, and the warm-season, hurricane type. Most floods at SQN, however, have been produced by winter-type storms in the months of January through early April.

Watershed snowfall is relatively light, averaging only about 14 inches annually above the plant. The maximum average annual snowfall of 63 inches occurs at Mt. Mitchell, the highest point east of the Mississippi River. The overall snowfall average above the 3,000-foot elevation, however, is only 22 inches annually. Individual snowfalls are normally light, with an average of 13 snowfalls per year. Snowmelt is not a factor in maximum flood determinations.

Chickamauga Dam, 13.5 miles downstream, affects water surface elevations at SQN. Normal full pool elevation is 683.0 feet. At this elevation the reservoir is 58.9 miles long on the Tennessee River and 32 miles long on the Hiwassee River, covering an area of 35,400 acres, with a volume of 628,000 acre-feet. The reservoir has an average width of nearly 1 mile, ranging from 700 feet to 1.7 miles. At SQN, the reservoir is about 3,000 feet wide with depths ranging between 12 feet and 50 feet at normal pool elevation.

The Tennessee River above Chattanooga, Tennessee, is one of the best regulated rivers in the United States. A prime purpose of the TVA water control system is flood control with particular emphasis on protection for Chattanooga, 20 miles downstream from SQN.

There are 20 major reservoirs in the TVA system upstream from the plant, 13 of which have substantial reserved flood detention capacity during the main flood season. Table 2.4.1-1 lists pertinent data for TVA's major dams prior to modifications made by the Dam Safety Program (see Table 2.4.1-5). In addition, there are six major dams owned by the Aluminum Company of America (ALCOA). The ALCOA reservoirs often contribute to flood reduction but were ignored in this analysis because they do not have dependable reserved flood detention capacity. The locations of these dams and the minor dams, Nolichucky and Walters (Waterville Lake), are shown on Figure 2.1.1-1. Table 2.4.1-2 lists pertinent data for the major and minor ALCOA dams and Walters Dam.

The flood detention capacity reserved in the TVA system varies seasonally, with the greatest amounts during the flood season. Figure 2.4.1-3, containing 14 sheets, shows tributary and main river reservoir seasonal operating guides for those reservoirs having major influence on SQN flood flows. Table 2.4.1-3 shows the flood control reservations at the multiple-purpose projects above SQN at the beginning and end of the winter flood season and in the summer. Assured system detention capacity above the plant varies from 5.6 inches on January 1 to 4.5 inches on March 15, decreasing to 1.0 inch during the summer and fall. Actual detention capacity may exceed these amounts, depending upon inflows and power demands.

Flood control above SQN is provided largely by 11 tributary reservoirs. Tellico Dam is counted as a tributary reservoir because it is located on the Little Tennessee River, although, because of canal connection with Fort Loudoun Dam, it also functions as a main river dam. On March 15, near the end of the flood season, these provide a minimum of 4,436,000 acre-feet of detention capacity, equivalent to 5.8 inches on the 14,476 square-mile area they control. This is 90 percent of the total available above Chickamauga Reservoir. The two main river reservoirs, Fort Loudoun and Watts Bar, provide 490,000 acre-feet, equivalent to 1.5 inches of detention capacity on the remaining area above the plant.

Daily flow volumes at the plant, for all practical purposes, are represented by discharges from Chickamauga Dam with drainage area of 20,790 square miles, only 140 square miles more than at the plant. Momentary flows at the nuclear plant may vary considerably from daily averages, depending upon turbine operations at Watts Bar Dam upstream and Chickamauga Dam downstream. There may be periods of several hours when there are no releases from either or both Watts Bar and Chickamauga Dams. Rapid turbine shutdown at Chickamauga may sometimes cause periods of up-stream flow in Chickamauga Reservoir.

Based upon discharge records since closure of Chickamauga Dam in 1940, the average daily streamflow at the plant is 32,600 cfs. The maximum daily discharge was 223,200 cfs on May 8, 1984. Except for two special operations on March 30 and 31, 1968, when discharge was zero to control milfoil, the minimum daily discharge was 700 cfs on November 1, 1953. Flow data for water years 1951-1972 indicate an average rate of about 27,600 cfs during the summer months (May-October) and about 38,500 cfs during the winter months (November-April). Flow durations based upon Chickamauga Dam discharge records for the period 1951-1972 are tabulated below.

Average Daily Discharge, cfs	Percent of Time Equaled or Exceeded
5,000	99.6
10,000	97.7
15,000	93.3
20,000	84.0
25,000	69.3
30,000	46.8
35,000	31.7

Channel velocities at SQN average about 0.6 fps under normal winter conditions. Because of lower flows and higher reservoir elevations in the summer months, channel velocities average about 0.3 fps.

As listed on Table 2.4.1-4, there are 23 surface water users within the 98.6-mile reach of the Tennessee River between Dayton, TN and Stevenson, AL. These include fifteen industrial water supplies and eight public water supplies.

The industrial users exclusive of SQN withdraw about 497 million gallons per day from the Tennessee River. Most of this water is returned to the river after use with varying degrees of contamination.

The public surface water supply intake (Savannah Valley Utility District), originally located across Chickamauga Reservoir from the plant site at TRM 483.6, has been removed. Savannah Valley Utility District has been converted to a ground water supply. The nearest public downstream intake is the East Side Utility (formerly referred to as U.S. Army, Volunteer Army Ammunition Plant). This intake is located at TRM 473.0.

Groundwater resources in the immediate SQN site are described in Section 2.4.13.

2.4.1.3 TVA Dam Safety Program

Most of the dams upstream from SQN were designed and built before the hydrometerological approach to spillway design had gained its current level of acceptance. Spillway design capacity was generally less than would be provided today. The original FSAR analyses were based on the existing dam system before dam safety modifications were made and included failure of some upstream dams from overtopping.

In 1982, TVA officially began a safety review of its dams. The TVA Dam Safety Program was designed to be consistent with Federal Guidelines for Dam Safety and similar efforts by other Federal agencies. Technical studies and engineering analyses were conducted and physical modifications implemented to ensure the hydrologic and seismic integrity of the TVA dams and demonstrate that TVA's dams can be operated in accordance with Federal Emergency Management Agency (FEMA) guidelines. Table 2.4.1-5 provides the status of TVA Dam Safety hydrologic modifications as of 1998. These modifications enable these projects to safely pass the probable maximum flood. The remaining hydrologic modifications planned for Bear Creek Dam and Chickamauga Dam will not affect SQN in any manner which might invalidate the reanalysis described below.

In 1997-98, TVA reanalyzed the nuclear plant design basis flood events. The purpose of the reanalysis was to evaluate the effects of the hydrologic dam safety modifications on the flood elevations and response times in the SQN FSAR and to confirm the adequacy of the plant flood plans. The following methods and assumptions were applied to the reanalysis:

1. The computer programs and modeling methods were the same as previously used and documented in the FSAR.

2. Probable maximum precipitation, time distribution of precipitation, precipitation losses and reservoir operating procedures were unchanged from the original analysis.

3. The original stability analyses and postulated seismic dam failure assumptions were conservatively assumed to occur in the same manner and in combination with the same previously postulated rainfall events. No credit was taken for the 1988 post-tensioning of Fontana and Melton Hill Dams to prevent seismic failure. Nor was any credit taken for Dam Safety seismic evaluations of Norris, Cherokee, Douglas, Fort Loudon, Tellico, Hiwassee, Apalachia, and Blue Ridge Dams which demonstrated their structural integrity for a seismic event with a return period of approximately 10,000 years.

4. The planned modification of Chickamauga Dam (armoring the embankment to permit overtopping) was conservatively assumed to have been implemented for the purpose of calculating flood effects. Under present existing conditions, the Chickamauga embankment would be severely eroded in the overtopping PMF event and the maximum flood elevation at SQN would be lower than that with the planned modification.

2.4.2 Floods

2.4.2.1 Flood History (Historical)

The nearest location with extensive formal flood records is 20 miles downstream at Chattanooga, Tennessee, where continuous records are available since 1874. Knowledge about significant floods extends back to 1826, based upon newspaper and historical reports. Flood flows and stages at Chattanooga have been altered by TVA's reservoir system beginning with the closure of Norris Dam in 1936 and reaching essentially the present level of control in 1952 with closure of Boone Dam, the last major dam with reserved flood detention capacity constructed above Chattanooga. Tellico Dam provides additional reserved flood detention capacity; however, the percentage increase in total detention capacity above the Watts Bar site is small. Thus, for practical purposes, flood records for the period 1952 to date can be considered representative of prevailing conditions. Figure 2.4.2-1 shows the known flood experience at Chattanooga in diagram form. The maximum known flood under natural conditions occurred in 1867. This flood reached elevation 690.5 at SQN. The maximum flood under present-day regulation reached elevation 687.9 at the site on May 9, 1984.

The following table lists the highest floods at SQN:

Date	Elevation, Feet	Discharge, cfs
Before Regulation		
March 11, 1867	690.5	450,000
March 1, 1875	686.2	405,000
April 3, 1886	684.5	385,000
March 7, 1917	680.0	335,000
April 5, 1920	676.5	270,000
Since Present Regulation		
February 3, 1957	683.7	180,000
March 13, 1963	684.8	205,000
March 18, 1973	687.0	219,000
May 9, 1984	687.9	250,000

2.4.2.2 Flood Design Considerations

TVA has planned the SQN project to conform with regulatory position 2 of Regulatory Guide 1.59.

The types of events evaluated to determine the worst potential flood included (1) Probable Maximum Precipitation (PMP) on the total watershed and critical subwatersheds, including seasonal variations and potential consequent dam failures and (2) dam failures in a postulated Safe Shutdown Earthquake (SSE) or one-half SSE with guide specified concurrent flood conditions.

The computed maximum stillwater flood level in the reservoir at the plant site from any cause is elevation 719.6. Maximum level including wave height is 722.4. This elevation would result from the probable maximum precipitation critically centered on the watershed and a 45-mile-per-hour overwater wind, from the most critical direction coincident with the peak of the resulting flood.

Other rainfall floods will also exceed plant grade, elevation 705, and will necessitate plant shutdown. Flood warning criteria and forecasting techniques have been developed to assure that there will always be adequate time to shut the plant down and be ready for floodwaters above plant grade and are described in Subsections 2.4.10 and 2.4.14, and Appendix 2.4A.

Seismic and concurrent flood events could create flood levels which would exceed plant grade. The maximum elevation reached in such an event is elevation 707.9, 2.9 feet above plant grade and 11.7 feet below the controlling event probable maximum flood (PMF), excluding wind-wave considerations. In all such events there is adequate time for safe plant shutdown after the seismic event and before plant grade would be crossed. The emergency protective measures and warning criteria are described in Subsections 2.4.10 and 2.4.14, and Appendix 2.4A.

Most safety-related building accesses are located at elevation 706 or above. The accesses below elevation 706 are within the powerhouse and will not be exposed to floodwater until plant grade is exceeded. Therefore, the structures are protected from flooding prior to the end of the shutdown period.

Drainage to the Tennessee River has been provided to accommodate runoff from the probable maximum precipitation on the local area of the plant site.

Specific analysis of Tennessee River flood levels resulting from oceanfront surges and tsunamis is not required because of the inland location of the plant.

Snowmelt and ice jam considerations are also unnecessary because of the temperate zone location of the plant. Flood waves from landslides into upstream reservoirs required no specific analysis, in part because of the absence of major elevation relief in nearby upstream reservoirs and because the prevailing thin soils offer small slide volume potential compared to the available detention space in reservoirs.

All safety-related facilities, systems, and equipment are housed in structures which provide protection from flooding for all flood conditions up to plant grade at elevation 705.

For the condition where flooding exceeds plant grade, as described in Subsections 2.4.3 and 2.4.4, all equipment required to maintain the plant safely during the flood, and for 100 days after the beginning of the flood, is either designed to operate submerged, located above the maximum flood level, or otherwise protected.

Safety-related facilities, systems, and equipment located in the containment structure are protected from flooding by the shield building. All accesses and penetrations below the maximum flood level in the shield building are designed and constructed as water-tight elements.

The turbine, control, and auxiliary building will be allowed to flood.

Wind wave run-up during the PMF at the diesel generator building reaches elevation 721.8 which is 0.2 feet below the operating floor. Consequently, wind wave run-up will not impair the safety function of systems in the diesel generator building.

The accesses and penetrations below this elevation in the diesel generator building are designed and constructed to minimize leakage into the buildings. Redundant sump pumps are provided within the building to remove minor leakage. Protective measures are taken to ensure that all safety-related systems and equipment in the Emergency Raw Cooling Water (ERCW) pump station will remain functional when subjected to the maximum flood level.

Class IE electrical cables, located below the Probable Maximum Flood (PMF) plus wind-wave activity and required in a flood, are designed for submerged operation.

Structures housing safety-related facilities, systems, and equipment are protected from flooding during a local PMF by the slope of the plant yard. The yard is graded so that the surface runoff will be carried to Chickamauga Reservoir without exceeding the elevation of the external accesses given in Paragraph 2.4.1.1 except those at the intake pumping station whose pumps can operate submerged.

2.4.3 Probable Maximum Flood (PMF) on Streams and Rivers

The guidance of Appendix A of Regulatory Guide 1.59 was followed in determining the PMF. Plant surface drainage was evaluated and found capable of passing the local probable maximum storm without reaching or exceeding the critical floor elevation 706, as further described in 2.4.3.5.

Evaluation of seasonal and areal variations of probable maximum storms showed that the probable maximum Tennessee River flood level at the plant would be caused by a sequence of storms occurring in March centered in the mountains, east of the plant. The flood crest at the plant would be augmented by the failure of the west saddle dike at Watts Bar Dam upstream. The estimated maximum discharge is 1,236,000 cfs. The probable maximum elevation at the plant is 719.6, excluding any wind-wave effects, and excluding any lower flood level due to failure of Chickamauga Dam downstream.

2.4.3.1 Probable Maximum Precipitation

Probable maximum precipitation (PMP) for the Tennessee River watershed above SQN has been defined for TVA by the Hydrometeorological Branch of the National Weather Service in Hydrometeorological Report No. 41 Reference [1]. Two basic storm positions were evaluated. One would produce maximum rainfall over the total watershed. The other would produce maximum rains in the part of the basin downstream from major TVA tributary reservoirs, hereafter referred to as the 7,980-square-mile storm. Snowmelt is not a factor in generating maximum floods at the plant site.

Controlling PMP depths for 21,400-square-mile and 7,980-square-mile areas are tabulated below. These storms would occur in March. Depths for other months would be less.

Depth, Inches				
	72-Hour	Main Storm		
Sq. Miles	Antecedent Storm	6-Hour	24-Hour	72-Hour
21,400	6.7	5.03	11.18	16.78
7,980	8.1	7.02	14.04	20.36

Two possible isohyetal patterns producing the total area depths are presented in Report No. 41. The one critical to this study is the "downstream pattern" shown in Figure 2.4.3-1. The isohyetal pattern for the 7,980-square-mile storm is shown in Figure 2.4.3-2. The pattern is not orographically fixed and can be moved parallel to the long axis northeast and southwest along the Valley.

A 72-hour storm three days antecedent to the main storm was assumed to occur in all PMP situations with storm depths equivalent to 40 percent of the main storm.

Potential storm amounts differing by seasons were analyzed in sufficient number to make certain that the March storms would be controlling. Enough centerings were investigated to assure that a most critical position was used.

Storms producing PMP above upstream tributary dams, whose failure has the potential to create maximum flood levels, were evaluated in the original FSAR analysis. Dam safety modifications at upstream tributary dams have eliminated these potential failures and subsequent plant site flood levels.

A standard time distribution pattern was adopted for all storms based upon major observed storms transposable to the Tennessee Valley and in conformance with the usual practice of Federal agencies. The adopted distribution is shown on Figure 2.4.3-3.

The critical probable maximum storm was determined to be a total basin storm with downstream orographically fixed pattern (Figure 2.4.3-1) which would follow an antecedent storm commencing on March 15. Translation of the PMP from Report No. 41 to the basin results in an antecedent storm producing an average precipitation of 6.4 inches in three days, followed by a three-day dry period, and then by the main storm producing an average precipitation of 16.5 inches in three days. Figure 2.4.3-4 is an isohyetal map of the maximum three-day PMP. Basin rainfall depths are given in Table 2.4.3-1.

PMP for the plant drainage system and roofs of safety-related structures was determined from Hydrometeorological Report No. 45 [2]. The probable maximum storm used to test the adequacy of the local drainage system would produce 27.5 inches of rainfall in six hours with a maximum one-hour depth of 14 inches. Depths for each of the six hours in sequence were 1.5, 2.3, 5.0, 14.0, 3.0, and 1.7 inches.

2.4.3.2 <u>Precipitation Losses</u>

Precipitation losses in the probable maximum storm are estimated with multivariable relationships used in the day-to-day operation of the TVA system. These relationships, developed from a study of storm and flood records, relate the amount of precipitation excess (and hence the precipitation loss) to the week of the year, an antecedent precipitation index (API), and geographic location. The relationships are such that the loss subtraction from rainfall to compute precipitation excess is greatest at the start of the storm and decreases to no subtraction when the storm rainfall totals from 7 to 16 inches. Precipitation losses become zero in the late part of extreme storms.

For this probable maximum flood analysis, median moisture conditions as determined from past records were used to determine the API at the start of the storm sequence. The antecedent storm is so large, however, that the precipitation excess computed for the later main storm is not sensitive to variations in adopted initial moisture conditions. The precipitation loss in the critical probable maximum storm totals 4.13 inches, 2.30 inches in the antecedent storm amounting to 36 percent of the 3-day 6.44-inch rainfall, and 1.83 inches in the main storm amounting to 11 percent of the 3-day, 16.46 inch rainfall. Table 2.4.3-1 displays the API, rain, and precipitation excess for each of the 45 subwatersheds of the hydrologic model for the SQN probable maximum flood.

No precipitation loss was applied in the probable maximum storm on the local area used to test the adequacy of the site drainage system and roofs of safety-related structures. Runoff was made equal to rainfall.

2.4.3.3 Runoff Model

The runoff model used to determine Tennessee River flood hydrographs at SQN is divided into 45 unit areas. Unit hydrographs are used to compute flows from these areas. The unit area flows are combined with appropriate time sequencing or channel routing procedures to compute inflows into the most upstream reservoirs, which in turn are routed through the reservoirs, using standard techniques. Resulting outflows are combined with additional local inflows and carried downstream using appropriate time sequencing or routing procedures, including unsteady flow routing. Figure 2.4.3-5 shows unit areas of the watershed upstream from SQN.

The runoff model used in this updated FSAR differs from that used previously because of refinements made in some elements of the model during PMF studies for other nuclear plants and those made from information gained from the 1973 flood, the largest that has occurred during present reservoir conditions.

Changes are identified when appropriate in the text. They include both additional and revised unit hydrographs and additional and revised unsteady flow stream course models.

Unit hydrographs were developed for each unit area from maximum flood hydrographs either recorded at stream gauging stations or estimated from reservoir headwater elevation, inflow, and discharge data. The number of unit areas has been increased from 34 used previously to 45. The differences include:

1. Use of the model developed for the Phipps Bend study which combined the two unit areas for Watauga River (Sugar Grove and Watauga local) into one unit area and divided the Cherokee to Gate City unit area into two unit areas (Surgoinsville local and Cherokee local below Surgoinsville);

2. Use of the model developed for the Clinch River Breeder Reactor which increased the unit areas on the Clinch River from 3 to 11 and the Watts Bar local from 1 to 2;

3. Changes to add an unsteady flow model for the Fort Loudoun-Tellico Dam complex which included dividing the lower Little Tennessee River unit area into two unit areas (Fontana to Chilhowee and Chilhowee to Tellico), and the Fort Loudoun local unit area into three unit areas (French Broad River local, Holston River local and Fort Loudoun local); and

4. Combining the two unit areas above Ocoee No. 1 (Ocoee No. 1 and Ocoee No. 3) into one unit area (Ocoee No. 1 to Blue Ridge).

In addition, eight of the unit graphs have been revised. Figure 2.4.3-6, which contains 11 sheets, shows the unit hydrographs. Table 2.4.3-2 contains essential dimension data for each unit hydrograph and identification of those hydrographs which are new or revised.
Tributary reservoir routings, except for Tellico, were made using the Goodrich semigraphical method and flat pool storage conditions. Main river reservoir and Tellico routings were made using unsteady flow techniques. This differs from the previous submission in that:

1. An unsteady flow model has been added for the Fort Loudoun-Tellico complex, and

2. The Chickamauga unsteady flow model has been revised using the 1973 flood data and results from the HEC-2 backwater computer program.

In the original study, the failure wave hydrograph of the mouth of the Hiwassee River was approximated for the postulated failures of Hiwassee, Apalachia and Blue Ridge dams as described in section 2.4.4.2.1. In the 1998 reassessment, an unsteady flow model developed during the dam safety studies was used as an adjunct to route the Hiwassee, Apalachia and Blue Ridge failures in the one half SSE. The model was verified by comparing model elevations in a state of steady flow with elevations computed by the standard-step method. This was done for steady flows ranging from 25,000 cfs to 1,000,000 cfs.

Unsteady flow routings were computer-solved with a mathematical model based on the equations of unsteady flow, [3]. Boundary conditions prescribed were inflow hydrographs at the upstream boundary, local inflow, and headwater discharge relationships at the downstream boundary based upon normal operating rules, or based upon rated curves when geometry controlled.

The unsteady flow mathematical model for the 49.9-mile-long Fort Loudoun Reservoir was divided into twenty-four 2.08-mile reaches. The model was verified at three gauged points within Fort Loudoun Reservoir using 1963 and 1973 flood data. The unsteady flow model was extended upstream on the French Broad and Holston Rivers to Douglas and Cherokee Dams, respectively. The French Broad and Holston River unsteady flow models were verified at one gaged point each at mile 7.4 and 5.5, respectively, using 1963 and 1973 flood data.

The Little Tennessee River was modeled from Tellico Dam, mile 0.3, through Tellico Reservoir to Chilhowee Dam at mile 33.6, and upstream to Fontana Dam at mile 61.0. The model for Tellico Reservoir to Chilhowee Dam was tested for adequacy by comparing its results with steady-state profiles at 1,000,000 and 2,000,000 cfs computed by the standard-step method. Minor decreases in conveyance in the unsteady flow model yielded good agreement. The average conveyance correction found necessary in the reach below Chilhowee Dam to make the unsteady flow model agree with the standard-step method was also used in the river reach from Chilhowee to Fontana Dam.

The Fort Loudoun and Tellico unsteady flow models were joined by a canal unsteady flow model. The canal was modeled with five equally-spaced cross Sections at 525-foot intervals for the 2,100-foot-long canal.

The unsteady flow routing model for the 72.4-mile-long Watts Bar Reservoir was divided into thirty-four 2.13-mile reaches. The model was verified at two gauged points within the reservoir using 1963 flood data.

The unsteady flow mathematical model for the total 58.9-mile-long Chickamauga Reservoir was divided into twenty-eight 2.1-mile reaches providing twenty-nine equally-spaced grid points. The grid point at mile 483.62 is nearest to the plant, mile 484.5. The unsteady flow model was verified at four gauged points within Chickamauga Reservoir using 1973 flood data. This differs from the previous submission in that the 1973 flood was added for verification, replacing the 1963 flood. The 1973 flood occurred during preparation of the FSAR and therefore, was not available for verification. The 1973 flood is the largest which has occurred since closure of South Holston Dam in 1950. Comparisons between observed and computed stages in Chickamauga Reservoir are shown in Figure 2.4.3-7.

It is impossible to verify the models with actual data approaching the magnitude of the probable maximum flood. The best remaining alternative was to compare the model elevations in a state of steady flow with elevations computed by the standard step method. This was done for steady flows ranging up to 1,500,000 cfs. An example shown by the rating curve of Figure 2.4.3-8 shows the good agreement.

The watershed runoff model was verified by using it to reproduce the March 1963 and March 1973 floods; the largest recorded since closure of South Holston Dam. This differs from the previous submission in that the 1973 flood was added for verification, replacing the 1957 flood. Observed volumes of precipitation excess were used in verification. Comparisons between observed and computed outflows from Watts Bar and Chickamauga Dams for the 1973 and 1963 floods are shown in Figures 2.4.3-9 and 2.4.3-10, respectively.

From a study of the basic units of the predicting system and its response to alterations in various basic elements, it is concluded that the model serves adequately and conservatively to determine maximum flood levels.

2.4.3.4 Probable Maximum Flood Flow

The probable maximum flood discharge at SQN was determined to be 1,236,000 cfs. The hydrograph of this flood is shown in Figure 2.4.3-11. This flood would result from the total basin downstream orographically fixed storm pattern, Figure 2.4.3-4, more completely described in Section 2.4.3.1. The dam safety modification to Fort Loudon, Tellico, and Watts Bar Dams enable them to safely pass the PMF. The west saddle dike at Watts Bar Dam would be overtopped and breached. Chickamauga would be overtopped but was assumed not to fail as a failure would reduce the flood level at the site.

In the original FSAR analysis, the flood would overtop and breach the earth embarkments of Fort Loudon, Tellico, and Watts Bar Dams upstream.

A second candidate storm is the 7,980-square-mile storm centered at Bulls Gap, Tennessee, 50 miles northeast of Knoxville, shown in Figure 2.4.3-2. The flood from this storm would overtop and breach the west saddle dike at Watts Bar Dam. The flood from the 7,980-square-mile storm is the less critical storm and would produce a probable maximum discharge less than from the total basin storm.

The previous PMF evaluations considered candidate situations involving upstream tributary dams Douglas and Watauga. These two situations were shown at that time to be non-governing. Dam safety modifications have since eliminated the potential failures of these dams. Therefore, these two candidate situations have been eliminated.

Reservoir routings started at median observed elevations for the mid-March large area PMP storms. Median levels were reevaluated using operating experience for:

1. The total project period, or

2. The five-year period, 1972-1976, for those projects whose operating guides were changed in 1971.

Because of the wet years of 1972-1975 and the operating guide changes, median elevations were higher for 8 of the 13 tributary reservoirs where routing is involved.

Normal reservoir operating procedures were used in the antecedent storm. These used turbine and sluice discharge in the tributary reservoirs. Turbine discharges are not used in the main river reservoirs after large flood flows develop because head differentials are too small. Normal operating procedures were used in the principal storm, except that turbine discharge was not used in either the tributary or main river dams.

All gates were determined to be operable without failures during the flood. Gates on main river dams would be fully raised, thus requiring no additional operations by the last day of the storm, which is before the structures and access roads would be inundated.

Median initial reservoir elevations were used at the start of the storm sequence used to define the PMF to be consistent with statistical experience and to avoid unreasonable combinations of extreme events. As a result, 53 percent of the total reserved system flood detention capacity was occupied at the start of the main flood. This is considered to be amply conservative. The statement made in the PSAR and subsequent versions of the FSAR that 67 percent of the reserved system detention capacity was occupied at the start of the main storm was in error. The correct percentage was 33. The remaining reserved system detention capacity was 67 percent. This erroneous statement was first made in the PSAR and was copied in subsequent statements where the routings were the same. In the revised analysis submitted in Amendment 51, all reservoirs are higher or about the same elevation at the beginning of the main storm as a result of the revised starting levels explained in Section 2.4.3.4 of the FSAR. This conservative change results in 53 percent of the total reservoir system detention capacity being occupied at the start of the main flood rather than 33 percent in previous studies.

Neither the initial reservoir levels nor the operating rules would have significant effect on maximum flood discharges and elevations at the plant site because spillway capacities, and hence, uncontrolled conditions, were reached early in the flood.

The procedures used to determine if and when an overtopped earth embankment would fail and the procedures for computing the effect of such failures are described in 2.4.4.2 and 2.4.4.3.

In testing the adequacy of the yard drainage system, to safely pass the site PMP, all underground drains were assumed clogged and the surface drainage to be full.

2.4.3.5 Water Level Determinations

The elevation hydrograph of the controlling PMF, cresting at elevation 719.6, is shown on Figure 2.4.3-12. Computation of both the probable maximum discharge hydrograph (Figure 2.4.3-11) and the corresponding elevation hydrograph was accomplished concurrently using the unsteady flow techniques described in Section 2.4.3.3.

The less critical total area storm-producing PMP depths on the 7,980-square-mile watershed would produce crest elevation 718.9 at the plant site.

Maximum water levels at buildings expected to result from the local plant PMP were determined using two methods: (1) when flow conditions controlled, standard-step backwater from the control section using peak discharges estimated from rainfall intensities corresponding to the time of concentration of the area above the control section or (2) when ponding or reservoir-type conditions controlled, storage routing the inflow hydrograph equivalent to the PMP hydrograph with 2-minute time intervals.

The separate watershed subareas and flowpaths are shown on Figure 2.4.3-13a.

Runoff from the 24.5 acre western plant site will flow either northwest to a 27-foot channel along the main plant tracks and then across the main access highway or to the south over the swale in Perimeter Road near the 161-kV switchyard and across Patrol Road to the river. Because the 500-kV switchyard and TEACP building areas are essentially level, peak outflows from this subarea were determined using method (2). These peak outflows were then combined with discharge estimates from the remaining areas, using method (1), to establish peak water surface profiles from both the north channel and south swale. The maximum water surface elevation is below critical floor elevation 706 and occurs near the east-west centerline of the Turbine Building.

The 28.9 acre eastern plant site was evaluated as two areas. Area 1 (19.7 acres) including the diesel generator, unit two reactor building, field services/storage buildings and adjacent areas. Runoff from area 1 will flow to the south along the perimeter road and across the pavement with low point elevation 705.0 to the discharge channel. Maximum water surface elevations computed using method (1) were less than elevation 706. Area 2 (9.2 acres) includes the office/service, unit one reactor building, office/power stores buildings, intake pumping station, and adjacent areas. Runoff from area 2 will flow to the north and west along the ERCW pumping station access road to the intake channel and river. Maximum water surface elevation computed using method (2) is less than elevation 706.

Underground drains were assumed clogged throughout the storm. For fence sections, the Manning's n value was doubled to account for increased resistance to flow and the potential for debris blockage.

The only stream adjacent to SQN is the Tennessee River. There are no streams within the site. The 1 percent-chance floodplain of the Tennessee River at the site is delineated on Figure 2.4.3-14. Details of the analyses used in the computation of the 1-percent-chance flood flow and water elevation are described in a study made by TVA for the Federal Insurance Administration (FIA) and published in February 1979 [5].

The only structures located in the 1-percent-chance floodplain are transmission towers, the intake pumping station skimmer wall, and the ERCW pump station deck. The ERCW pumps are located on the pump station deck at elevation 720.5, well above the 1-percent-chance flood level. These structures are shown on Figure 2.4.3-14.

The structures that are located in the floodplain will not alter flood flows or elevations. The 20,650-square-mile drainage area is not altered and the reduction in flow area at the site is infinitesimal and at the fringe of the flooded area. The site will be well maintained and any debris generated from it will be minimal and will present no problem to downstream facilities.

2.4.3.6 Coincident Wind-Wave Activity

Some wind waves are likely when the probable maximum flood crests at SQN. The flood would be near its crest for a day beginning about 2-1/2 days after cessation of the probable maximum storm. The day of occurrence would most likely be in the month of March or possibly the first week in April.

A conservatively high velocity of 45 miles per hour over water was adopted to associate with the probable maximum flood crest. A 45-mile- per-hour overwater velocity exceeds maximum March one-hour velocities observed in severe March windstorms of record in a homogeneous region as reported by the Corps of Engineers [6].

That a 45-mile-per-hour overwater wind is conservatively high, is supported also by an analysis of March day maximum winds of record collected at Knoxville and Chattanooga, Tennessee. The records analyzed varied from 30 years at Chattanooga to 26 years at Knoxville, providing samples ranging from 930 to 806 March days. The recorded fastest mile wind on each March day was used rather than hourly data because this information is readily available in National Weather Service publications. Relationships to convert fastest mile winds to winds of other durations were developed from Knoxville and Chattanooga wind data contained in USWB Form 1001 and the maximum storm information contained in Technical Bulletin No. 2 [6]. From the wind frequency analysis it was determined that the 45-mile-per-hour overwater wind for the critical minimum duration of 20 minutes had an 0.1 percent chance of occurrence on any given March day.

The probability that this wind might occur on the specific day that the probable maximum flood would crest is extremely remote. Even assuming that the flood was to crest once during the 40-year plant life, the probability of the wind occurring on that particular day is in the order of 1×10^{-6}.

TVA estimates that the probability of the flood and wind occurring in a given year on the same day to be in the order of 1×10^{-11} to 1×10^{-13}.

Computation of wind waves was made using the procedures of the Corps of Engineers [7]. The critical directions were from the north-northwest and northeast with effective fetches of 1.7 and 1.5 miles, respectively. For the 45-mile-per-hour wind, 99.6 percent of the waves approaching the plant would be less than 4.2- and 4.0-foot-high crest to trough for the 1.7- and 1.5-mile fetches as shown on Figures 2.4.3-15 and 2.4.3-16. Maximum water surfaces in the reservoir approaching the plant would be 2.8 and 2.7 feet above the maximum computed level or elevations 722.4 and 722.3, respectively.

The maximum water level attained due to the PMF plus wind-wave activity is elevation 723.8 at the ERCW pump station and the nuclear island structures (shield, auxiliary, and control building).

The wind waves approaching the Diesel Generator Building and cooling towers break before reaching the structures due to the shallow depth of water. The topography surrounding these structures is such that the wind waves will break on a steeper slope (4H:1V) than the slope immediately adjacent to the structures. This is shown by Figure 2.4.3-17.

The runup estimates are calculated on the basis that the incoming wind waves break before reaching the structure and then reform for a shallower water depth. This reformed wave then approaches the structure. The runups are lower than the maximum reservoir level due to the small wave height for the reformed wave, the shallow water, and the very shallow slope before reaching the structures.

Wind-wave runup coincident with the maximum flood level for the diesel generator building and cooling towers is elevation 721.8. The level inside structures that are allowed to flood is elevation 720.1. The flood elevations used as design bases are given in Section 2.4A.1.1.

<u>Dynamic Effect of Waves</u>

1. Nonbreaking Waves

   The dynamic effect of nonbreaking waves on the walls of safety- related structures was investigated using the Rainflow Method [8]. As a result of this investigation, concrete and reinforcing stresses were found to be within allowables.

2. Breaking Waves

   The dynamic effect of breaking waves on the walls of safety-related structures was investigated using a method developed by D. D. Gaillard and D. A. Molitar. The concrete and reinforcing stresses were found to be less than the allowable stresses using this method.

3. Broken Waves

The dynamic effect of broken waves on the walls of safety-related structures was investigated using a method proposed by the U.S. Army Coastal Engineering Research Center [7]. This method of design yielded concrete and reinforcing stresses within allowable limits.

All safety-related structures are designed to withstand the static and dynamic effects of the water and waves as stated in Section 2.4.2.2.

2.4.4 Potential Dam Failures (Seismically and Otherwise Induced)

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2.4.5 Probable Maximum Surge and Seiche Flooding (HISTORICAL INFORMATION)

Chickamauga Lake level during nonflood conditions could be no higher than elevation 685.44, top of gates, and is not likely to exceed elevation 682.5, normal summer level, for any significant time. No conceivable hurricane or cyclonic-type winds could produce the over 20 feet of wave height required to reach plant grade elevation 705.

2.4.6 Probable Maximum Tsunami Flooding (HISTORICAL INFORMATION)

Because of its inland location, SQN is not endangered by tsunami flooding.

2.4.7 Ice Flooding and Landslides (HISTORICAL INFORMATION)

Because of the location in a temperate climate, significant amounts of ice do not form on the Tennessee Valley rivers and lakes. SQN is in no danger from ice flooding.
Flood waves from landslides into upstream reservoirs pose no danger because of the absence of major elevation relief in nearby upstream reservoirs and because the prevailing thin soils offer small slide volume potential compared to the available detention space in reservoirs.

2.4.8 Cooling Water Canals and Reservoirs (HISTORICAL INFORMATION)

2.4.8.1 Canals

The intake channel, as shown in Figure 2.1.2-1, referenced in paragraph 2.4.1.1, is designed for a flow of 2,250 cfs. At minimum pool (elevation 675), as shown in Figure 2.4.8-1, this flow is maintained at a velocity of 2.7 fps.

The protection of the intake channel slopes from wind-wave activity is afforded by the placement of riprap, shown in Figure 2.4.8-1, in accordance with TVA Design Standards, from elevation 665 to elevation 690. The riprap is designed for a wind velocity of 45 mph.

2.4.8.2 Reservoirs (HISTORICAL INFORMATION)

Chickamauga Reservoir provides the cooling water for SQN. This reservoir and the extensive TVA system of upstream reservoirs, which regulate inflows, are described in Table 2.4.1-1. The location in an area of ample runoff and the extensive reservoir system assures sufficient cooling waterflow for the plant.

2.4.9 Channel Diversions (HISTORICAL INFORMATION)

Channel diversion is not a potential problem for the plant. There are now no channel diversions upstream of SQN that would cause diverting or rerouting of the source of plant cooling water, and none are anticipated in the future. The floodplain is such that large floods do not produce major channel meanders or cutoffs. Carbon 14 dating of material at the high terrace levels shows that the Tennessee River has essentially maintained its present alignment for over 35,000 years. The topography is such that only an unimaginable catastrophic event could result in flow diversion above the plant.

2.4.10 Flooding Protection Requirements

Assurance that safety-related facilities are capable of surviving all possible flood conditions is provided by the discussions given in Paragraph 2.4.2.2, Section 3.4, Section 3.8, and Appendix 2.4A.

The plant is designed to be shutdown and remain in a safe shutdown condition for any rainfall flood exceeding plant grade, up to the "design basis flood" discussed in Subsection 2.4.3, and for lower, seismic-caused floods discussed in Subsection 2.4.4. Any rainfall flood exceeding plant grade will be predicted at least 27 hours in advance by TVA's Reservoir Operations. Warning of seismic failure of key upstream dams will be available at the plant at least 27 hours before a resulting flood surge would reach plant grade. Hence, there is adequate time to prepare the plant for any flood.

See Appendix 2.4A for a detailed presentation of the flood protection plan.

2.4.11 Low Water Considerations

Because of its location on Chickamauga Reservoir, maintaining minimum water levels at SQN is not a problem. The high rainfall and runoff of the watershed and the regulation afforded by upstream dams assure minimum flows for plant cooling.

2.4.11.1 Low Flow in Rivers and Streams

The targeted minimum water level at SQN is elevation 675, which corresponds to the lower bound of the winter operating zone for Chickamauga Reservoir. On rare occasions, the water level may be slightly lower (.1 or .2 tenths of a foot) for a brief period of time (hours) due to hydropower peaking operations at Chickamauga and Watts Bar Dams during the winter season. A minimum elevation of 675 must be maintained in order to provide the prescribed commercial navigation depth in Chickamauga Reservoir.

The “Preferred Alternative” Reservoir Operating Policy was designed to provide increased recreation opportunities while avoiding or reducing adverse impacts on other operating objectives and resource areas. Under the Preferred Alternative, TVA will no longer target specific summer pool elevations at 10 tributary storage reservoirs. Instead, TVA tends to manage the flow of water through the system to meet operating objectives. TVA will use weekly average system flow requirements to limit the drawdown of 10 tributary reservoirs (Blue Ridge, Chatuge, Cherokee, Douglas, Fontana, Nottely, Hiawassee, Norris, South Holston, and Watauga) June 1 through Labor Day to increase recreation opportunities. For four main stem reservoirs (Chickamauga, Guntersville, Wheeler, and Pickwick), summer operating zones will be maintained through Labor Day. For Watts Bar Reservoir, the summer operating zone will be maintained through November 1.

Weekly average system minimum flow requirements from June 1 through Labor Day, measured at Chickamauga Dam, are determined by the total volume of water in storage at the 10 tributary reservoirs compared to the seasonal total tributary system minimum operating guide (SMOG). If the volume of water in storage is above the SMOG, the weekly average system minimum flow requirement will be increased each week from 14,000 cfs (cubic feet per second) the first week of June to 25,000 cfs the last week of July.

Beginning August 1 and continuing through Labor Day, the weekly average flow requirement will be 29,000 cfs. If the volume of water in storage is below the SMOG curve, 13,000 cfs weekly average minimum flows will be released from Chickamauga Dam between June 1 and July 31, and 25,000 cfs weekly average minimum flows will be released from August 1 through Labor Day.

Within these weekly averages, TVA has the flexibility to schedule daily and hourly flows to best meet all operating objectives, including water supply for TVA's thermal power generating plants. Flows may be higher than these stated minimums if additional releases are required at tributary or main river reservoirs to maintain allocated flood storage space or during critical power situations to maintain the integrity and reliability of the TVA power supply system.

In the assumed event of complete dam failure of the north embankment of Chickamauga Dam resulting in a breach width of 400 feet, with the Chickamauga pool at elevation 681, the water surface at SQN will begin to drop within one hour and will fall to elevation 641 about 60 hours after failure. TVA will begin providing steady releases of at least 14,000 cfs at Watts Bar within 12 hours of Chickamauga Dam failure to assure that the water level recession at SQN does not drop below elevation 641. The estimated minimum river flow requirement for the ERCW system is only 45 cfs.

Reference: Programmatic Environmental Impact Statement, TVA Reservoir Operations Study, Record of Decision, May 2004.

2.4.11.2 Low Water Resulting From Surges, Seiches, or Tsunamis

Because of its inland location on a relatively small, narrow lake, low water levels resulting from surges, seiches, or tsunamis are not a potential problem.

2.4.11.3 Historical Low Water

From the beginning of stream gauge records at Chattanooga in 1874 until the closure of Chickamauga Dam in January 1940, the lowest daily flow in the Tennessee River at SQN was 3,200 cfs on September 7 and 13, 1925. The next lowest daily flow of 4,600 cfs occurred in 1881 and also in 1883.

Since January 1942, low flows at the site have been regulated by TVA reservoirs, particularly by Watts Bar and Chickamauga Dams. Under normal operating conditions, there may be periods of several hours daily when there are no releases from either or both dams, but average daily flows at the site have been less than 5,000 cfs only 0.65 percent of the time and have been less than 10,000 cfs, 5.19 percent of the time.

On March 30 and 31, 1968, during special operations for the control of watermilfoil, there were no releases from either Watts Bar or Chickamauga Dams during the two-day period. The previous minimum daily flow was 700 cfs on November 1, 1953. TVA no longer conducts special operations for the control of water milfoil on Chickamauga Reservoir.

Since January 1940, water levels at the plant have been controlled by Chickamauga Reservoir. Since then, the minimum level at the dam was 673.3 on January 21, 1942. TVA no longer routinely conducts pre-flood drawdowns below elevation 675 at Chickamauga Reservoir and the minimum elevation in the past 20 years (1987 - 2006) was 674.97 at Chickamauga head water.

2.4.11.4 Future Control

Future added controls which could alter low flow conditions at the plant are not anticipated because no sites that would have a significant influence remain to be developed.

2.4.11.5 Plant Requirements

2.4.11.5.1 Two-Unit Operation

The safety related water supply systems requiring river water are: the essential raw cooling water (ERCW) (Subsection 9.2.2), and that portion of the high-pressure fire-protection system (HPFP) (Subsection 2.4A.4.1) supplying emergency feedwater to the steam generators. The fire/flood mode pumps are submersible pumps located in the intake pumping station. The intake pumping station sump is at elevation 648. The entrances to the suction pipes for the fire/flood mode pumps are at elevation 651 feet 0 inches which is 32 feet and 24 feet, respectively, below the maximum normal water elevation of 683.0 and the normal minimum elevation of 675.0 for the reservoir. Abnormal reservoir level is 670 feet with a technical specification limit of 674 ft. For flow requirements of the HPFP during engineering safety feature operation, see subsection 9.5.1. The ERCW pump sump in this independent station is at elevation 625.0, which is 58.0' below maximum normal water elevation, 50.0' below minimum normal water elevation, and 16' below the 641' minimum possible elevation of the river.

Since the ERCW pumping station has direct communication with the river for all water levels and is above probable maximum flood, the ERCW system for two-unit plant operation always operates in an open cooling cycle.

2.4.11.6 Heat Sink Dependability Requirements

The ultimate heat sink, its design bases and its operation, under all normal and credible accident conditions is described in detail in Subsection 9.2.5. As discussed in Subsection 9.2.5, the sink was modified by a new essential raw cooling water (ERCW) pumping station before unit 2 began operation. The design basis and operation of the ERCW system, both with the original ERCW intake station and with the new ERCW intake station, is presented in Subsection 9.2.2. As described in these sections, the new ERCW station is designed to guarantee a continued adequate supply of essential cooling water for all plant design basis conditions. This position is further assured since additional river water may be provided from TVA's upstream multiple-purpose reservoirs, as previously discusssed during Low Flow in Rivers and Streams.

2.4.11.6.1 Loss of Downstream Dam

The loss of downstream dam will not result in any adverse effects on the availability of water to the ERCW system or these portions of the original HPFP supplying emergency feedwater to the steam generator. Loss of downstream dam reduces ERCW flow about 7% to the component cooling and containment spray heat exchangers. ERCW flow does not decrease below that assumed in the analysis (analyzed as 670' to 639') until more than two hours after the peak containment temperature and pressure occurs. (See Section 6.2.1.3.4.)

2.4.11.6.2 Adequacy of Minimum Flow

The cooling requirements for plant safety-related features are provided by the ERCW system. The required ERCW flow rates under the most demanding modes of operation (including loss of downstream dam) as given in Subsection 9.2.2 are contained in TVA calculations and flow diagrams.

Two other safety-related functions may require water from the ultimate heat sink; these are fire protection water (refer to Subparagraph 2.4.11.6.3) and emergency steam generator feedwater (refer to Subsection 10.4.7). These two functions have smaller flow requirements than the ERCW systems. Consequently, the relative abundance of the river flow, even under the worst conditions, assures the availability of an adequate water supply for all safety-related plant cooling water requirements.

River operations methodology for maintaining UHS temperatures are discussed in “Monitoring and Moderating Sequoyah Ultimate Heat Sink,” Reference 21.

2.4.11.6.3 Fire-Protection Water

Refer to the Fire Protection Report discussed in Section 9.5.1.

2.4.12 Environmental Acceptance of Effluents

The ability of surface waters near SQN, located on the right bank near Tennessee River Mile (TRM) 484.5, to dilute and disperse radioactive liquid effluents accidentally released from the plant is discussed herein. Routine radioactive liquid releases are discussed in Section 11.2.

The Tennessee River is the sole surface water pathway between SQN and surface water users along the river. Liquid effluent from SQN flows into the river from a diffuser pond through a system of diffuser pipes located at TRM 483.65. An accidental, radioactive liquid effluent release from SQN would enter the Tennessee River after it reached the diffuser pond and entered the diffuser pipes. The contents of the diffuser pond enter the diffuser pipes and mix with the river flow upon discharge. The diffusers are designed to provide rapid mixing of the discharged effluent with the river flow. The flow through the diffusers is driven by the elevation head difference between the diffuser pond and the river [1](McCold 1979). Descriptions of the diffusers and SQN operating modes are given in Paragraph 10.4.5.2. Flow is discharged into the diffuser pond via the blowdown line, ERCW System (Subsection 9.2.2) and CCW System (Subsection 10.4.5). A layout of SQN is given in Figures 2.1.2-1 and 2.1.2-2. Two pipes comprise the diffuser system and are set alongside each other on the river bottom. They extend from the right bank of the river into the main channel. The main channel begins near the right bank of the river and is approximately 900 feet wide at SQN [1] (McCold, 1979). Each diffuser pipe has a 350-foot section through which flow is discharged into the river. The downstream diffuser leg discharges across a section 0 to 350 feet from the right bank of the main channel. The upstream diffuser leg starts at the end of the downstream diffuser leg and discharges across a section 350 to 700 feet from the right bank of the main channel. The two diffusers therefore provide mixing across nearly the entire main channel width.

The river flow near SQN is governed by hydro power operations of Watts Bar Dam upstream (TRM 529.9) and Chickamauga Dam downstream (TRM 471.0). The backwater of Chickamauga Dam extends to Watts Bar Dam. Peaking hydro power operations of the dams cause short periods of zero (i.e., stagnant) and reverse (i.e., upstream) flow near the plant. Effluent released from the diffusers during these zero and reverse flow periods will not concentrate near the plant or affect any water intake upstream. The maximum flow-reversal during 1978-1981 were not long enough to cause discharge from the diffusers to extend upstream to the SQN intake [2] (El-Ashry, 1983), which is the nearest intake and located at the right bank near TRM 484.7. Moreover, the warm buoyant discharge from the diffusers will tend toward the water surface as it mixes the river flow and away from the cooler, denser water found near the intake opening below the skimmer wall. The intake opening extends the first 10 feet above the riverbed elevation of about 631 feet mean sea level (MSL). The minimum flow depth at the intake is approximately 45 feet [3] (Ungate and Howerton, 1979). There are no other surface water users between the diffusers and this intake.

Subsection 2.4.13 discusses groundwater movement at SQN. Effluent released through the diffusers will have no impact on SQN groundwater sources along the banks of the river. Paragraph 2.2.3.8 discusses the effect on plant safety features from flammable or toxic materials released in the river near SQN.

The predominant transport and effect of a diffuser release is along the main channel and in the downstream direction. The nearest downstream surface water intake is located along the left bank at TRM 473.0 (Table 2.4.1-4).

A mathematical analysis is used to estimate the downstream transport and dilution of a contaminant released in the Tennessee River during an accidental spill at SQN. Only the main channel flow area without the adjacent overbank regions is considered in the analysis. The mathematical analysis of a potential spill scenario can involve: (1) a slug release, which can be modeled as an instantaneous release; (2) a continuous release, which can be modeled as a steady-state release; (3) a bank release, which can be modeled as a vertical line source; and (4) a diffuser release, which can be modeled either as a vertical line or plane source, depending on the width of the diffuser with respect to the channel width.

The following assumptions are used in the mathematical analyses to compute the minimum dilution expected downstream from SQN and, in particular, at the nearest water intake.

1. Mixing calculations are based on unstratified steady flow in the reservoir. River flow, Q, is assumed to be 27,474 cubic feet per second (cfs), which is equalled or exceeded in the reservoir approximately 50 percent of the time (Paragraph 2.4.1.2). Because various combinations of the upstream and downstream hydro power dam operations can create upstream flows past SQN, a minimum flow is not well defined. Larger (smaller) flows will decrease (increase) the travel time to the nearest intake but cause less than an order of magnitude change in the calculated dilution.

2. Because the SQN diffusers and the nearest downstream water intake are on opposite banks of the river, and the diffusers extend across most of the main channel width, an analysis using a diffuser release (rather than a bank release) is selected to yield a lesser (i.e., more conservative) dilution at the intake. Thus, the accidental spill is modeled as a vertical plane source across the width of the main channel.

3. The contaminant concentration profile from a slug release is assumed to be Gaussian (i.e., normal) in the longitudinal direction.

4. The contaminant is conservative, i.e., it does not degrade through radioactive decay, chemical or biological processes, nor is it removed from the reservoir by adsorption to sediments or by volatilization.

5. The transport of the contaminant is described using the motion of the river flow, i.e., the contaminant is neutrally buoyant and does not rise or sink due to gravity.

The main channel and dynamic, flow-dependent processes of the reservoir reach between SQN and the first downstream water intake are modeled as a channel of constant rectangular cross section with the following constant geometric, hydraulic and dispersion characteristics.

Longitudinal distance, x = 10.6 miles

Average water surface elevation = 678.5 feet MSL (Figure 2.4.1-3 (1))

Average width, W = 1175 feet

Average depth, H = 50 feet

Average velocity, U (= Q/(W H)) = 0.468 feet per second (fps)

Average travel time (for approximate peak contaminant), t (= x/U) = 1.4 days

Manning coefficient n (surface roughness) = 0.03

Longitudinal dispersion parameter, alpha = 200

where: alpha = E_x / (H u)

E_x = constant longitudinal dispersion coefficient (square feet per second)

u = shear velocity (fps) = $\sqrt{gRS}$

g = acceleration due to gravity = 32.174 ft/s^2

R = hydraulic radius (ft)

S = slope of the energy line (ft/ft)

The average width and depth were estimated from measurements of 9 cross sections in the reach [4] (TVA) [5] (TVA). For wide channels (i.e., large width-to-depth ratio), the hydraulic radius can be approximated as the average depth. The value of alpha = 200 is on the conservative (i.e., low) side [6] (Fischer, et al., 1979). The value of the Manning coefficient n is representative for natural rivers [7] (Chow, 1959).

The equation used to describe the maximum downstream activity (or concentration), C, at a point of interest due to an instantaneous plane source release of volume V is [8] (Guide 1.113):

$$\frac{C}{C_o} = \frac{V}{W H \sqrt{4 \pi E_x t}} \quad (2.4.12\text{-}1)$$

where:

C_o = initial activity (or concentration) in the plant of the released contaminant

π = 3.14156

Any consistent set of units can be used on each side of Equation 2.4.12-1 (e.g., C and C_o in mCi/ml; V in cf; W and H in ft; E_x in ft^2/s; t in s).

The term, C/C_o, is the relative (i.e., dimensionless) activity (or concentration) and its reciprocal is the dimensionsless dilution factor. Equation 2.4.12-1 simplifies to C/C_o = 8.3E-10 * V (V expressed in cubic feet (cf)) when the parameters are substituted and the Manning equation [7] (Chow, 1959) is used in the definition of the shear velocity, u. In the substitution, u = 0.028 ft/s and E_x = 282.1 ft^2/s.

The equation used to describe the maximum downstream concentration at a point of interest due to a continuous plane source release rate, Q_s, where $Q_s << Q$, is [8] (Guide 1.113):

$$\frac{C}{C_o} = \frac{Q_s}{Q} \qquad (2.4.12\text{-}2)$$

Any consistent set of units can be used on each side of Equation 2.4.12-2 (e.g., C and C_o in mCi/ml; Q_s and Q in cfs).

Equation 2.4.12-2 simplifies to $C/C_o = 3.64E\text{-}05 * Q_s$ (Q_s expressed in cfs) for Q = 27,474 cfs.

Examples of quantities and concentrations of potential contaminant releases and the use of Equations 2.4.12-1 and 2.4.12-2 follow. Because C_o is defined as the in-plant activity (or concentration) and not that of the diffuser release, an estimate of the dilution of liquid waste occurring in the diffuser pond and diffuser pipes is not needed. This is because the flow available for dilution in the plant (e.g., CCW and ERCW) is taken from and returned to the river. Only effluent extraneous to the river flow requires consideration in the analyses to calculate the dilution. More information on the possible means which liquid waste from the plant enters the diffuser pond is contained in Subsection 10.4.5.

The largest outdoor tanks whose contents flow into the diffuser pond are the two condensate storage tanks (Paragraph 11.2.3.1), which each have an overflow capacity of 398,000 gallons. Liquid waste that reaches the diffuser pond enters the Tennessee River through the diffuser system. The diffuser pond is approximately 2000 feet long and 500 feet wide with a depth that, although it depends on the Chickamauga Reservoir elevation, averages about 10 feet [9] (McIntosh, et al., 1982). The design flow residence time of the pond is approximately one hour (i.e., diffuser design flow is 2,480 cfs at maximum plant capacity [3] [Ungate and Howerton, 1979]).

For example, assume an instantaneous plane source release into the Tennessee River of the contents of one condensate storage drain tank. Assume the full 398,000 gallon (53,210 cf) volume contains Iodine-131 (I-131) at an activity of 1.5E-06 mCi/gm (Table 10.4.1-1). From Equation 2.4.12-1, the activity, C, at the first downstream water intake would be 6.6E-11 mCi/gm, which is within the acceptable limit [10] (CFR) for soluble I-131.

For a continuous plane source release, assume the contents of the 398,000 gallon (53,210 cf) floor drain tank leak out steadily over a 24-hour period. The effective release rate is 0.6 cfs at an activity of 1.5E-06 mCi/gm. The expected activity at the first downstream water intake would be 3.4E-11 mCi/gm using Equation 2.4.12-2 and is within the acceptable limit [10] (CFR) for soluble I-131.

REFERENCES (for Section 2.4.12 only)

[1] McCold, L. N. (March 1979), "Model Study and Analysis of Sequoyah Nuclear Plant Submerged Multiport Diffuser," TVA, Division of Water Resources, Water System Development Branch, Norris, TN, Report No. WR28-1-45-103.

[2] El-Ashry, Mohammed T., Director of Environmental Quality, TVA, February 1983 letter to Paul Davis, Manager, Permit Section, Tennessee Division of Water Quality Control, SEQUOYAH NUCLEAR PLANT---NPDES PERMIT NO. T0026450.

[3] Ungate, C. D., and Howerton, K. A. (April 1978; revised March 1979), "Effect of Sequoyah Nuclear Plant Discharges on Chickamauga Lake Water Temperatures," TVA, Division of Water Management, Water Systems Development Branch, Norris, TN, Report No. WR28-1-45-101.

[4] TVA, Chickamauga Reservoir Sediment Investigations, Cross Sections, 1940-1961, Division of Water Control Planning, Hydraulic Data Branch.

[5] TVA, Measured Cross Sections of Chickamauga Reservoir, 1972, Flood Protection Branch.

[6] Fischer, H. B., List, E. J., Koh, R.C.Y., Imberger, J., Brooks, N. H. (1979), Mixing in Inland and Costal Waters, Academic Press, New York.

[7] Chow, V. T. (1959) Open-Channel Hydraulics, McGraw-Hill, New York.

[8] United States Nuclear Regulatory Commission, Office of Standards Development, Regulatory Guide 1.113 (April 1977), "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," Revision 1.

[9] McIntosh, D. A., Johnson, B. E. and Speaks, E. B. (October 1982), "A Field Verification of Sequoyah Nuclear Plant Diffuser Performance Model: One-Unit Operation," TVA, Office of Natural Resources, Division of Air and Water Resources, Water Systems Development Branch, Norris, TN, Report No. WR28-1-45-110.

[10] 10 CFR Part 20, Appendix B, Table II, Column 2.

[11] TVA SQN Calculation SQN-SQS2-0242, SQN Site Iodine-131 Release Concentration in Tennessee River.

2.4.13 Groundwater (HISTORICAL INFORMATION)

2.4.13.1 Description and Onsite Use

The peninsula on which SQN is located is underlain by the Conasauga Shale, a poor water-bearing formation. About 2,000 feet northwest of the plant site, the trace of the Kingston Fault separates this outcrop area of the Conasauga Shale from a wide belt of Knox Dolomite. The Knox is the major water bearing formation of eastern Tennessee.

Groundwater in the Conasauga Shale occurs in small openings along fractures and bedding planes; these rapidly decrease in size with depth, and few openings exist below a depth of 300 feet. Groundwater in the Knox Dolomite occurs in solutionally enlarged openings formed along fractures and bedding planes and also in locally thick cherty clay overburden.

There is no groundwater use at SQN.

2.4.13.2 Sources

The source of groundwater at SQN is recharged by local, onsite precipitation. Discharge occurs by movement mainly along strike of bedrock, to the northeast and southwest, into Chickamauga Lake. Rises in the level of Chickamauga Lake result in corresponding rises in the water table and recharge along the periphery of the lake, extending inland for short distances. Lateral extent of this effect varies with local slope of the water table, but probably nowhere exceeds 500 feet. Lowering levels of Chickamauga Lake results in corresponding declines in the water table along the lake periphery, and short-term increase in groundwater discharge.

When SQN was initially evaluated in the early 1970s, it was in a rural area, and only a few houses within a two-mile radius of the plant site were supplied by individual wells in the Knox Dolomite (see Table 2.4.13-1, Figure 2.4.13-1). Because the average domestic use probably does not exceed 500 gallons per day per house, groundwater withdrawal within a two-mile radius of the plant site was less than 50,000 gallons per day. Such a small volume withdrawal over the area would have essentially no effect on areal groundwater levels and gradients. Although development of the area has increased, public supplies are available and overall groundwater use is not expected to increase.

Public and industrial groundwater supplies within a 20 mile radius of the site in 1985 are listed in Table 2.4.13-2. The area groundwater gradient is towards Chickamauga Lake, under water table conditions, and at a gradient of less than 120 feet per mile. The water table system is shallow, the surface of which conforms in general to the topography of the land surface. Depth to water ranges from less than 10 feet in topographically low areas to more than 75 feet in higher areas underlain by Knox Dolomite. Figure 2.4.13-2 is a generalized water-table map of SQN, based on water level data from five onsite observation wells, and in private wells adjacent to the site in April 1973, and also based on surface resistivity measurements of depth to water table made in 1972.

Because permeability across strike in the Conasauga Shale is extremely low, and nearly all water movement is in a southwest-northeast direction, along strike, the Conasauga-Knox Dolomite

Contact is a hydraulic barrier, across which only a very small volume of water could migrate in the event large groundwater withdrawals were made from the adjacent Knox.

Although some water can cross this boundary, the permeability normal to strike of the Conasauga is too low to allow development of an areally extensive cone of depression.

Groundwater recharge occurs to the Conasauga Shale at the plant site. Recharge water moves no more than 3,000 feet before being discharged to Chickamauga Lake.

2.4.13.3 <u>Accident Effects</u>

Design features in SQN further protect groundwater from contamination.

Category I structures in the SQN facility are designed to assure that all system components perform their designed function, including maintenance of integrity during earthquake.

Buildings in which radioactive liquids could be released due to the equipment failure, overflow, or spillage are designed to retain such liquids even if subject to an earthquake equivalent to the safe shutdown earthquake. Outdoor tanks that contain radioactive liquids are designed so that if they overflow, the overflow liquid is redirected to the building where the liquid is collected in the radwaste system. Two outdoor tanks that contain low concentrations of radioactivity at times overflow to yard drains which discharge into the diffuser pond. Overflow liquid is discharged near the discharge diffuser.

The capacity for dispersion and dilution of contaminants by the groundwater system of the Conasauga Shale is low. Dispersion would occur slowly because water movement is limited to small openings along fractures and bedding planes in the shale. Clay minerals of the Conasauga Shale do, however, have a relatively high exchange capacity, and some of the radioactive ions would be absorbed by these minerals. Any ions moving through the groundwater system eventually would be discharged to Chickamauga Lake.

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have a relatively high exchange capacity, and some of the radioactive ions would be absorbed by these minerals. Any ions moving through the groundwater system eventually would be discharged to Chickamauga Lake.

The Conasauga Shale is heterogeneous and anisotropic vertically and horizontally. Water-bearing characteristics change abruptly within short distances. Standard aquifer analyses cannot be applied, and meaningful values for permeability, time of travel, or dilution factors cannot be obtained.

Bedrock porosity is estimated to be less than 3 percent based on examination of results of exploratory core drilling. It is known from experience elsewhere in this region that water movement in the Conasauga Shale occurs almost entirely parallel to strike. Subsurface movement of a liquid radwaste release at the plant site would be about 1,000 feet to the northeast or about 2,000 feet to the southwest before discharge to Chickamauga Lake.

Time of travel can only be estimated as being a few weeks for first arrival, a few months for peak concentration arrival, and perhaps two or more years for total discharge. The computed mean time of travel of groundwater from SQN to Chickamauga Lake is 303 days.

No radwaste discharge would reach a groundwater user. At the nearest point, the reservation boundary lies 2,200 feet northwest of the plant site, across strike. Groundwater movement will not occur from the plant site in this direction across this distance.

During initial licensing, the radionuclide concentrations were determined for both groundwater and surface water movement to the nearest potable water intake (Savannah Valley Utility District, which is no longer in service) and found to be of no concern (see Safety Evaluation Report, March 1979, Section 2.4.4 Groundwater).

2.4.13.4 Monitoring or Safeguard Requirements

SQN is on a peninsula of low-permeability rock; the groundwater system of the site is essentially hydraulically isolated and potential hazard to groundwater users of the area is minimal. The environmental radiological monitoring program is addressed in Section 11.6.

Monitor wells 1, 2, 3, and 4 were sampled and analyzed for radioactivity during the period from 1976 through 1978. Well 5 was not monitored because of insufficient flow. An additional well (Well 6) was drilled in late 1978 downgradient from the plant and a pump sampler installed.

Wells 1, 2, 4, and 5 are each 150 feet deep, Well 6 is 250 feet deep, and Wells L6 and L7 are 75-80 feet deep. All of the wells are cased in the residuum and open bore in the Conasauga Shale.

2.4.13.5 Conclusions

SQN was designed to provide protection of groundwater resources by preventing the escape of the leaks of radionuclides. Site soils and underlying geology provide further protection in that they retard the movement of water and attenuate any contaminants that would be released. All groundwater movement is toward Chickamauga Lake. The Knox Dolomite is essentially hydraulically separated from the Conasauga Shale; therefore, offsite pumping, including future development, should have little effect upon the groundwater table in the Conasauga Shale at the plant.

Even though the potential for accidental contamination of the groundwater system is extremely low, the radiological monitoring program will provide ample lead times to mitigate any offsite contamination.

As a consequence of the geohydrologic conditions that remain unchanged from evaluations conducted in the 1970s, the information in Chapter 2.4.13 Groundwater is historical and should not be subject to updating revisions.

2.4.14 Technical Requirements and Emergency Operation Requirements

Emergency flood protection plans, designed to minimize impact of floods above plant grade on safety-related facilities, are described in Appendix 2.4A. Procedures for predicting rainfall floods, arrangements to warn of upstream dam failure floods, and lead times available and types of action to be taken to meet related safety requirements for both sources of flooding are described therein. The Technical Requirements Manual specify the action to be taken to minimize the consequences of floods.

2.4.15 References

1. U.S. Weather Bureau, "Probable Maximum and TVA Precipitation Over The Tennessee River Basin Above Chattanooga," Hydrometeorological Report No. 41, 1965.

2. U.S. Weather Bureau, "Probable Maximum and TVA Precipitation for Tennessee River Basins Up To 3,000 Square Miles in Area and Duration to 72 Hours," Hydrometeorological Report No. 45, 1969.

3. Garrison, J. M., Granju, J. P., and Price, J. T., "Unsteady Flow Simulation in Rivers and Reservoirs," Journal of the Hydraulics Division, ASCE, Vol. 95, No. HY5, Proceedings Paper 6771, September 1969, pp. 15559-1576.

4. PSAR, Phipps Bend Nuclear Plant, Docket Nos. 50-553, 50-554.

5. Tennessee Valley Authority, "Flood Insurance Study, Hamilton County, Tennessee, (Unincorporated Areas)," Division of Water Resources, February 1979.

6. U.S. Army Engineering, Corps of Engineers, Omaha, Nebraska, "Severe Windstorms of Record," Technical Bulletin No. 2, Civil Works Investigations Project CW-178 Freeboard Criteria for Dams and Levees, January 1960.

7. U.S. Army Corps of Engineers, "Computation of Freeboard Allowances for Waves in Reservoirs," Engineering Engineer Technical Letter No. 1110-2-8, August 1966.

8. U.S. Army Coastal Engineering Research Center, "Shore Protection, Planning, and Design," 3rd Edition, 1966.

9. Reference removed per Amendment 6.

10. Hinds, Julian, Creager, William P., and Justin, Joel D., "Engineering For Dams," Vol. II, Concrete Dams, John Wiley and Sons, Inc., 1944.

11. Bustamante, Jurge I., Flores, Arando, "Water Pressure in Dams Subject to Earthquakes," Journal of the Engineering Mechanics Division, ASCE Proceedings, October 1966.

12. Chopra, Anil K., "Hydrodynamic Pressures on Dams During Earthquakes," Journal of the Engineering Mechanics Division, ASCE Proceedings, December 1967.

13. Zienkiewicz, O. C., "Hydrodynamic Pressures Due to Earthquakes," Water Power, Vol. 16, September 1964, pp. 382-388.

14. Tennessee Valley Authority, "Sedimentation in TVA Reservoirs," TVA Report No. 0-6693, Division of Water Control Planning, February 1968.

15. Reference removed per Amendment 6.

16. Cristofano, E. A., "Method of Computing Erosion Rate for Failure of Earthfill Dams," Engineering and Research Center, Bureau of Reclamation, Denver 1966.

17. "The Breaching of the Oros Earth Dam in the State of Ceara, North-East Brazil," Water and Water Engineering, August 1960.

18. NRC letter to TVA dated December 8, 1989, "Chickamauga Reservoir Sediment Deposition and Erosion - Sequoyah Nuclear Plant, Units 1 and 2."

19. Programmatic Environmental Impact Statement, TVA Reservoir Operations Study, Record of Decision, May 2004.

20. Updated Predictions of Chickamauga Reservoir Recession Resulting from Postulated Failure of the South Embankment at Chickamauga Dam; TVA River System Operations and Environment, Revised June 2004 (B85 070509 001).

21. Monitoring and Moderating Sequoyah Ultimate Heat Sink, June 2004, River System Operations and Environment, River Operations, River Scheduling (B85 070509 001).

TABLE 2.4.1-1

FACTS ABOUT MAJOR TVA DAMS AND RESERVOIRS (HISTORICAL INFORMATION)

Main River Projects	River	State	Type of Dam (d)	Max. Height (Feet)	Length (Feet)	Drainage area above dam (sq. mi.)	Length of Lake (miles)	Area of Lake at Full Pool (acres)	Lake Elevation (feet above sea level)			Lake Volume (acre-feet)		Useful Controlled Storage (Ac-Fl)	Construction Started
									Ordinary Minimum	Top of Gates	Fall Pool (g)	Ordinary Minimum Elevation	Top of Gates Elevation		
Kentucky	Tenn.	Ky.	CGE	206	8,422	40,200	184.3	160,300	354	375	359	2,121,000	6,129,000	4,008,000	7-1-38
Pickwick Landing	Tenn.	Tenn.	CGE	113	7,715	32,820	52.7	43,100	408	418	414	688,000	1,105,000	417,000	3-8-35
Wilson (f)	Tenn.	Ala.	CG	137	4,535	30,750	15.5	15,500	504.5	507.88	507.5	582,000	641,000	59,000	4-14-18
Wheeler	Tenn.	Ala.	CG	72	6,342	29,590	74.1	67,100	550	556.3	556	720,000	1,071,000	351,000	11-21-33
Guntersville	Tenn.	Ala.	CGE	94	3,979	24,450	75.7	67,900	592	505.44	595	379.700	1,052,000	172,300	12-4-35
Nickajack (e)	Tenn.	Tenn.	CGE	83	3,767	21,870	46.3	10,900	632	635	634	221.600	254,600	33,000	4—54
Chickamauga	Tenn.	Tenn.	CGE	129	5,800	20,790	58.9	35,400	675	685.44	682.5	392.000	739.000	347,000	1-13-36
Watts Bar	Tenn.	Tenn.	CGE	112	2,960	17,310	72.4	39,000	735	745	741	796.000	1,175,000	379,000	7-1-39
Ft Loudon	Tenn.	Tenn.	CGE	122	4,190	9,550	55.0	14,600	807	815	813	282.000	393,000	111,000	7-8-40
TRIBUTARIES															
Tims Ford	Elk	Tenn.	E & R	170	1,470	529	34	10,700	860	895	888	294.000	617,000	323,000	3-28-66
Appalachia	Hiwassee	N.C.	CG	150	1,308	1,018	9.8	1,100	1,272	1,280	1,280	48.600	57,500	8,900	7-17-41
Hiwassee	Hiwassee	N.C.		307	1,376	968	22	6,090	1,415	1,528.5	1,524.5	71.800	434,000	362,200	7-15-36
Chatuga	Hiwassee	N.C.	E	144	2,850	189	13	7,050	1,860	1,928	1,927	18.400	240,500	222,100	7-17-41
Ocoee No. 1 (f)	Ocoee	Tenn.	CG	135	840	595	7.5	1,890	818.9	837.65	837.65	53.500	87,300	33,800	8—10
Ocoee No. 2 (f)	Ocoee	Tenn.	RFT	30	450	516	-----	-----	-----	1,115	1,115	-----	-----	-----	5---12
Ocoee No. 3	Ocoee	Tenn.	CG	110	612	496	7	621	1,112	1,425	1,435	790	4,650	3,860	7-17-41
Blue Ridge (f)	Toccoa	Ga.	E	167	1,000	232	10	3,290	1,590	1,691	1,690	12.500	196,500	184,000	11--25 (b)
Nettely	Nettely	Ga.	E & R	184	2,300	214	20	4,180	1,690	1,779	1,779	12.700	174,300	161,600	7-17-41
Melton Hill	Clinch	Tenn.	CG	103	1,020	3,343	44	5,690	790	796	795	94.500	126,000	31,500	9-6-60
Norris	Clinch	Tenn.	CGE	265	1,860	2,912	72	34,200	930	1,034	1,020	290,000	2,555,000	2,265,000	10-1-33
Tellico	Little T.	Tenn.	CGE	108	3,238	2,627	33.2	16,500	807	815	813	321,300	447,300	126,000	3-15-67
Fontana	Little T.	N.C.	CG	480	2,365	1,571	29	10,640	1,525	1,710	1,708	295,000	1,448,000	1,153,000	1-1-42
Douglas	French Bread	Tenn.	CGE	202	1,705	4,541	43.1	30,400	920	1,092	1,000	84,500	1,490,000	1,105,500	2-2-42
Cherokee	Holston	Tenn.	CGE	175	6,760	3,428	59	30,300	989	1,075	1,073	83,600	1,544,000	1,160,400	8-1-40
Fort Patrick Henry	S. Fork Holston	Tenn.	CG	95	737	1,903	10.3	872	1,258	1,263	1,263	22,700	26,900	4,290	5-14-51
Boone	S. ForkHolston	Tenn.	CGE	160	1,532	1,840	17.3	4,400	1,330	1,385	1,385	45,000	193.400	148,400	8-29-50
South Holston	S. Fork Holston	Tenn.	E & R	285	1,600	703	24.3	7,580	1,616	1,742	1,729	121.400	764.000	642,600	8-4-47 (c)
Watauga	Watauga		E & R	318	900	468	16.7	6,430	1,815	1,975	1,959	52,300	677,000	624,700	7-22-46 (c)
Great Falls (f) (in Cumberland Valley)	Caney Fork	Tenn.	CG	92	800	1,675	22	2,100	780	405.30	805.30	14,600	51,600	37,000	-15
TOTALS								638,353				8,621,490	23,732,359	15,110,860	
PUMPED STORAGE Racoon Mountain	Tenn.	Tenn.	E & R	230		----------	---------	520	1,530	-------	1,672	2,000	37,800	35,400	7-6-70

a. Foundation to operating deck.
b. Construction discontinued early in 1926; resumed in March 1929.
c. Initial construction started February 16, 1942; temporarily discontinued to conserve critical materials during war.
d. Abbreviations: CG - Concrete gravity dams. CGE - Concrete gravity with earth embankments. E - Earth fill. E&R - Earth and rock fill. RFT - Rock-filled timber.
e. Nickajack Dam replaced the old Hales Bar Dam 6 miles upstream.
f. Acquired: Wilson by transfer from U. S. Corps of Engineers in 1933; Ocoee No. 1, Ocoee No. 2, Blue Ridge, and Great Falls by purchase from TEP Co. In 1939. Subsequent to acquisition, TVA heightened and installed additional units at Wilson.
g. Full Pool Elevation is the normal upper level to which the reservoirs may be filled. Where storage space is available above this level, additional filling may be made as needed for flood control.

Table 2.4.1-2

FACTS ABOUT NON-TVA DAM AND RESERVOIR PROJECTS

(HISTORICAL INFORMATION)

ALCOA Projects	River	Drainage Area Sq. Miles	Miles Above Mouth	Maximum Height, Feet	Length Feet	Area of Lake, Acres	Length of Lake, Miles	Useful[a] Storage Acre-Feet	Construction Started
Major Dams									
Calderwood	Little Tenn	1,856	43.7	232	916	536	8	1,570	1928
Cheoah	Little Tenn	1,608	51.4	225	750	595	10	1,850	1916
Chilhowee	Little Tenn	1,976	33.6	91	1,373	1,690	8.9	6,564	1955
Nantahala	Nantahala	108	22.8	250	1,042	1,605	4.6	126,000	1930
Santeetlan	Cheoah	176	9.3	212	1,054	2,863	7.5	133,290	1926
Thorpe (Glenville)	West Fork Tuckasegee	36.7	9.7	150	900	1,462	4.5	67,100	1940
Minor Dams									
Bear Creek	East Fork Tuckasegee	75.3	4.8	215	740	476	4.6	4,536	1952
Cedar Cliff	East Fork Tuckasegee	80.7	2.4	165	600	121	2.4	698	1950
Mission (Andrews)	Hiwassee	292	106.1	50	390	61	1.46	157	1924
Queens Creek	Queens Creek	3.58	1.5	78	382	37	0.5	490	1947
Wolf Creek	Wolf Creek	15.2	1.7	180	810	176	2.2	6,909	1952
East Fork	East Fork Tuckasegee	24.9	10.9	140	385	39	1.4	906	1952
Tuckasegee	West Fork Tuckasegee	54.7	3.1	61	254	9	0.5	35	1949
Walters (Carolina P&L)	Pigeon	455	38.0	200	00000 870	340	5.5		20,500

[a] Volume between elevations of top of gates and maximum drawdown.

Table 2.4.1-3

Flood Detention Capacity
TVA Projects Above Sequoyah Nuclear Plant

Storage Reserved for Flood Control in Acre - Feet*

	January 1		March 15		Summer	
Project	Elev. (Ft)	Storage	Elev. (Ft)	Storage	Elev. (Ft)	Storage
Tributary						
Douglas	940	1,251,000	958	1,021,300	994	237,500
Watauga	1940	223,000	1951.5	155,900	1959	108,500
South Holston	1702	290,200	1713	220,100	1729	106,100
Boone	1358	92,400	1369	60,400	1382.5	10,800
Cherokee	1030	1,011,800	1042	807,800	1071	118,100
Fontana	1644	580,000	1644	580,000	1703	73,400
Norris	985	1,473,000	1000	1,113,000	1020	512,000
Hiwassee	1465	270,200	1482	216,100	1521	35,000
Chatuge	1912	93,000	1916	73,300	1926	13,900
Nottely	1745	100,000	1755	79,100	1777	12,300
Tellico	809	92,000	809	92,000	813	32,000
Main River						
Fort Loudoun	809	85,700	809	85,700	813	30,000
Watts Bar	737	312,100	737	312,100	741	165,000
Total		5,874,400		4,816,800		1,454,600

* 2001 Conditions

Table 2.4.1-4

PUBLIC AND INDUSTRIAL SURFACE WATER SUPPLIES WITHDRAWN FROM THE 98.6 MILE REACH OF THE TENNESSEE RIVER BETWEEN DAYTON TENNESSEE AND MEADE CORP. STEVENSON ALA.

(HISTORICAL INFORMATION)

Plant Name	Use (MGD)	Location	Approximate Distance From Site (River Miles)	Type Supply
City of Dayton	1.780	TRM 503.8 R	19.1 (Upstream)	Municipal
Cleveland Utilities Board	5.030	TRM 499.4 L Hiwassee RM 22.9	37.6 (Upstream)	Municipal
Bowaters Southern Paper	80.000	TRM 499.4 L Hiwassee RM 22.7	37.4 (Upstream)	Industrial & Potable
Hiwassee Utilities	3.000	TRM 499.4 L Hiwassee RM 22.5	37.2 (Upstream)	Municipal
Olin Corporation	5.000	TRM 499.4 L Hiwassee RM 22.3	37.0 (Upstream)	Industrial & Potable
Soddy-Daisy Falling Water U.D.	0.927	TRM 487.2 R Soddy Cr. 4.6 Plus 2 Wells	7.1 (Upstream)	Municipal
Sequoyah Nuclear Plant	1615.680	TRM 484.7 R	0.0	Industrial
East Side Utility	5.000	TRM 473.0 L	11.7 (Downstream)	Municipal
Chickamauga Dam	#	TRM 471.0	13.7 (Downstream)	Industrial
DuPont Company	7.200	TRM 469.9 R	14.8 (Downstream)	Industrial
Tennessee-American Water	40.930	TRM 465.3 L	19.4 (Downstream)	Municipal
Rock-Tennessee Mill	0.510	TRM 463.5 R	21.2 (Downstream)	Industrial
Dixie Sand and Gravel	0.035	TRM 463.2 R	21.5 (Downstream)	Industrial
Chattanooga Missouri Portland Cement	0.100	TRM 456.1 R	28.6 (Downstream)	Industrial
Signal Mountain Cement	2.800	TRM 454.2 R	30.5 (Downstream)	Industrial
Racoon Mount. Pump Stor.	0.561	TRM 444.7 L	40.0 (Downstream)	Industrial
Signal Mountain Cement	0.200	TRM 433.3 R	51.4 (Downstream)	Industrial
Nickajack Dam	#	TRM 424.7	60.0 (Downstream)	Industrial
South Pittsburg	0.900	TRM 418.0 R	66.7 (Downstream)	Municipal
Penn Dixie Cement	0.00001	TRM 417.1 R	67.6 (Downstream)	Industrial
Bridgeport	0.600	TRM 413.6 R	71.1 (Downstream)	Municipal
Widows Creek Stream Plant	397.440	TRM 407.7 R	77.0 (Downstream)	Industrial
Mead Corporation	4.400	TRM 405.2 R	79.5 (Downstream)	Industrial

Water usage is not metered

TABLE 2.4.1-5

Sheet 1 of 2

DAM SAFETY MODIFICATION STATUS (HYDROLOGIC)

DAM	*DAM MODIFICATION	Year Completed
Main River Dams		
Fort Loudon-Tellico	Fort Loudon Dam embarkment was raised 3.25 with a concrete wall to elevation 833.25. A 2000-foot uncontorolled spillway with crest at elevation 817 was added at Tellico Dam.	1989
Watts Bar	Embankment of main dam was raised 10 feet with earthfill/concrete wall to elevation 767. West Saddle Dike was not modified. Top of saddle dike remains at elevation 757.	1997
Nickajack	South embankment was raised 5 feet with earthfill/concrete wall to elevation 657. A 1900-foot roller-compacted concrete overflow dam with top at elevation 634 was added below the north embankment.	1992
Guntersville	Embankments were raised 7.5 feet with earthfill and concrete walls to elevation 617.5.	1996

TABLE 2.4.1-5
Sheet 2 of 2

DAM SAFETY MODIFICATION STATUS (HYDROLOGIC)

DAM	*DAM MODIFICATION	Year Completed
Tributary Dams		
Little Bear Creek	Embankment was raised 4.5 feet.	1998
Beech	Embankment was raised 4.5 feet with earthfill to elevation 475.5.	1992
Blue Ridge	Three (3) additional spillway bays were added in 1982. Embankment was raised 7 feet with earthfill/concrete wall to elevation 1713, and a 320-foot uncontrolled spillway with crest at elevation 1691 was added in 1995.	1995
Boone	Embankment was raised 8.5 feet with earthfill to elevation 1408.5.	1984
Cedar Creek	Embankment was raised 5.5 feet with concrete wall to elevation 605.	1997
Chatuge	Embankment was raised 6.5 feet with earthfill to elevation 1946.5.	1986
Cherokee	A portion (600 feet) of the non-overflow dam was raised 7.75 feet to elevation 1089.75.	1982
Douglas	A portion of the non-overflow dam was raised 13.5 feet to elevation 1022.5, and eight saddle dams were raised 6.5 feet with earthfill to elevation 1023.5.	1988
Nottely	Embankment was raised 13.5 feet with rockfill to elevation 1807.5	1988
Upper Bear Creek	Embankment was raised 4 feet with concrete wall to elevation 817.	1997
Watauga	Embankment was raised 10 feet with rockfill to elevation 2012.	1983
Fontana	Dam post-tensioned.	1988
Melton Hill	Dam post-tensioned.	1988

* These dam safety modifications enable these projects to safely pass the probable maximum flood (PMF).
Note: Plans are to armor the embankment at Chickamauga and Bear Creek Dams to permit overtopping.

Table 2.4.3-1 (Sheet 1)

PROBABLE MAXIMUM STORM RAINFALL AND PRECIPITATION EXCESS

Index No.	Area	Antecedent Storm Rain, Inches	Antecedent Storm P_e,[a] Inches	Main Storm Rain, Inches	Main Storm P_e,[b] Inches
1.	Asheville	6.44	2.99	17.40	14.72
2.	Newport, French Broad	6.44	4.04	18.50	16.51
3.	Newport, Pigeon	6.44	4.04	19.30	17.31
4.	Embreeville	6.44	4.04	15.10	13.11
5.	Nolichucky Local	6.44	4.04	15.50	13.51
6.	Douglas Local	6.44	4.86	17.10	15.88
7.	Little Pigeon River	6.44	4.04	20.90	18.91
8.	French Broad Local	6.44	4.19	18.60	16.81
9.	South Holston	6.44	4.52	12.30	10.70
10.	Watauga	6.44	4.04	13.30	11.31
11.	Boone Local	6.44	4.04	14.10	12.11
12.	Fort Patrick Henry	6.44	4.86	14.40	13.18
13.	Gate City	6.44	4.86	12.30	11.08
14.	Surgoinsville Local	6.44	4.86	14.60	13.38
15.	Cherokee Local below Surgoinsville	6.44	4.86	15.80	14.58
16.	Holston River Local	6.44	4.52	17.10	15.50
17.	Little River	6.44	4.04	21.50	19.51
18.	Fort Loudoun Local	6.44	4.04	17.60	15.61
19.	Needmore	6.44	2.99	21.20	18.52
20.	Nantahala	6.44	2.99	21.50	18.82
21.	Bryson City	6.44	2.99	19.10	16.42
22.	Fontana Local	6.44	2.99	20.70	18.02
23.	Little Tennessee Local - Fontana to Chilhowee Dam	6.44	2.99	24.00	21.32
24.	Little Tennessee Local - Chilhowee to Tellico Dam	6.44	4.04	21.00	19.01
25.	Watts Bar Local above Clinch River	6.44	4.04	15.80	13.81
26.	Norris Dam	6.44	4.86	13.80	12.58
27.	Coal Creek	6.44	4.52	14.60	13.19
28.	Clinch Local	6.44	4.52	14.90	13.49
29.	Hinds Creek	6.44	4.52	15.30	13.89
30.	Bullrun Creek	6.44	4.68	15.70	14.29

Table 2.4.3-1 (Sheet 2)
(Continued)

PROBABLE MAXIMUM STORM RAINFALL AND PRECIPITATION EXCESS

Index No.	Area	Antecedent Storm Rain, Inches	Antecedent Storm P_e,[a] Inches	Main Storm Rain, Inches	Main Storm P_e,[b] Inches
31.	Beaver Creek	6.44	4.52	16.10	14.69
32.	Clinch Local (5 areas)	6.44	4.52	15.30	13.89
33.	Local above mile 16	6.44	4.52	15.30	13.89
34.	Poplar Creek	6.44	4.52	14.90	13.49
35.	Emory River	6.44	4.52	13.10	11.69
36.	Local Area at Mouth	6.44	4.52	14.90	13.49
37.	Watts Bar Local below Clinch River	6.44	4.52	14.40	12.99
38.	Chatuge	6.44	2.99	21.40	18.72
39.	Nottely	6.44	2.99	19.10	16.42
40.	Hiwassee Local	6.44	2.99	18.90	16.22
41.	Apalachia	6.44	2.99	17.90	15.22
42.	Blue Ridge	6.44	2.99	22.10	19.42
43.	Ocoee No. 1, Blue Ridge to Ocoee No. 1	6.44	4.04	18.30	16.31
44.	Lower Hiwassee	6.44	4.19	15.20	13.41
45.	Chickmauga Local	6.44	4.52	14.50	13.09
	Average above Watts Bar Dam	6.44	4.20	16.34	14.56
	Average above Chickamauga Dam	6.44	4.14	16.46	14.63

a. Adopted API prior to antecedent storm, 1.0 inch.
b. Computed API prior to main storm, 3.65 inches.

Table 2.4.3-2
UNIT HYDROGRAPH DATA

Unit AREA	Name	Drain Area, Sq. Miles	Duration, Hours	Q_p	C_p	T_p	W_{50}	W_{75}	T_B
1	French Broad River at Asheville	945	6	15,000	.27	14	35	12	166
2	French Broad River, Newport to Asheville	913	6	35,000	.53	12	12	7	108
3	Pigeon River at Newport[a]	666	6	26,600	.56	12	11	6	78
4	Nolichucky River at Embreeville	805	6	27,300	.58	14	14	9	82
5	Nolichucky Local	378	6	10,600	.40	12	16	9	87
6	Douglas Local[a]	832	6	47,930	.27	6	8	6	60
7	Little Pigeon River at Sevierville	353	6	15,600	.62	12	10	6	102
8	French Broad River Local[b]	207	6	7,500	.51	12	11	8	60
9	South Holston	703	6	16,000	.53	18	24	17	100
10	Watauga[b]	468	6	17,700	.53	12	13	7	84
11	Boone Local[a]	669	6	22,890	.16	6	13	8	90
12	Fort Patrick Henry	63	6	3,200	.40	8	8	6	64
13	North Fork Holston River near Gate City[a]	672	6	12,260	.60	24	33	25	108
14	Surgoinsville Local[b]	299	6	10,280	.48	12	13	9	66
15	Cherokee Local below Surgoinsville[b]	554	6	18,750	.48	12	14	7	66
16	Holston River Local[b]	289	6	6,800	.55	18	22	15	96
17	Little River at Mouth[b]	379	4	11,730	.68	16	14	8	96
18	Fort Loudoun Local[b]	323	6	20,000	.29	6	10	6	36
19	Little Tennessee River at Needmore	436	6	9,130	.49	18	23	12	126
20	Nantahala	91	6	3,770	.45	10	12	7	70
21	Tuckasegee River at Bryson City	655	6	26,000	.43	10	12	7	58
22	Fontana Local	389	6	16,350	.46	10	9	5	94
23	Little Tennessee River Local, Fontana-Chilhowee[b]	406	6	16,900	.58	12	9	5	84
24	Little Tennessee River Local Chilhowee-Tellico Dam[b]	650	6	17,000	.61	18	21	11	72
25	Watts Bar Local above Clinch River[b]	293	6	11,300	.30	8	9	7	84
26	Norris Dam	2912	6	43,300	.07	6	15	8	118
27	Coal Creek[b]	36.6	2	2,150	.64	8	9	5	40
28	Clinch Local[b]	22.25	2	1,350	.10	2	8	5	34
29	Hinds Creek[b]	66.4	2	3,620	.68	9	7	5	54
30	Bull Run Creek[b]	104	2	2,400	.47	14	21	14	84
31	Beaver Creek[b]	90.5	2	2,600	.58	14	14	10	88
32	Clinch Locals (5 areas)[b]	111.25	2	1,350	.10	2	8	5	34
33	Local above mi. 16[b]	37	2	4,490	.95	6	4	3	46
34	Poplar Creek[b]	136	2	2,800	.61	20	25	13	88
35	Emory River at Mouth[b]	865	6	34,000	.37	9	13	8	87
36	Local area at Mouth[b]	32	2	3,870	.95	6	3	2	46
37	Watts Bar Local below Clinch River[b]	427	6	16,300	.36	9	9	7	84
38	Chatuge Dam[a]	189	6	13,570	.34	6	6	5	54
39	Nottely Dam[a]	215	6	13,500	.29	6	5	4	80
40	Hiwassee Local	564	6	13,800	.36	12	18	12	124
41	Apalachia Local	50	6	2,900	.54	9	6	4	90
42	Blue Ridge Dam[a]	232	6	11,920	.24	6	7	4	54
43	Ocoee No. 1 to Blue Ridge[b]	363	6	17,000	.37	8	11	7	36
44	Lower Hiwassee	1087	6	32,500	.93	23	16	10	136
45	Chickamauga Local[a]	780	6	32,000	.38	9	14	7	36

Definition of Symbols

Q_p = Peak discharge in cfs
C_p = Snyder coefficient
T_p = Time in hours from beginning of precipitation excess to peak of unit hydrograph
W_{50} = Width in hours at 50 percent of peak discharge
W_{75} = Width in hours at 75 percent of peak discharge
T_B = Base length in hours of unit hydrograph
a = Revised
b = New

SQN-17

Table 2.4.4-1

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Table 2.4.13-1 (Sheet 1)

WELL AND SPRING INVENTORY
WITHIN 2-MILE RADIUS OF SEQUOYAH NUCLEAR PLANT SITE

(HISTORICAL INFORMATION)

Map Ident. No.	Location Latitude	Longitude	Well Depth, Feet	Estimated Elevation, Feet Ground	Estimated Elevation, Feet Water Surface	Well Dia., Feet	Remarks
1	35°13'34"	85°06'09"	--	725	--	.5	Serves 2 families; submersible
2	35°13'23"	85°06'12"	75	720	685	.5	Submersible pump
3	35°13'30"	85°06'47"	116	745	--	.5	Submersible pump
4	35°13'58"	85°05'45"	42	700	696	3.0	
5	35°14'15"	85°06'25"	--	680	--	.5	1/4-hp pump
6	35°14'34"	85°06'46"	85	720	--	15	Submersible pump
7	35°14'35"	85°06'52"	65	720	670	2.5	3/4-hp pump
8	35°14'36"	85°06'57"	73	735	687	.5	1/3-hp pump
9	35°15'06"	85°06'32"	27	780	761	5.0	Bucket
10	35°14'46"	85°06'16"	110	720	--	.5	Submersible
11	35°14'55"	85°06'15"	--	725	--	-	
12	35°14'53"	85°06'13"	77	800	--	.5	
13	35°14'52"	85°06'13"	--	800	--	-	Summer home
14	35°14'50"	85°06'12"	--	800	--	-	Summer home
15	35°14'45"	85°06'14"	50	720	680	.5	
16	35°14'44"	85°06'18"	275	795	525	.5	1-hp submersible pump
17	35°14'45"	85°06'22"	--	740	--	.5	1-hp pump
18	35°14'21"	85°05'30"	--	695	--	-	
19	35°14'26"	85°05'27"	200	695	--	.5	1-hp pump
20	35°14'34"	85°05'29"	150	695	--	.5	1/2-hp pump
21	35°14'31"	85°05'29"	--	695	--	.5	
22	35°14'29"	85°05'29"	110	690	--	.5	1-hp pump
23	35°14'23"	85°05'32"	85	700	--	.75	1-hp jet pump
24	35°14'22"	85°05'40"	--	695	--	.5	Serves 2 familes; 1-hp pump
25	35°14'24"	85°05'46"	52	710	680	.5	3/4-hp pump
26	35°14'28"	85°05'45"	130	740	620	.5	
27	35°14'26"	85°05'41"	90	740	710	.5	
28	35°14'32"	85°05'44"	141	740	650	.5	
29	35°14'34"	85°05'44"	--	735	--	-	Summer home
30	35°14'38"	85°05'41"	58	700	670	.5	1/3-hp pump
31	35°14'41"	85°05'41"	--	720	--	.5	
32	35°14'45"	85°05'46"	--	715	--	-	
33	35°14'43"	85°05'47"	--	720	--	-	
34	35°14'41"	85°05'48"	--	695	--	-	Summer home
35	35°14'39"	85°05'50"	48	695	650	.5	1-hp pump
36	35°14'39"	85°05'53"	60	700	--	.5	Submersible pump
37	35°14'40"	85°05'58"	--	695	653	.5	1-hp pump
38	35°14'41"	85°05'56"	50	695	655	.5	3/4-hp pump
39	35°14'35"	85°05'54"	--	700	--	-	Summer home
40	35°14'36"	85°05'57"	--	700	--	-	
41	35°14'37"	85°06'01"	--	715	--	-	Summer home
42	35°14'33"	85°05'02"	223	720	530	.5	

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-1 (Sheet 2)

(Continued)

WELL AND SPRING INVENTORY
WITHIN 2-MILE RADIUS OF SEQUOYAH NUCLEAR PLANT SITE

(HISTORICAL INFORMATION)

Map Ident. No.	Location Latitude	Longitude	Well Depth, Feet	Estimated Elevation, Feet Ground	Water Surface	Well Dia., Feet	Remarks
43	35°14'46"	85°05'54"	65	695	655	.5	3/4-hp pump
44	35°14'47"	85°05'54"	95	705	655	.5	
45	35°14'48"	85°05'53"	--	700	--	-	Summer home
46	35°14'50"	85°05'53"	257	695	665	.5	1-hp submersible pump
47	35°14'52"	85°05'48"	--	710	--	-	Summer home
48	35°15'04"	85°05'56"	--	725	--	-	Summer home
49	35°15'06"	85°06'02"	--	720	--	-	Summer home
50	35°15'06"	85°06'05"	90	705	625	.5	Submersible pump
51	35°14'58"	85°06'06"	--	695	--	-	Summer home
52	35°15'01"	85°06'02"	65	720	680	.5	3/4-hp pump
53	35°14'47"	85°05'57"	46	700	670	.5	2 familes; 1-hp pump
54	35°14'42"	85°06'01"	48	695	675	.5	1/2-hp pump
55	35°14'41"	85°06'02"	--	695	--	-	Summer home
56	35°14'40"	85°06'03"	--	695	--	-	Summer home
57	35°14'37"	85°06'08"	155	690	670	.5	1-hp pump
58	35°14'34"	85°06'09"	--	695	--	-	
59	35°14'23"	85°05'53"	--	760	--	.5	Submersible pump
60	35°14'49"	85°05'58"	--	705	--	-	
61	35°13'01"	85°04'41"	--	720	--	-	Summer home
62	35°13'18"	85°04'24"	--	845	--	.5	1-hp pump
63	35°13'19"	85°04'23"	206	845	645	.5	1/2-hp pump
64	35°13'33"	85°04'19"	50	720	680	.5	1-hp pump
65	35°13'49"	85°04'14"	100	720	640	.5	Servies clubhouse, 15 houses
66	35°13'57"	85°03'55"	175	741	--	.6	1-hp pump
67	35°13'53"	85°03'49"	100	738	690	.5	1-hp submersible pump
68	35°13'50"	85°03'52"	133	720	675	.5	1/2-hp pump
69	35°13'48"	85°03'43"	85	736	--	.5	1-hp pump
70	35°13'43"	85°03'38"	80	780	--	.5	1-hp pump
71	35°13'37"	85°03'36"	130	800	715	.5	1-hp pump
72	35°13'38"	85°03'43"	--	800	--	-	Well not used
73	35°13'16"	85°03'30"	227	880	680	.5	Submersible pump
74	35°13'09"	85°03'41"	397	900	820	.5	2-hp pump
75	35°12'47"	85°03'58"	190	860	800	.5	Serves 2 families; submersible
76	35°13'03"	85°04'17"	--	720	--	-	Summer home
77	35°13'05"	85°04'10"	90	740	670	.5	1/2-hp pump
78	35°12'50"	85°04'13"	85	760	--	.5	1-hp pump
79	35°12'45"	85°03'59"	190	880	--	.5	Serves 2 families; 1-hp pump
80	35°12'26"	85°04'07"	290	860	--	.5	Serves 5 families; submersible

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-1 (Sheet 3)
(Continued)

WELL AND SPRING INVENTORY
WITHIN 2-MILE RADIUS OF SEQUOYAH NUCLEAR PLANT SITE

(HISTORICAL INFORMATION)

Map Ident. No.	Location Latitude	Longitude	Well Depth, Feet	Estimated Elevation, Feet Ground	Water Surface	Well Dia., Feet	Remarks
81	35°12'20"	85°04'33"	265	940	--	.5	Submersible pump
82	35°12'15"	85°04'34"	250	965	735	.5	1-hp submersible pump
83	35°12'24"	85°04'35"	305	965	665	.5	Submersible pump
84	35°12'22"	85°05'05"	135	740	690	.5	1-hp pump
85	35°12'21"	85°05'08"	120	740	--	.5	Serves 2 families; 3/4-hp jet pump
86	35°12'17"	85°05'06"	190	800	--	.5	3/4-hp submersible pump
87	35°12'23"	85°05'09"	--	740	--	.5	1-hp pump
88	35°12'16"	85°05'12"	55	740	720	2.5	Bucket
89	35°12'07"	85°05'09"	251	775	700	.5	Serves 2 families; 3/4-hp pump
90	35°11'54"	85°04'56"	170	980	--	.5	1/2-hp pump
91	35°12'19"	85°05'20"	125	740	705	.5	Submersible pump
92	35°12'22"	85°05'33"	--	725	--	-	Summer home
93	35°12'22"	85°05'35"	--	700	--	-	1-hp pump
94	35°12'22"	85°05'36"	--	705	--	-	Summer home
95	35°12'20"	85°05'44"	--	700	--	-	Summer home
96	35°12'04"	85°05'56"	160	700	--	.5	Serves 5 families; 1-hp pump
97	35°12'04"	85°05'59	65	700	--	.5	House and cottage; 1-hp pump

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-2 (Sheet 1)

GROUND WATER SUPPLIES WITHIN 20-MILE RADIUS OF THE PLANT SITE

(HISTORICAL INFORMATION)

	Location	Owner	Average Daily Use mgd	Source	Approximate Distance From Site[a] (Miles)
1.	Chattanooga	Kay's Ice Cream Company	0.0400	Well	20.4
2.	Chattanooga	Selox, Inc.	0.0250	Well	21.0
3.	Chattanooga	Stainless Metal Products	0.0100	Well	16.4
4.	Chattanooga	American Cyanamid	0.0727	Well	21.0
5.	Chattanooga	Dixie Yarns, Inc.	0.5350	Wells (2) and Tennessee-American Water Company	13.3
6.	Chattanooga	Scholze Tannery	0.1560	Wells (2) and Tennessee-American Water Company	24.0
7.	Chattanooga	Southern Cellulose Products, Inc.	4.0000 0.1000	Well (1) and Tennessee-American Water Company	24.2
8.	Chattanooga	Alco Chemical Corporation	0.2300	Well (1) and Tennessee-American Water Company	--
9.	Chattanooga	Chattem Drug and Chemical	0.8500 0.2380	Wells (3) and Tennessee-American Water Company	24.0
10.	Chattanooga	Cumberland Corporation	0.2380 0.0150	Well (1) and Tennessee-American Water Company	17.4
11.	Chattanooga	Bacon Trailer Park		Well	--
12.	Dunlap	Bethel Church of Christ		Well	20.0
13.	Dayton	Blue Water Trail and Campground		Well	19.0
14.	Cleveland	Cohulla Baptist Church		Well	9.5
15.	Dayton	Crystal Springs Recreation Area		Spring	19.0
16.	Georgetown	Eastview School		Well	9.5
17.	Dayton	Fort Bluff Youth Camp		Well	19.0
18.	Dayton	Frazier Elementary School		Well	19.0
19.	Birchwood	Grasshopper Church of God		Well	11.3

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-2 (Sheet 2)

GROUND WATER SUPPLIES WITHIN 20-MILE RADIUS OF THE PLANT SITE

(HISTORICAL INFORMATION)

	Location	Owner	Average Daily Use mgd	Source	Approximate Distance From Site[a] (Miles)
20.	Dayton	Hastings Mobile Home Park		Spring	19.0
21.	Ooltewah	High Point Baptist Church		Well	10.0
22.	Dayton	Lake Richland Apartments		Well	19.0
23.	Dayton	Laurelbrook Sanitarium School	.017	Wells (7)	19.0
24.	Cleveland	Labanon Baptist Church		Well	13.5
25.	Cleveland	Mt. Carmel Baptist Church		Well	13.5
26.	Sale Creek	Mt. Vernon Baptist Church		Well	11.0
27.	Dayton	Mt. Vista Mobile Home Park		Wells (2)	19.0
28.	Dayton	New Bethel Methodist Church		Well	19.0
29.	Cleveland	New Friendship Baptist Church		Well	13.5
30.	Dayton	Ogden Baptist Church		Well	19.0
31.	Dunlap	Old Union Water System		Spring	20.0
32.	Dunlap	P.A.W., Inc. #2		Well	20.0
33.	Cleveland	Red Clay State Historic Area		Well	13.5
34.	Chattanooga	Riverside Catfish House		Well	25.0
35.	Cleveland	Robert Allen		Well	13.5
36.	Dayton	Salem Baptist Church		Well	19.0
37.	Dunlap	Sequatchie-Bledsoe VO-Training		Well	20.0
38.	Dayton	Seventh Day Adventist Church		Well	19.0
39.	Chattanooga	Shamrock Motel		Well	20.1
40.	Dayton	Sinclair Packing House		Well	19.0
41.	Dunlap	Stonecave Institute Water System	0.0064	Spring	20.0
42.	Dunlap	Old Union Water System		Spring	20.0
43.	Sale Creek	Sale Creek Marina Multiboating		Well	11.0

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-2 (Sheet 3)

GROUND WATER SUPPLIES WITHIN 20-MILE
RADIUS OF THE PLANT SITE

(HISTORICAL INFORMATION)

	Location	Owner	Average Daily Use mgd	Source	Approximate Distance From Site[a] (Miles)
44.	Sale Creek	Sale Creek P.U.A. - TVA		Well	11.0
45.	Sale Creek	Sale Creek Utility District	0.204	Wells (2)	10.8
46.	Graysville	Graysville Water Supply	0.220	Wells (2)	15.0
47.	Graysville	Graysville Nursing Home		Well	15.0
48.	Dayton	Dayton Golf & CC % Mokas		Well	19.0
49.	Birchwood	Birchwood School		Well	11.3
50.	Cleveland	Cassons Grocery Water System	0.0170	Well	19.7
51.	Cleveland	Black Fox School		Well	13.5
52.	Cleveland	Blue Springs Baptist Church		Well	13.5
53.	Cleveland	Blue Springs School		Well	13.5
54.	Cleveland	Bradley Limestone, Div. of Dalton Rock Product Co.	0.2400	Well	13.5
55.	Cleveland	Hardwick Stone Company	0.1130	Well	13.5
56.	Cleveland	Cleveland-Tenn. Enamel	0.2240	Well	13.5
57.	Cleveland	Magic Chef, Inc.	0.4200	Spring	13.5
58.	Hamilton County	Savannah Valley U.D.	0.720	Wells (2)	5.0
59.	Hamilton County	Eastside Utility District	3.0130 0.0920	Wells (3) and Tennessee American Water Company	7.9
60.	Hamilton County	Hixson Utility District	4.0000 0.3330	Cave Springs (3) and Tennessee American Water Company	12.9
61.	Soddy	Union Fork Bakewell, U.D.	0.192 0.0010	Wells (3) and Sale Creek Utility District	9.8
62.	Hamilton County	Walden's Ridge, U.D.	0.471	Wells (2)	17.4
63.	Hamilton County	Container Corporation of America	1.9200	Well	22.0
64.	Hamilton County	Dave L. Brown Company	0.0200	Well	--

NOTE: The information in this table is historic and not subject to updating revisions.

Table 2.4.13-2 (Sheet 4)

GROUND WATER SUPPLIES WITHIN 20-MILE RADIUS OF THE PLANT SITE

(HISTORICAL INFORMATION)

	Location	Owner	Average Daily Use mgd	Source	Approximate Distance From Site[a] (Miles)
65.	Hamilton County	De Sota, Inc.	0.0750	Well	--
66.	Hamilton County	Hamilton Concrete Products	0.0050	Spring	24
67.	Cleveland	Thompson Spring Baptist Church		Well	13.5
68.	Dayton	Vaughn Trailer Park		Well	19.0
69.	Dayton Church	Walden's Ridge Baptist		Well	19.0
70.	Dayton	Walden's Ridge Elementary School		Well	19.0
71.	Cleveland	White Oak Baptist Church		Well	13.5
72.	Bradley County	Bockman Childrens Home		Well	10.2
73.	Catoosa County	Catoosa County U.D.		Well	19.0

[a] River mile distance from differences (TRM 483.6) for supplies taken from the Tennessee River channel; radial distance to other supplies.

NOTE: The information in this table is historic and not subject to updating revisions.

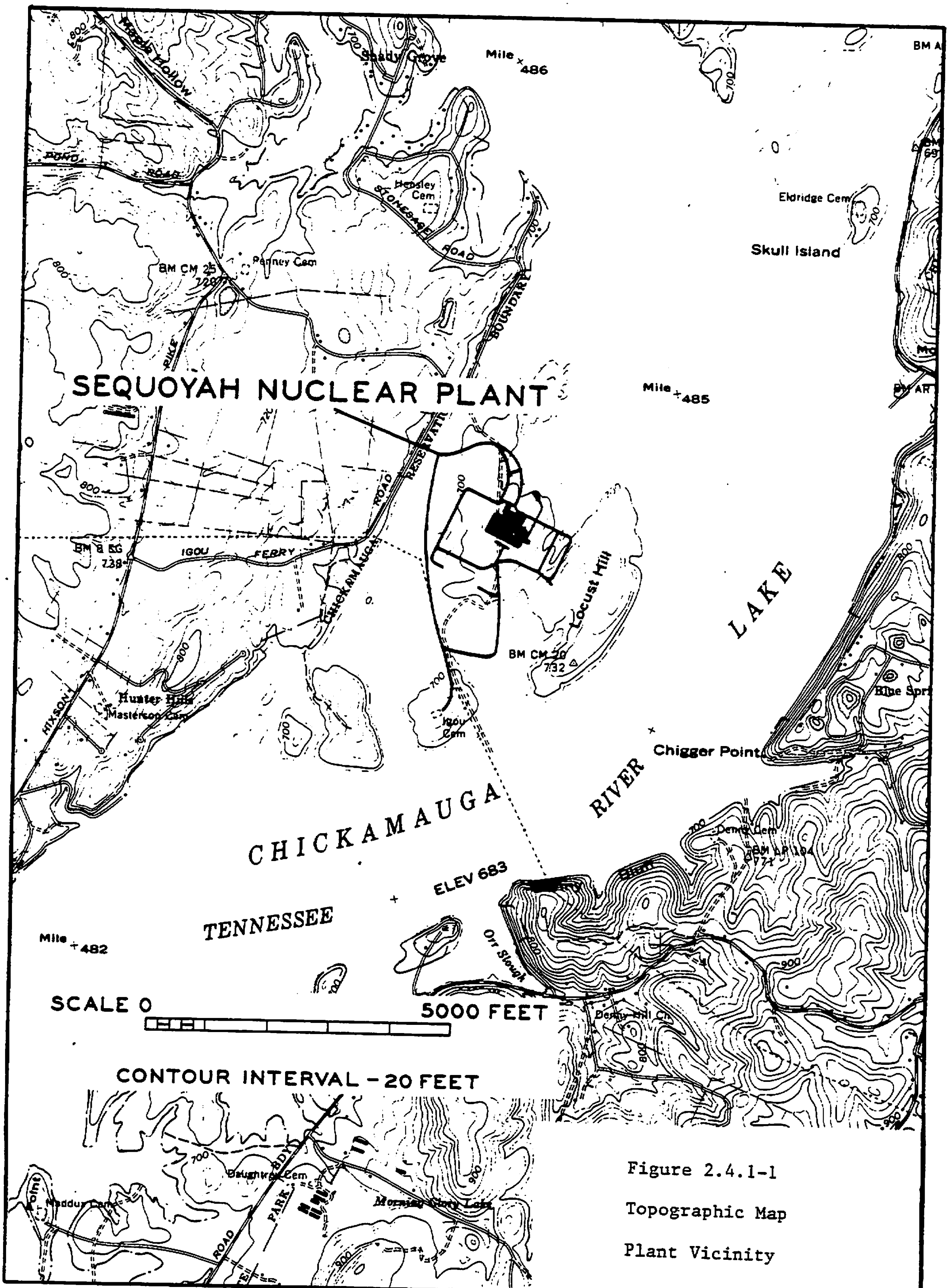
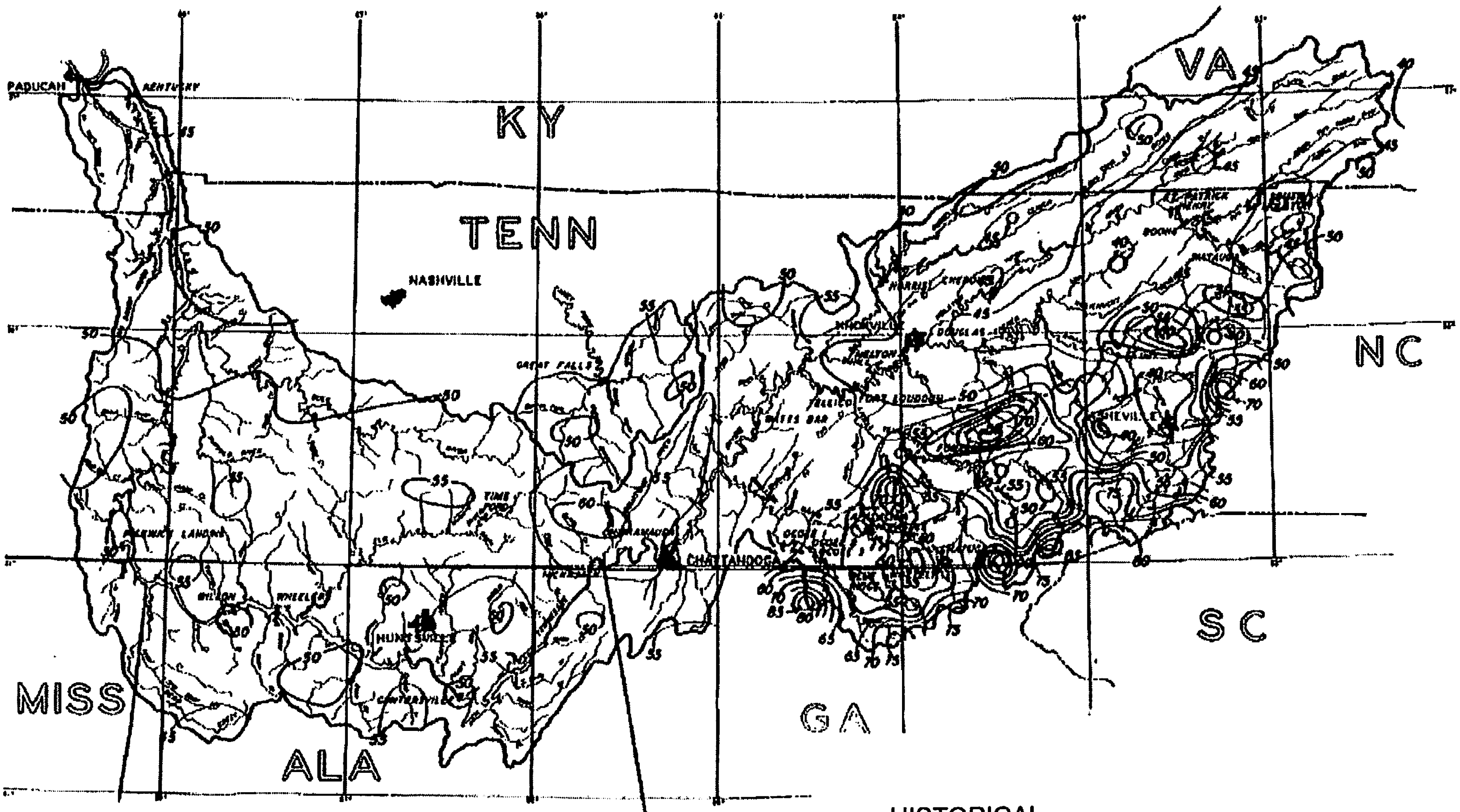


Figure 2.4.1-1

Topographic Map

Plant Vicinity



HISTORICAL

SYMBOLS:
50 Rainfall in Inches
State Lines
Dams

Figure 2.4.1-2 Tennessee River Basin
Mean Annual Precipitation
30-year Period, 1935-64

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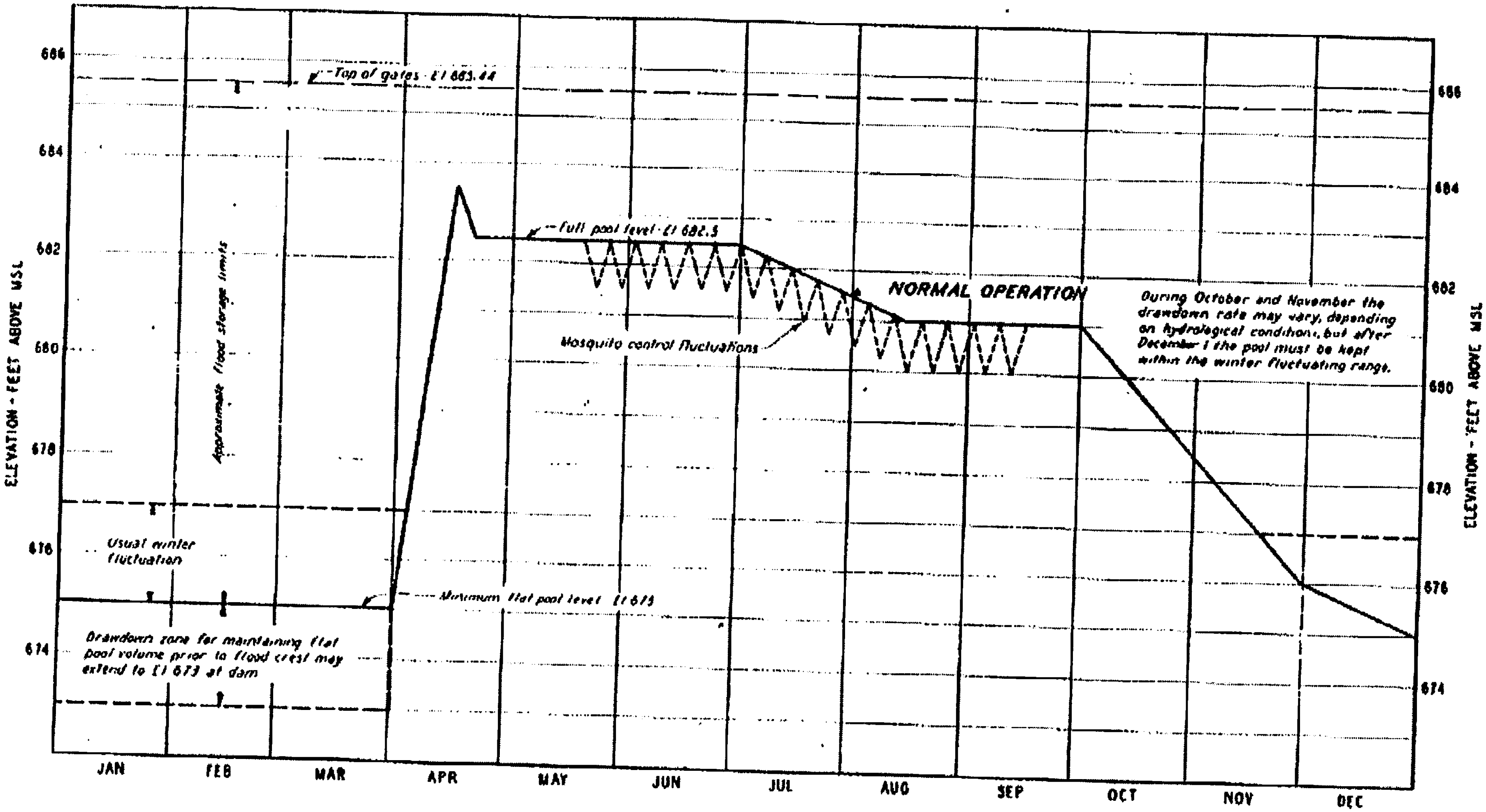


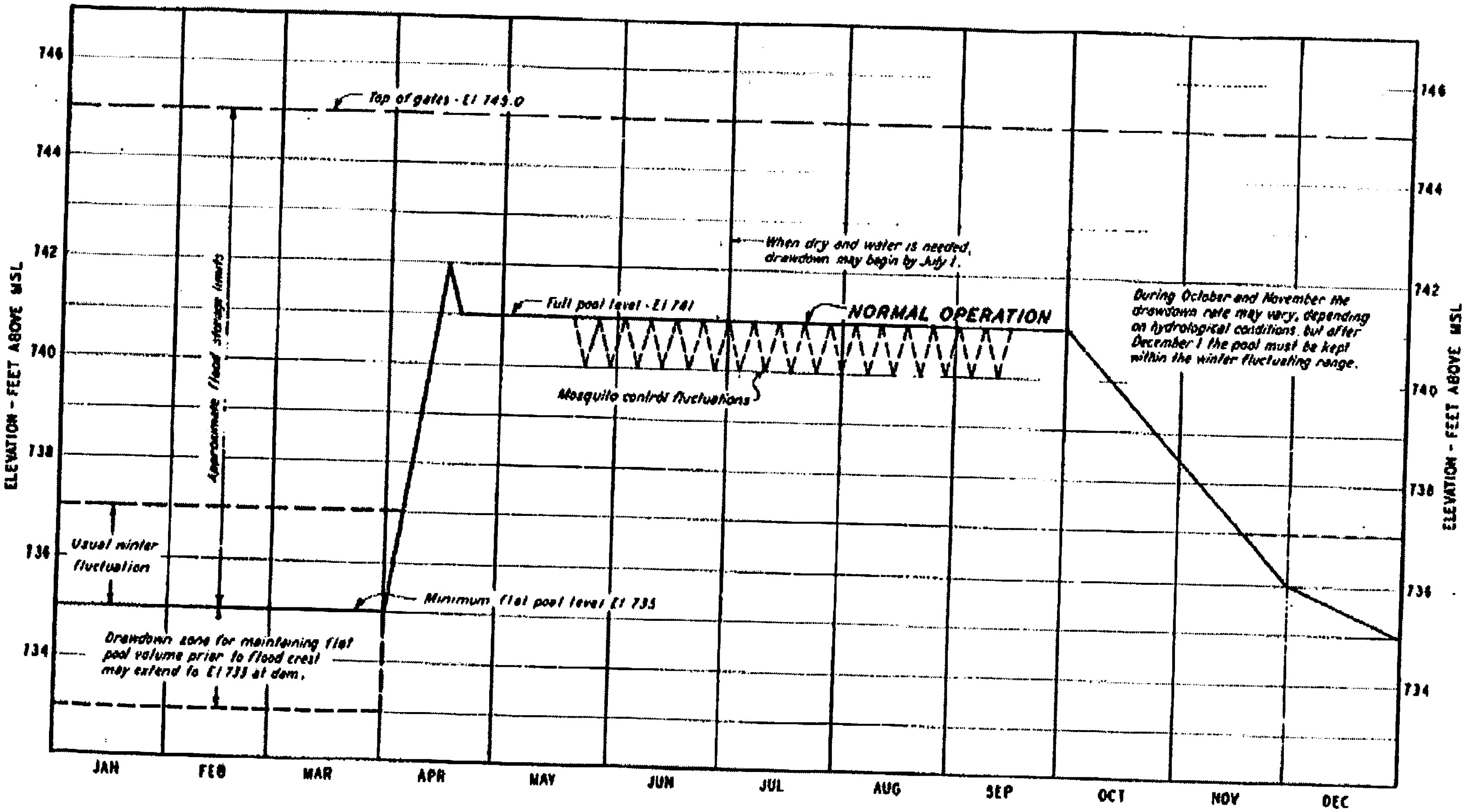
NOTES
(1) Elevations apply only at dam
(2) Maximum level assumed for design of dam - El 701.0

Best Available Historical Image

HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS CHICKAMAUGA PROJECT FIGURE 2.4.1-3 SHEET 1 OF 14

Revised by Amendment 17

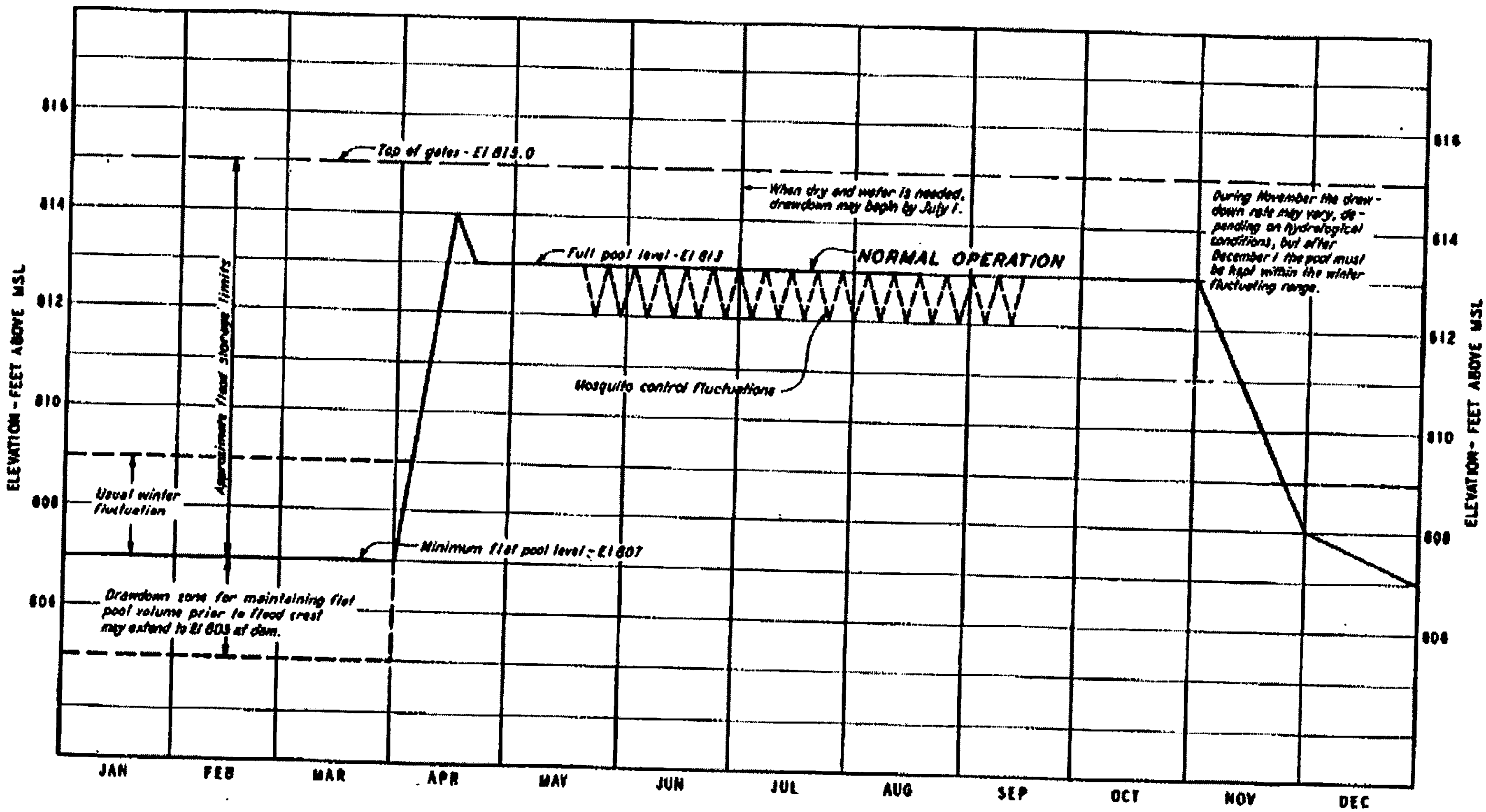


NOTES:
(1) Elevations apply only at dam.
(2) Maximum level assumed for design of dam - El 745.0

HISTORICAL

MULTIPLE PURPOSE RESERVOIR OPERATIONS
WATTS BAR PROJECT
FIGURE 2.4.1-3
SHEET 2 OF 14

Revised by Amendment 17

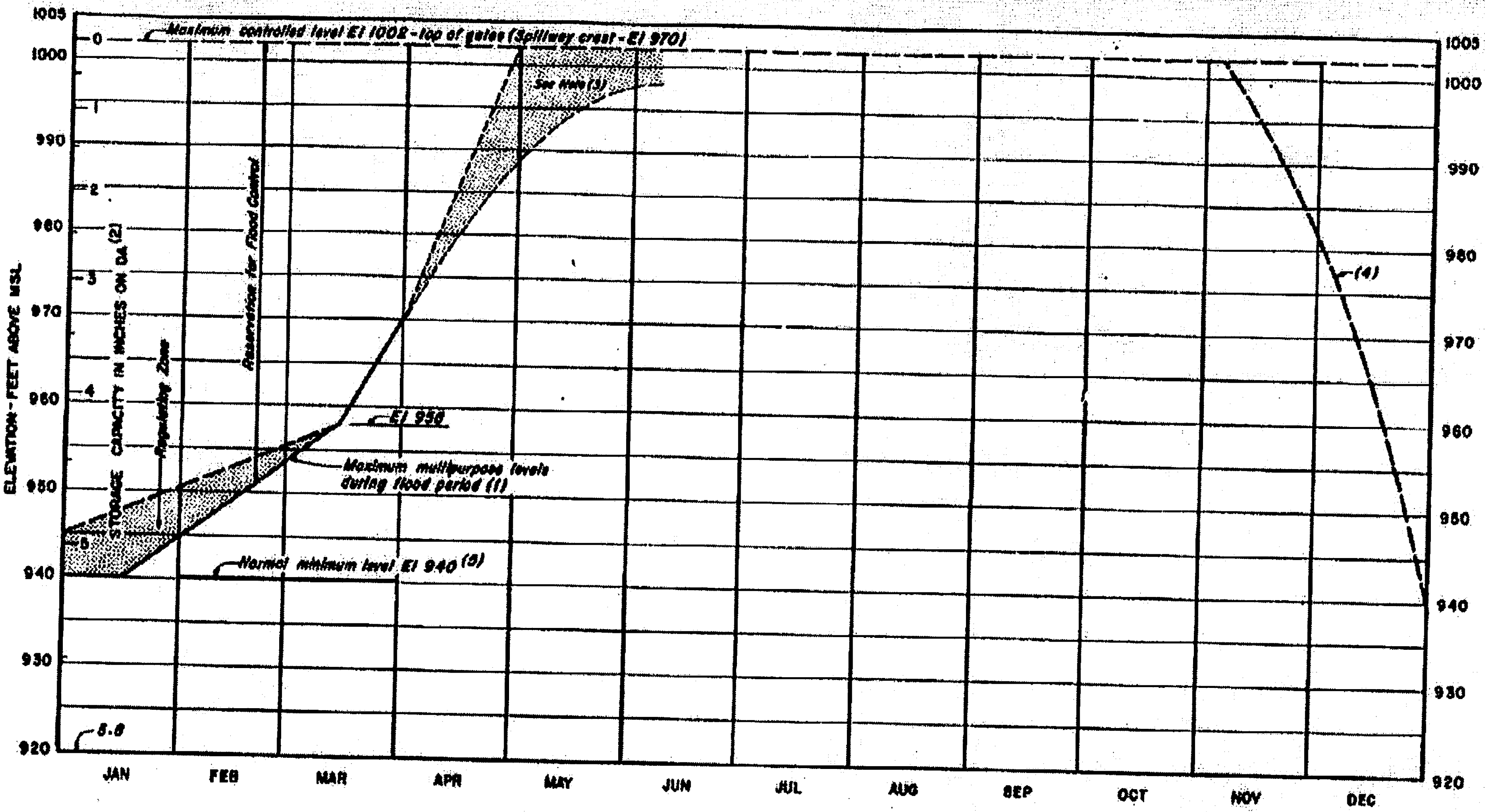


NOTES:
(1) Elevations apply only at dam.
(2) Maximum level assumed for design of dam - El 815.0.

HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS
FT. LOUDOUN PROJECT
FIGURE 2.4.1-3
SHEET 3 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area, 4,541 square miles.

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

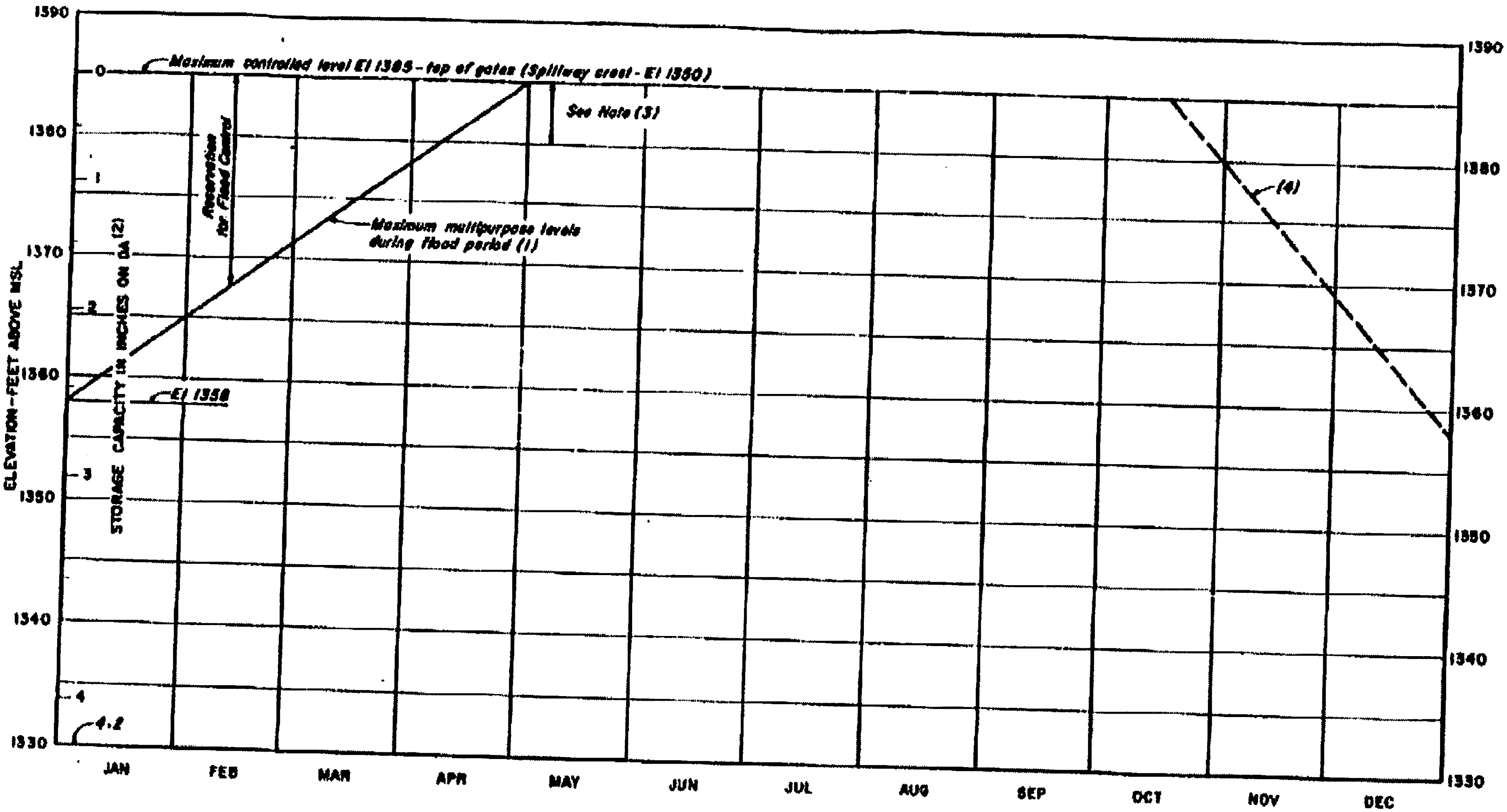
(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 910.

HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS DOUGLAS PROJECT FIGURE 2.4.1-3 SHEET 4 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations.

(2) Based upon drainage area at Boone Dam less drainage areas at South Holston and Watauga Dams (1840 - (703 + 468) = 669 square miles).

(3) During the summer and fall, levels within the range 1380 - 1385 will be controlled to regulate flash floods and to conserve water.

(4) Probable maximum levels.

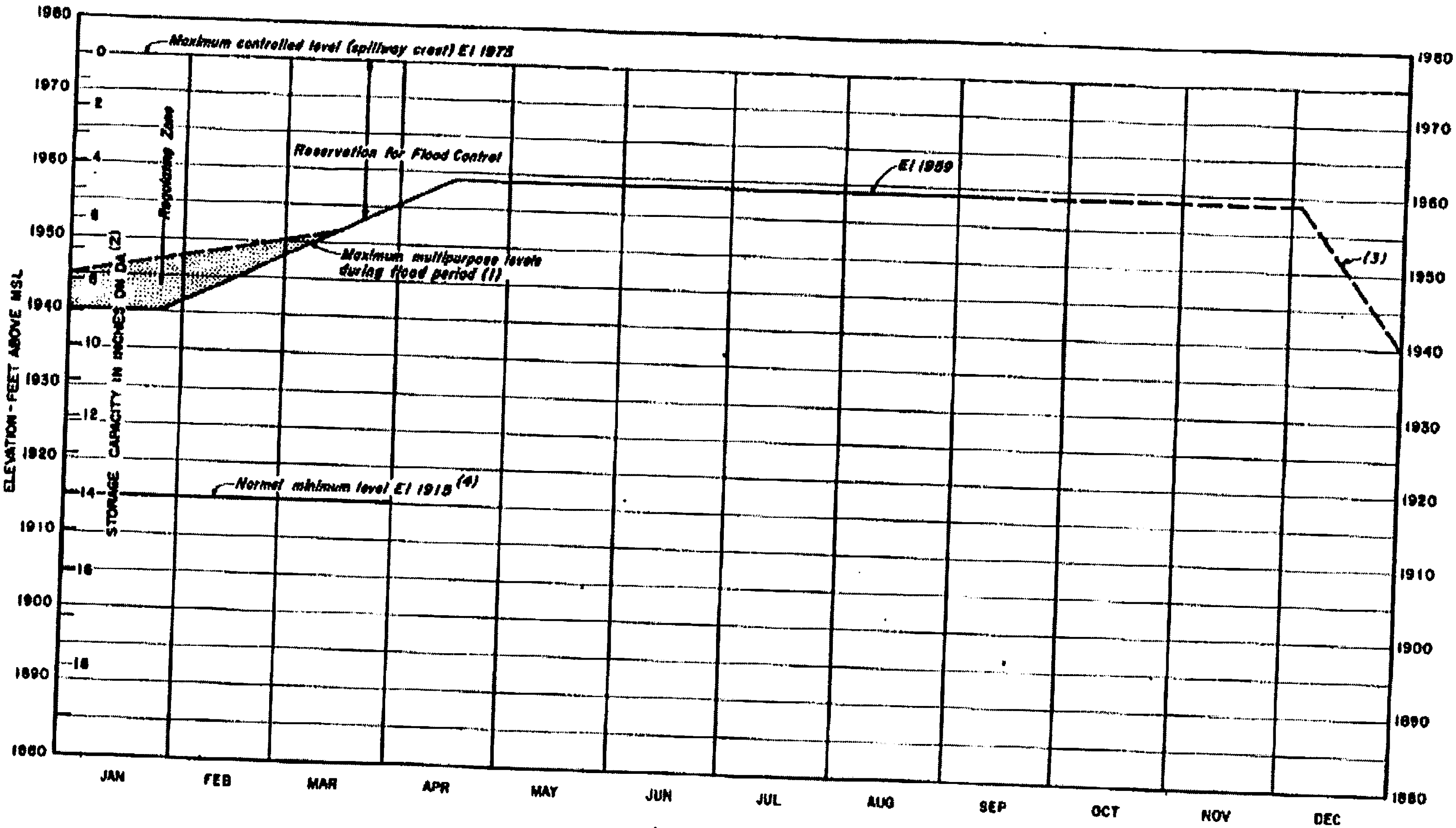
HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS BOONE PROJECT

FIGURE 2.4.1-3

SHEET 5 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area, 468 square miles.

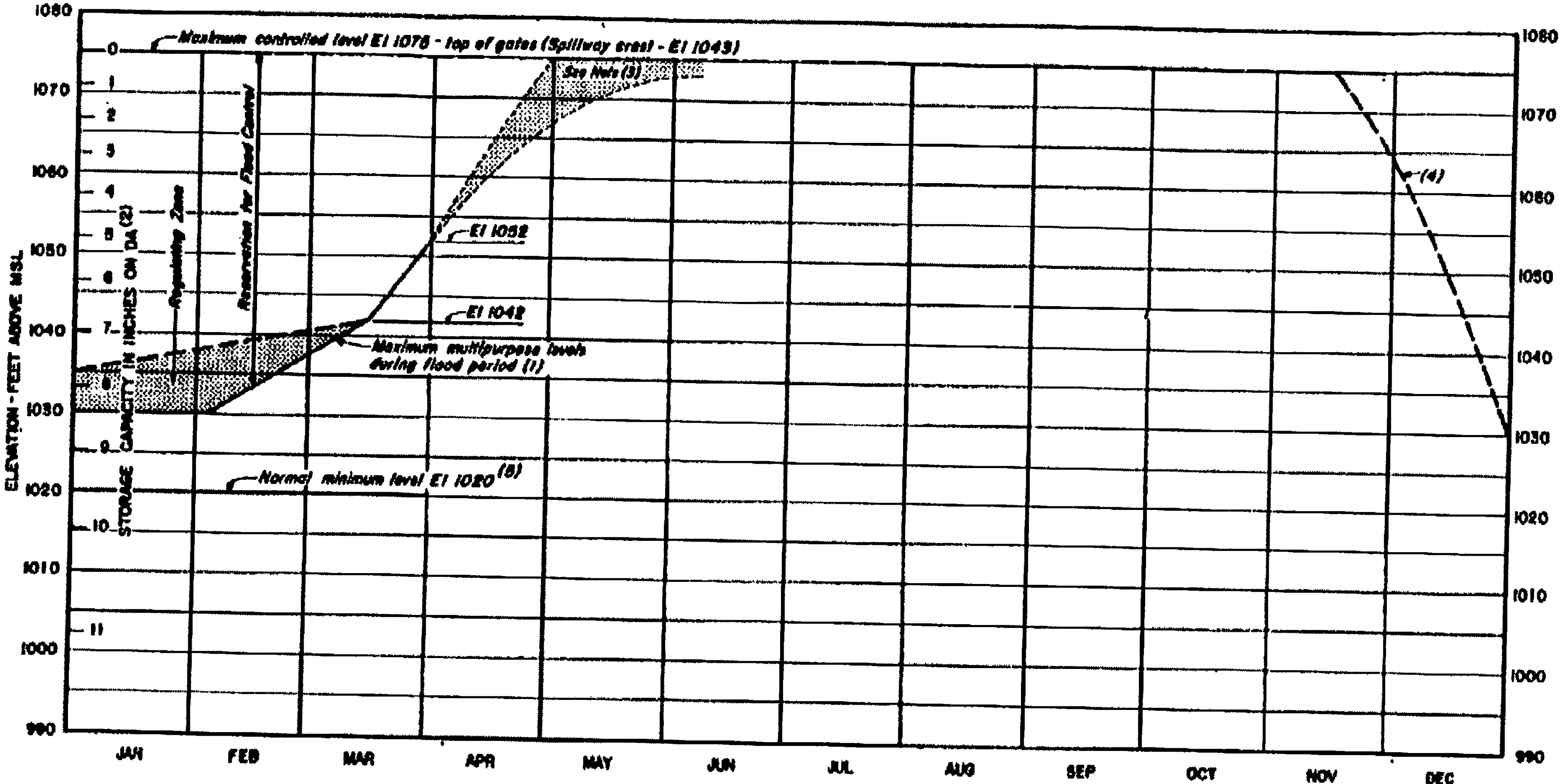
(3) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(4) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1815.

HISTORICAL

MULTIPLE PURPOSE RESERVOIR OPERATIONS WATAUGA PROJECT FIGURE 2.4.1-3 SHEET 6 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area at Cherokee Dam less drainage areas at South Holston Dam and Watauga Dam (3428 - (703+ 468) = 2257 square miles). Does not include storage in Boone Reservoir.

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

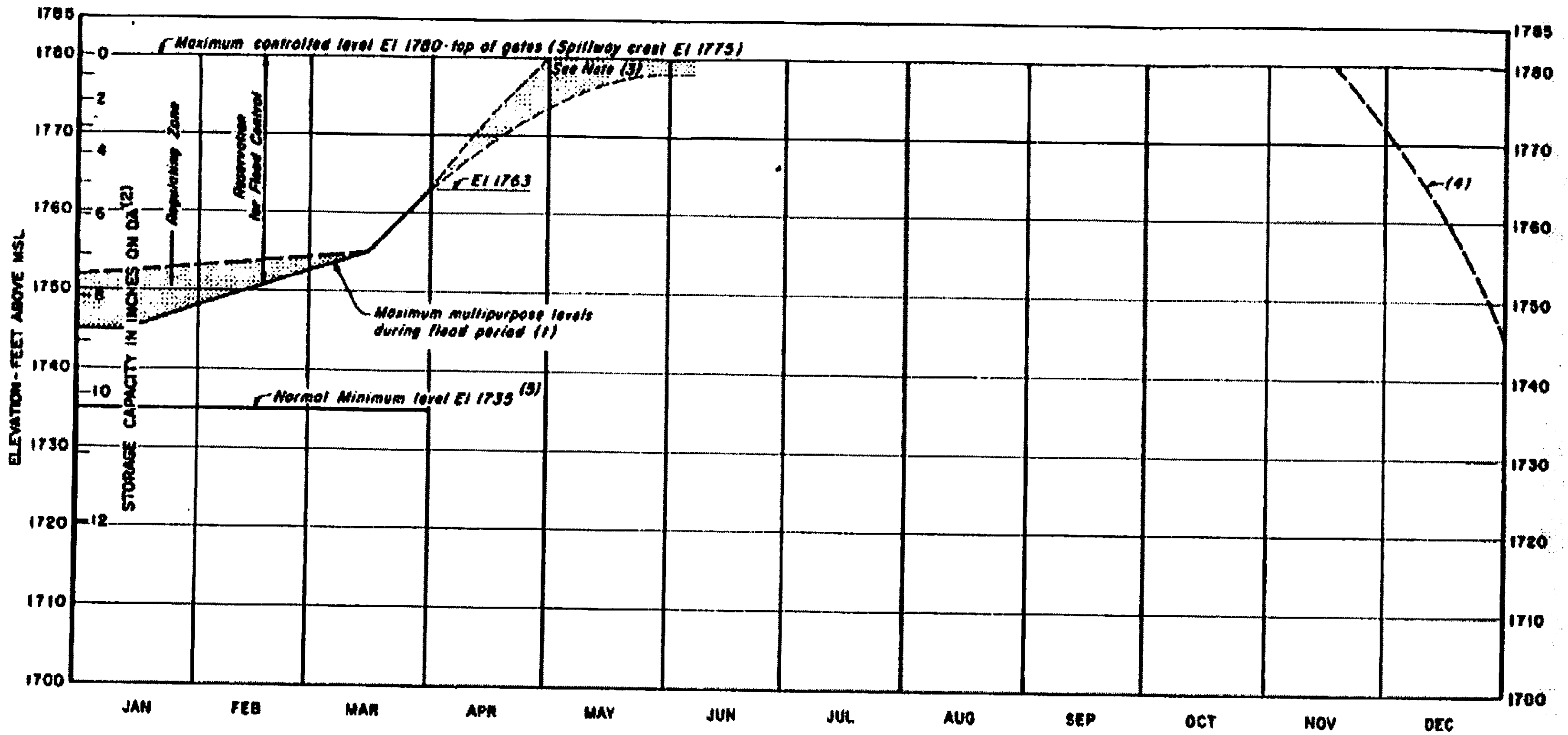
(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 980.

HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS CHEROKEE PROJECT
FIGURE 2.4.1-3
SHEET 7 OF 14

Revised by Amendment 17



NOTES

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area, 214 square miles.

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1690.

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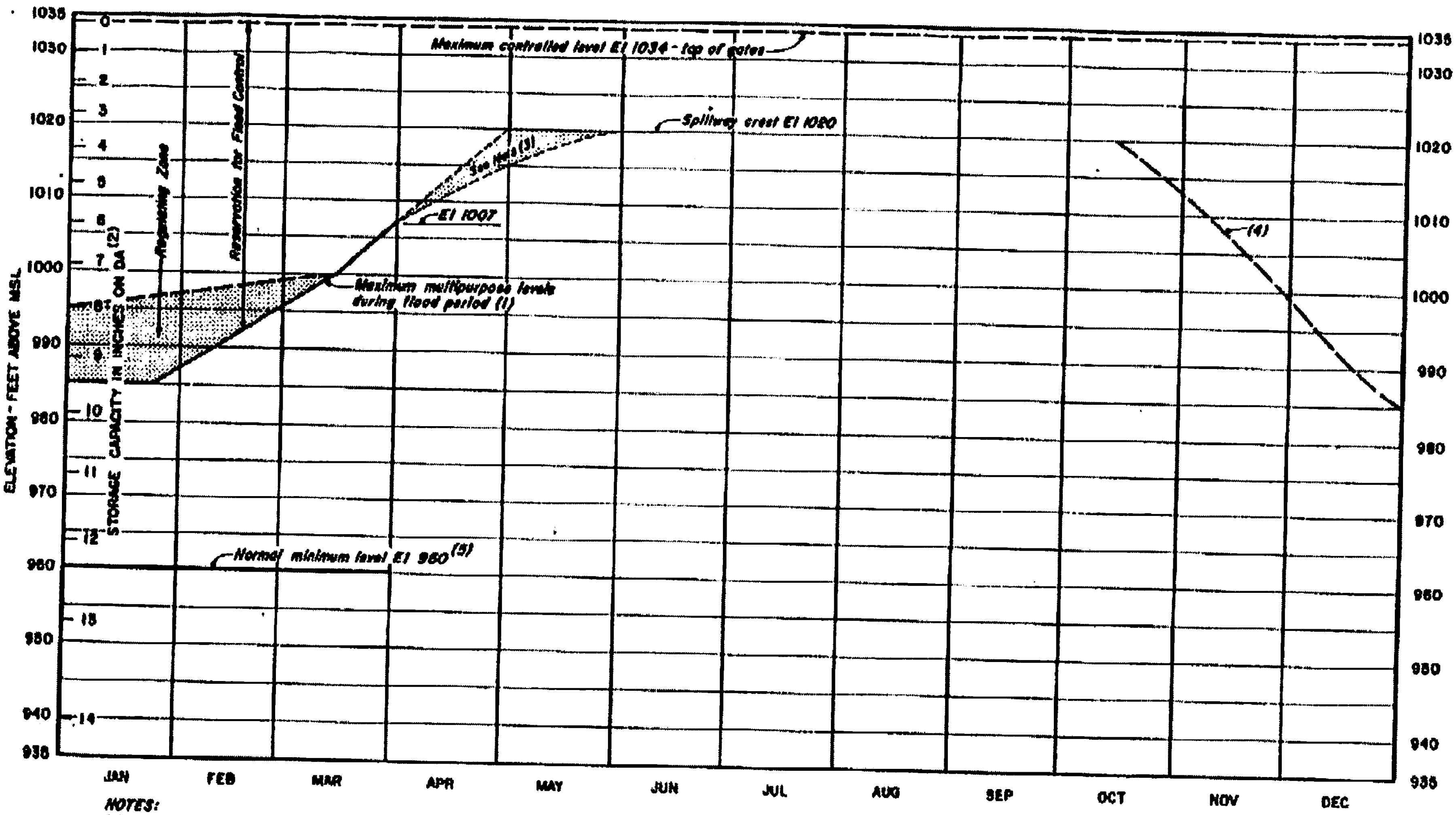
HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS NOTTELY PROJECT FIGURE 2.4.1-3 SHEET 8 OF 14

Revised by Amendmen'



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area, 2,912 square miles.

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

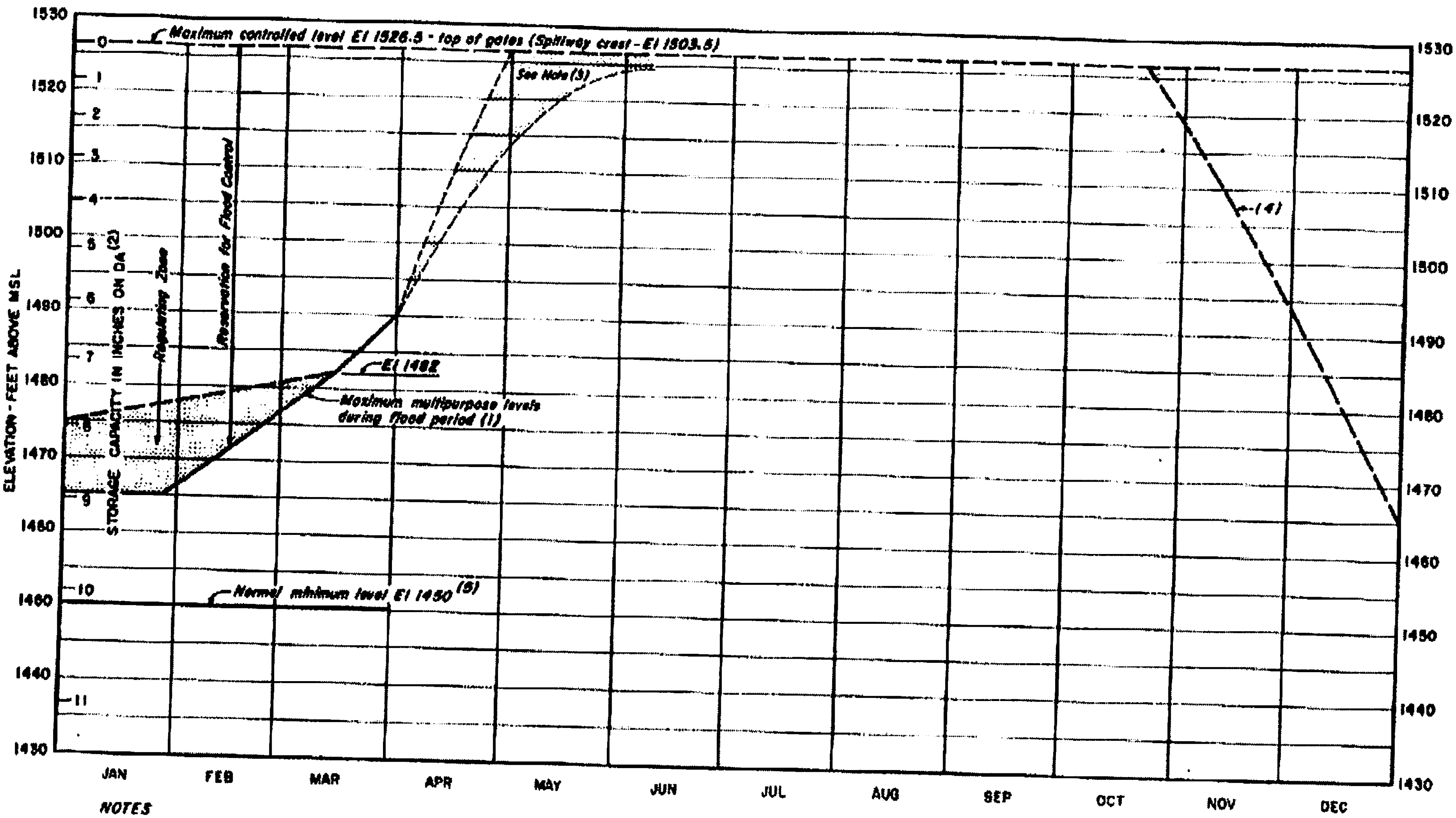
(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 900.

HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS NORRIS PROJECT FIGURE 2.4.1-3 SHEET 9 OF 14

Revised by Amendment 17



NOTES

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area at Hiwassee Dam less drainage areas of Nottely and Chatuge Dams (968-(214+189)=565 square miles).

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

(4) Drawdown limited by Apalachia generators or full-gate turbine discharge with median inflow.

(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1415.

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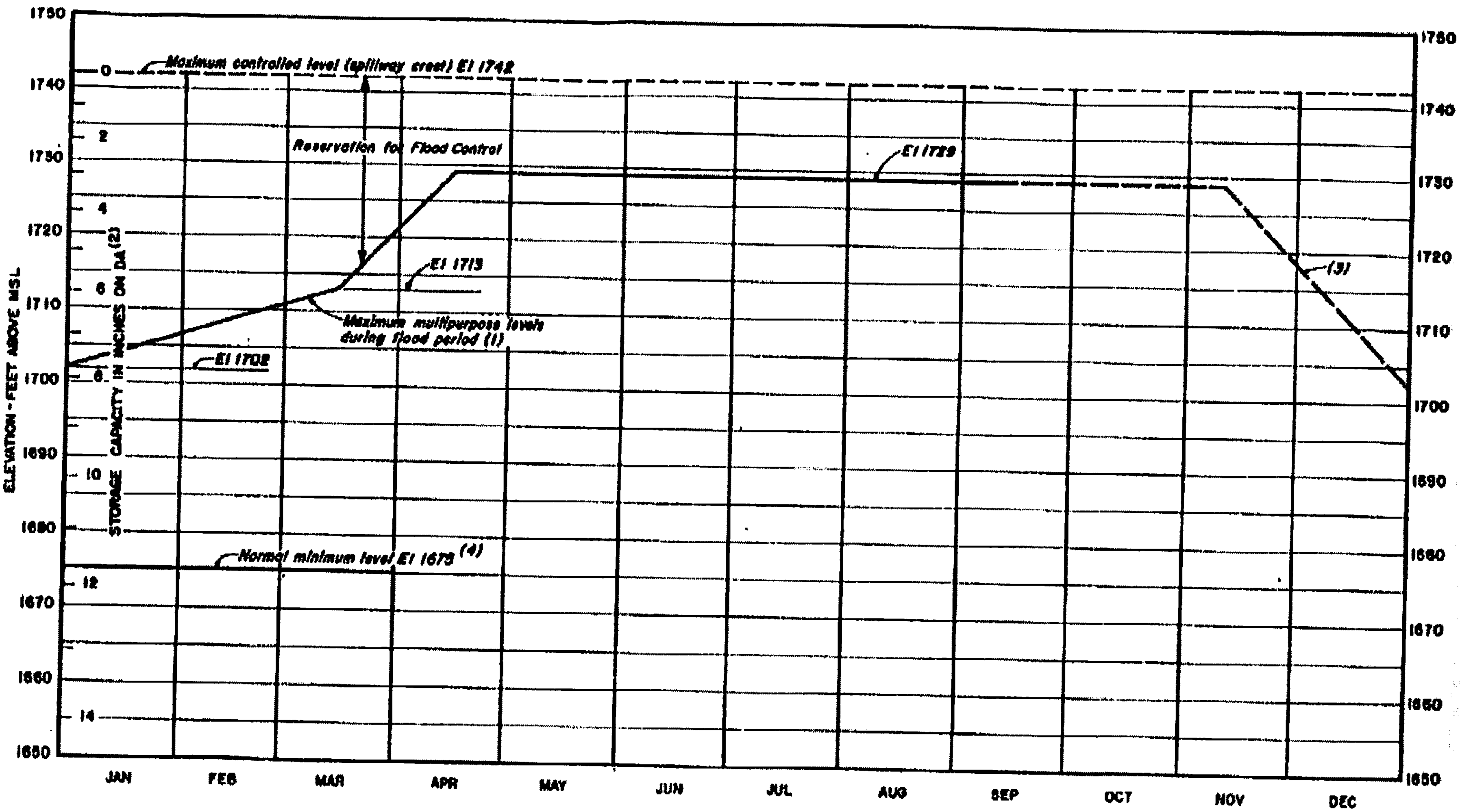
HISTORICAL

MULTIPLE PURPOSE RESERVOIR OPERATIONS HIWASSEE PROJECT FIGURE 2.4.1-3 SHEET 10 OF 14

Revised by Amendment 17



NOTES:
(1) To be exceeded only during flood control operations.
(2) Based upon drainage area, 703 square miles.
(3) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.
(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1616.

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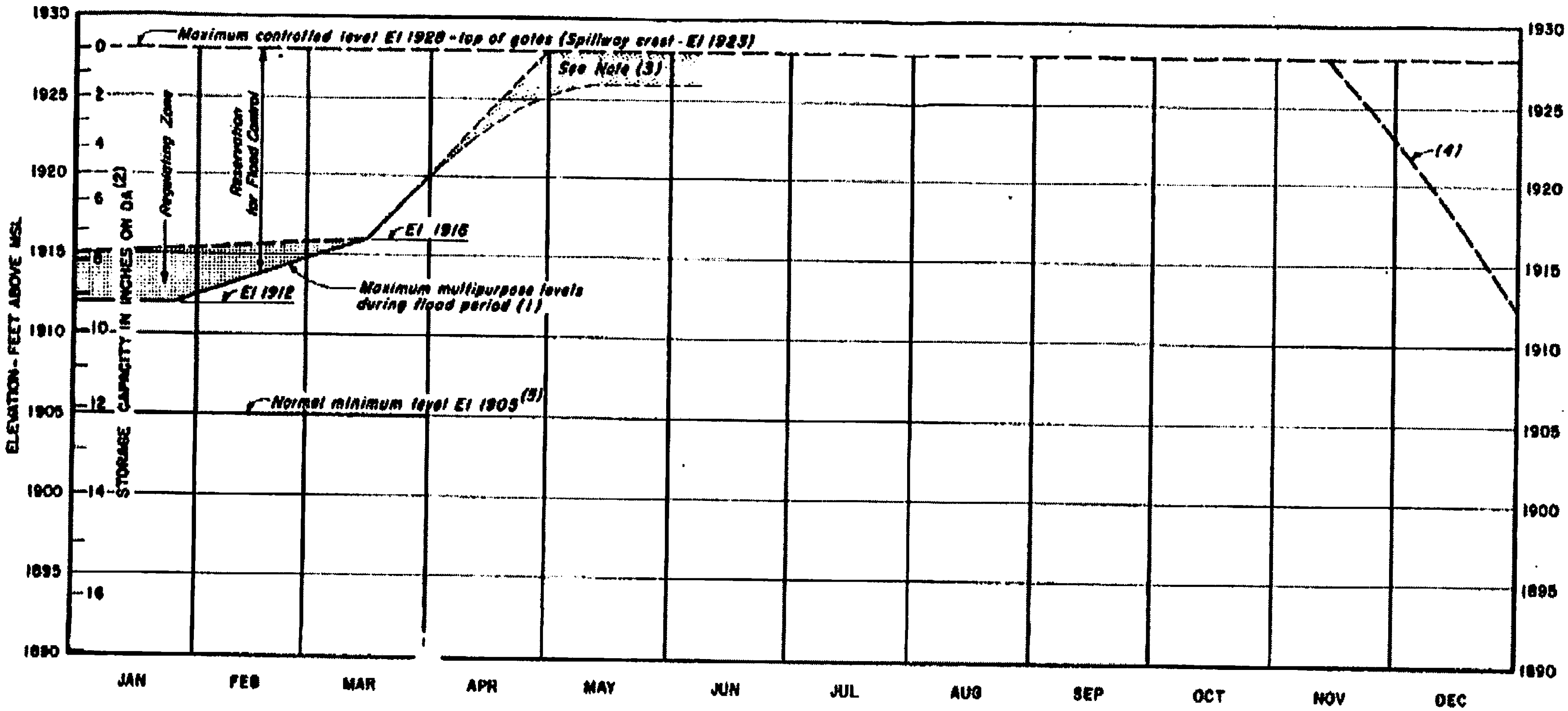
HISTORICAL

MULTIPLE-PURPOSE RESERVOIR OPERATIONS SOUTH HOLSTON PROJECT FIGURE 2.4.1-3 SHEET 11 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area, 189 square miles.

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

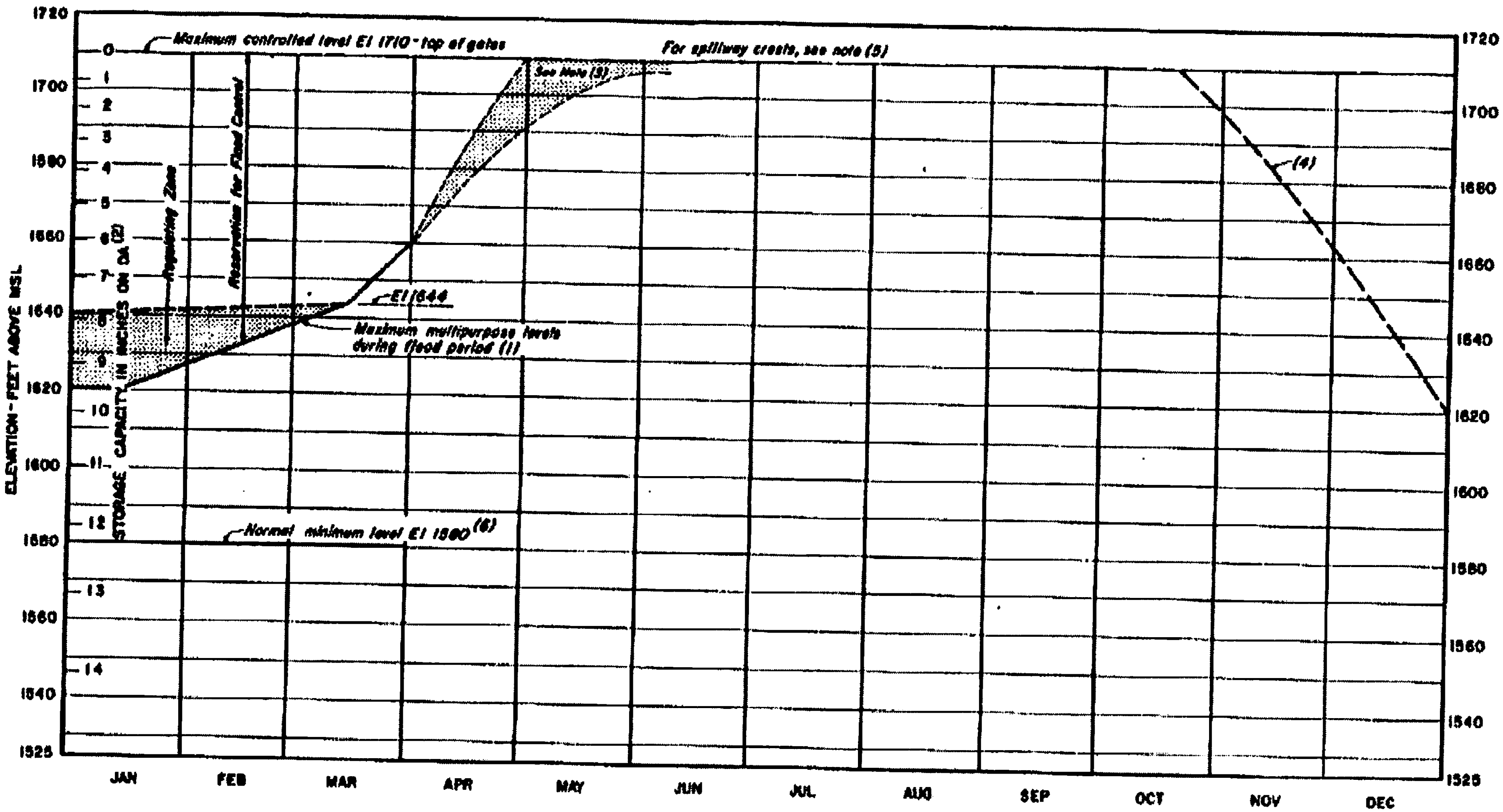
(5) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1860.

HISTORICAL

Best Available Historical Image

MULTIPLE-PURPOSE RESERVOIR OPERATIONS CHATUGE PROJECT FIGURE 2.4.1-3 SHEET 12 OF 14

Revised by Amendment 17



NOTES:

(1) To be exceeded only during flood control operations or for temporary regulation dependent upon hydrological conditions.

(2) Based upon drainage area at Fontana Dam less drainage areas at Thorpe and Nantahala Dams (1571-(36.7+91.0)=1443.3 square miles).

(3) Limitation on filling after April 1 or on drawdown following floods will depend on currently existing hydrological conditions and levels in other reservoirs.

(4) Drawdown at full machine capacity as limited by generator or by full-gate turbine discharge with median inflow.

(5) Main spillway crest - El 1675, Emergency spillway crest - El 1715.

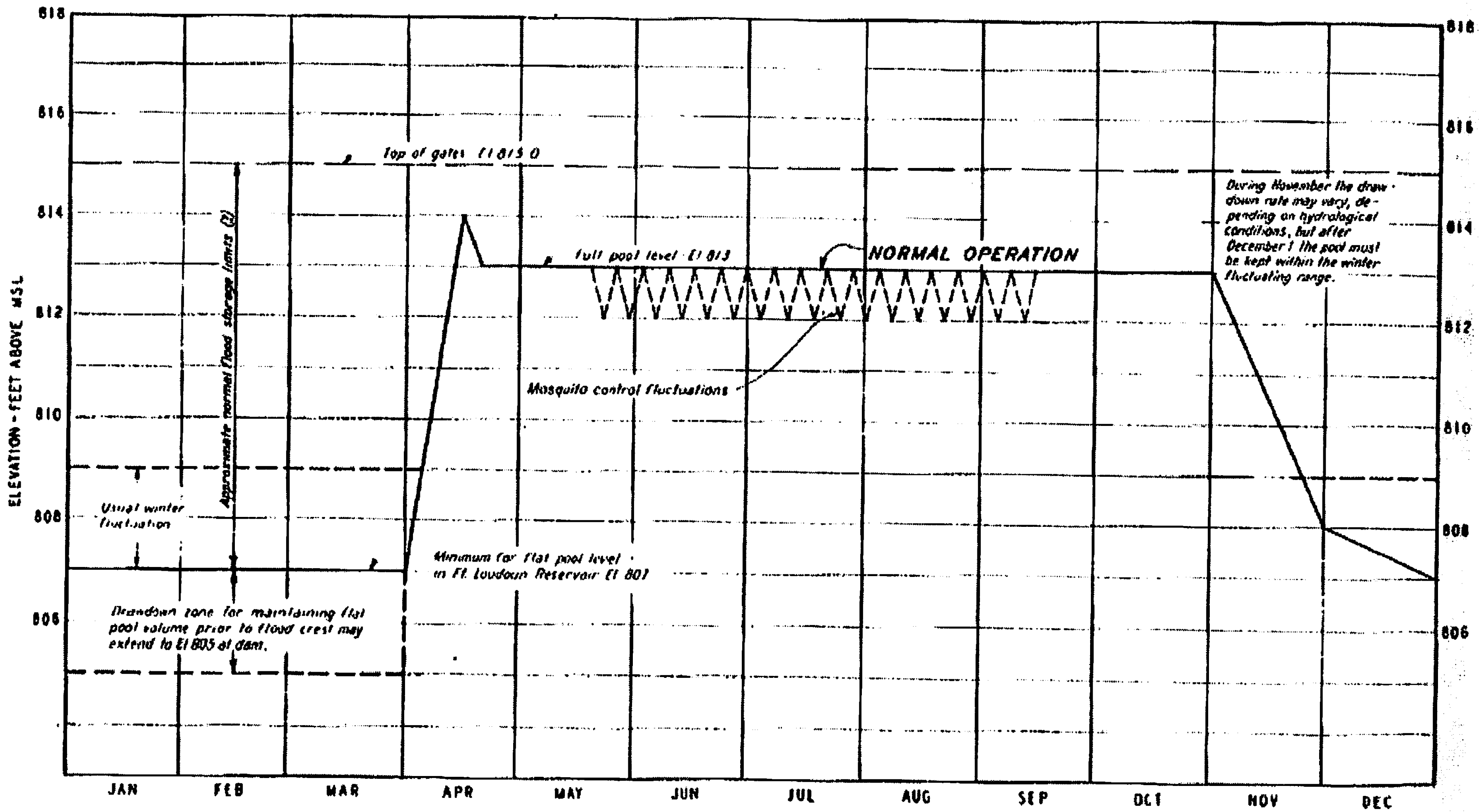
(6) Reservoir may be drawn infrequently to lower levels in the event of drought conditions. Generation can be maintained to approximately elevation 1470.

HISTORICAL

MULTIPLE PURPOSE RESERVOIR OPERATIONS
FONTANA PROJECT
FIGURE 2.4.1-3
SHEET 13 OF 14

Revised by Amendment 17

Best Available Historical Image



NOTES

(1) Elevations apply only at dam
(2) Maximum level assumed for design of dam El 817.5.
(3) Under extreme flood conditions the reservoir may be surcharged as high as El 817.5

HISTORICAL

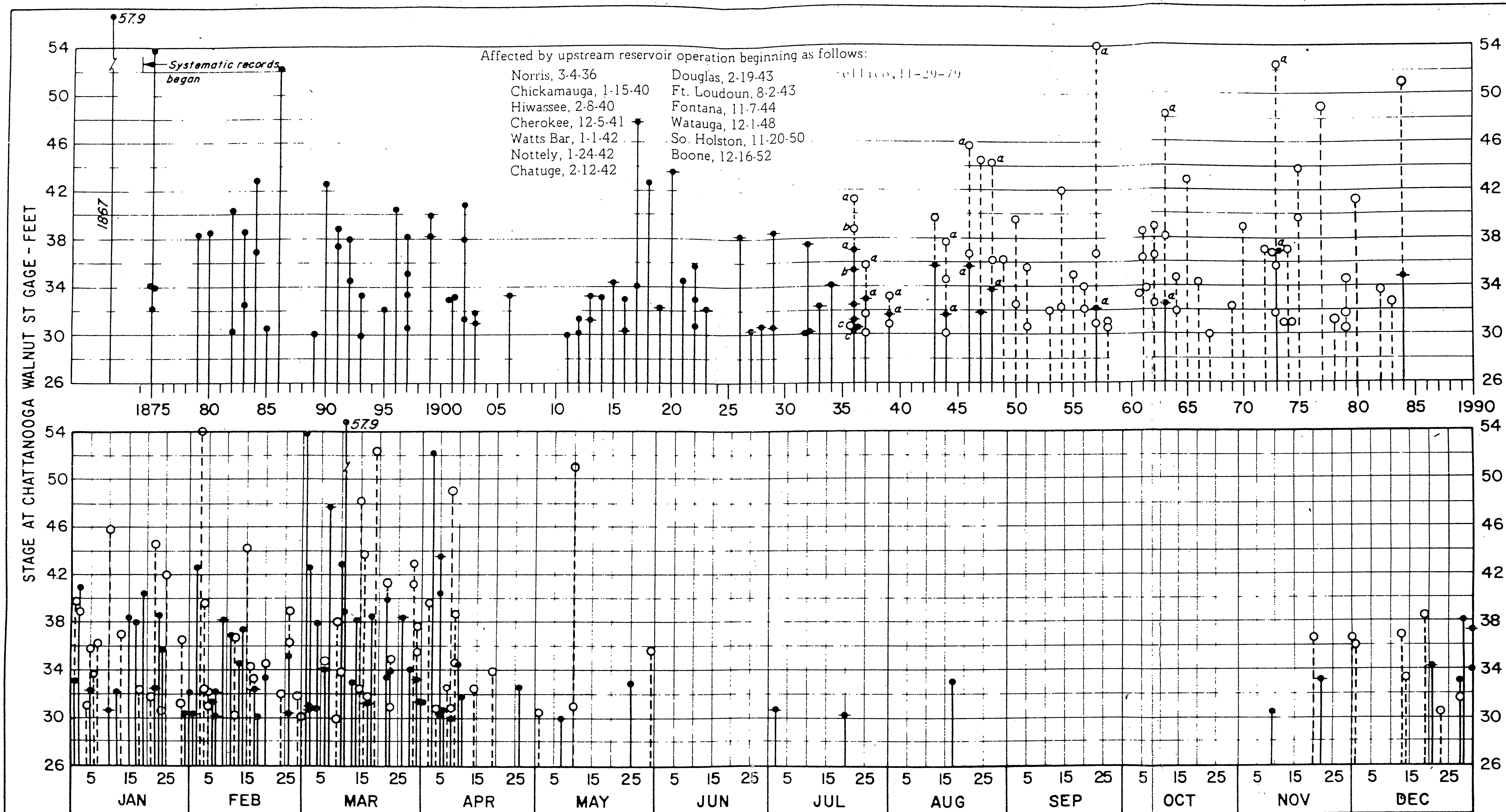
MULTIPLE - PURPOSE RESERVOIR OPERATIONS TELLICO PROJECT

FIGURE 2.4.1-3

SHEET 14 OF 1

Revised by Amend. 7

Best Available Historical Image



Gage zero = 621.12 (1929 genl. adj)
USWB flood stage = 30 feet
Drainage area = 21,400 sq mi

Complete to Oct. 1, 1985

NOTES:

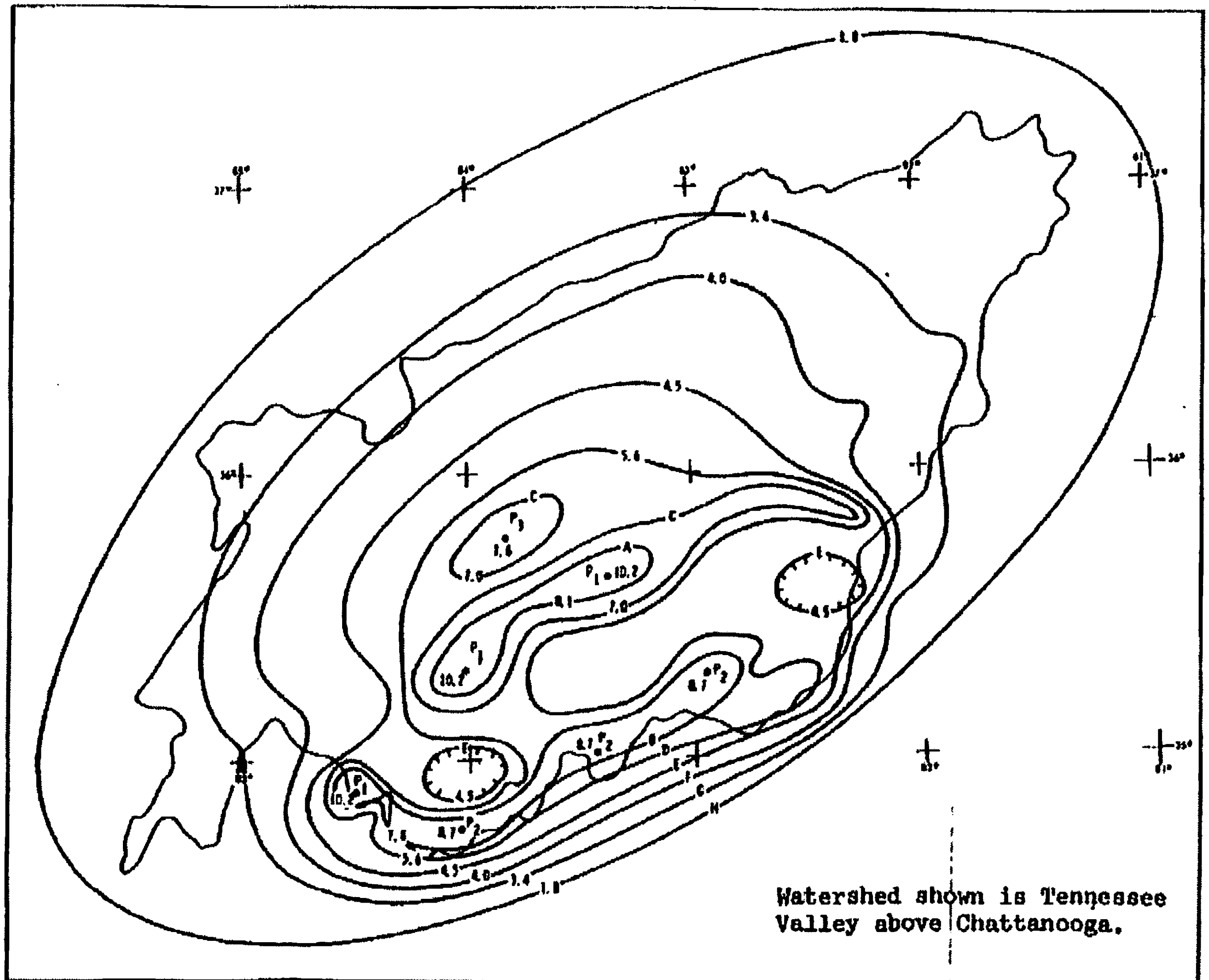
The stages shown for the 1867 flood and the highest flood in 1875 are from well authenticated flood marks. All other stages, except in 1874 and 1875, are reported (◆) or estimated (●) crests from observations at the same datum and location, Walnut Street. The stage readings in 1874 and 1875 were based on a different datum, but the estimated crests were corrected to be comparable to later records. Stages since October 22, 1913 are not comparable with earlier ones because of the backwater effect of Hales Bar Dam, 35 miles downstream. A change in Hales Bar Spillway in 1948, the closure of Nickajack Dam in December 1967, and subsequent removal of Hales Bar Dam further affected Chattanooga stages, making later stages incomparable to earlier periods.

Since March 4, 1936, when upstream regulation began, both computed natural (O) and reported crests are shown on the yearly chart. These natural crests are based on conditions when TVA was established, and hence are comparable to stages from 1913 to 1948. Only natural crests since March 1936 are shown on the seasonal diagram.

HISTORICAL

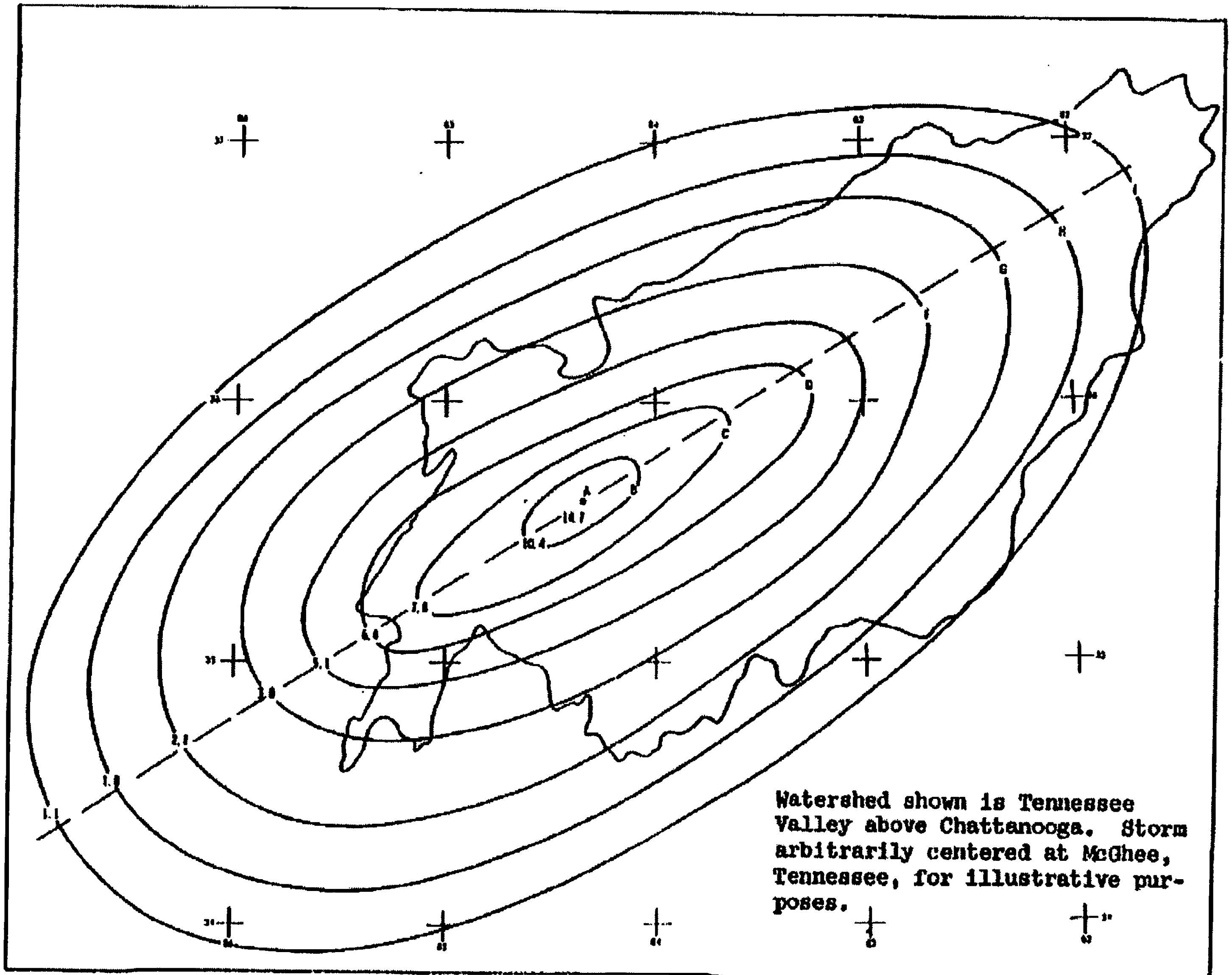
Figure 2.4.2-1 Flood Distribution Diagram Chattanooga, Tn.

Revised by Amendment 17



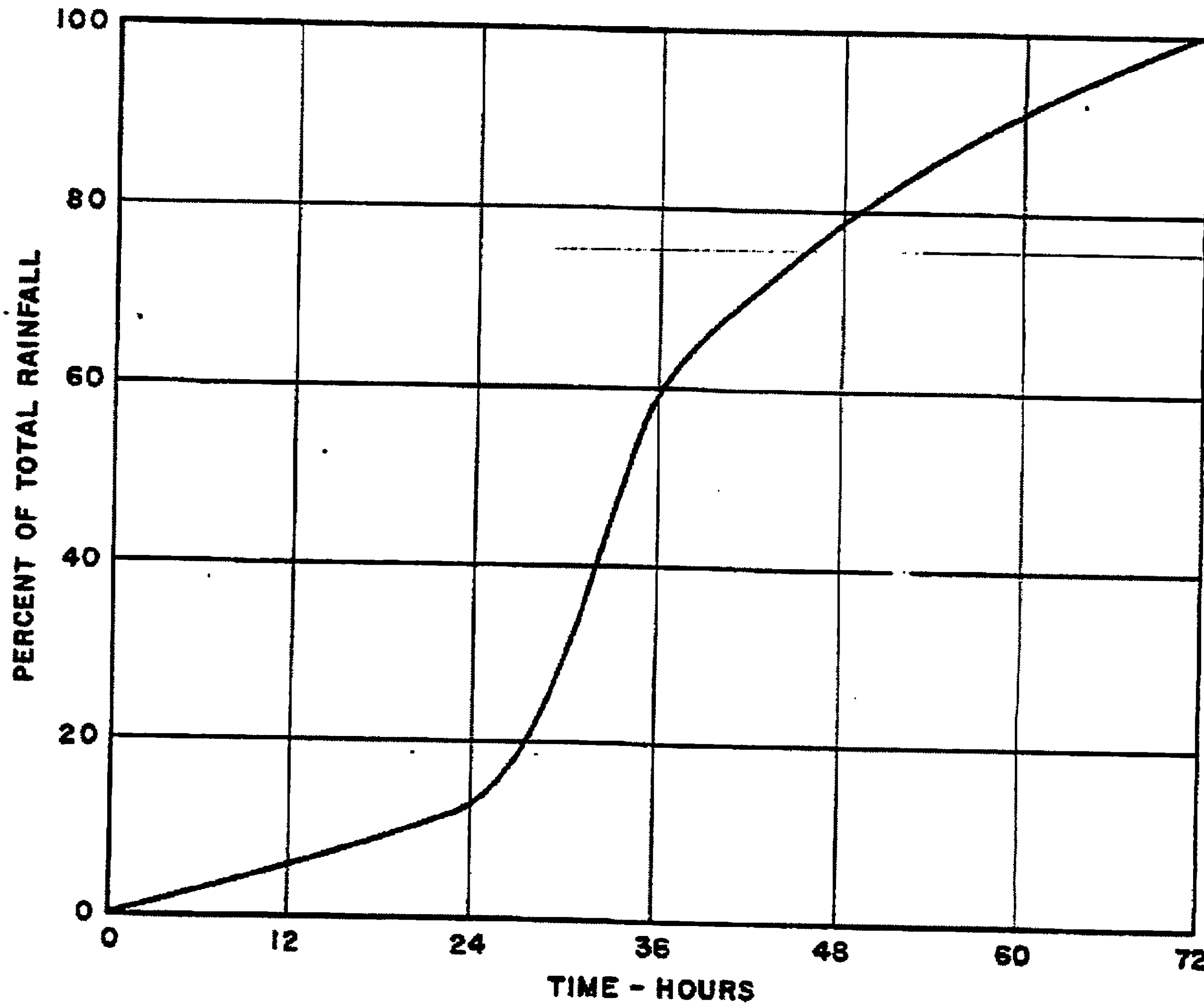
HISTORICAL

Figure 2.4.3-1 Probable maximum March isohyets (21,400-sq. mi. downstream), 1st 6 hours (in.)



HISTORICAL

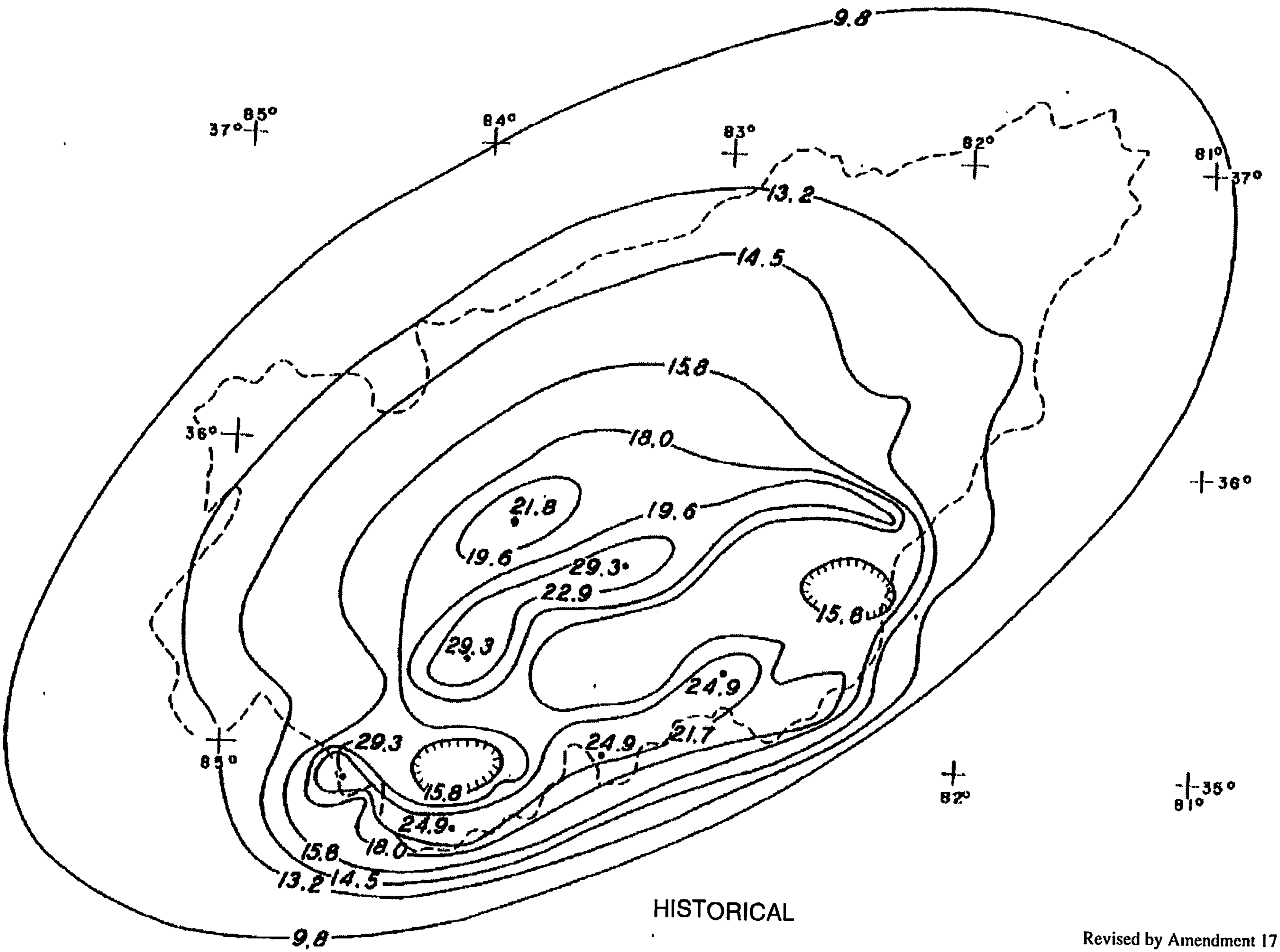
Figure 2.4.3-2 **Probable maximum March isohyets (7980 sq. mi.), 1st 6 hours (in.)**



RAINFALL-TIME DISTRIBUTION
ADOPTED STANDARD MASS CURVE
HISTORICAL

Figure 2.4.3-3

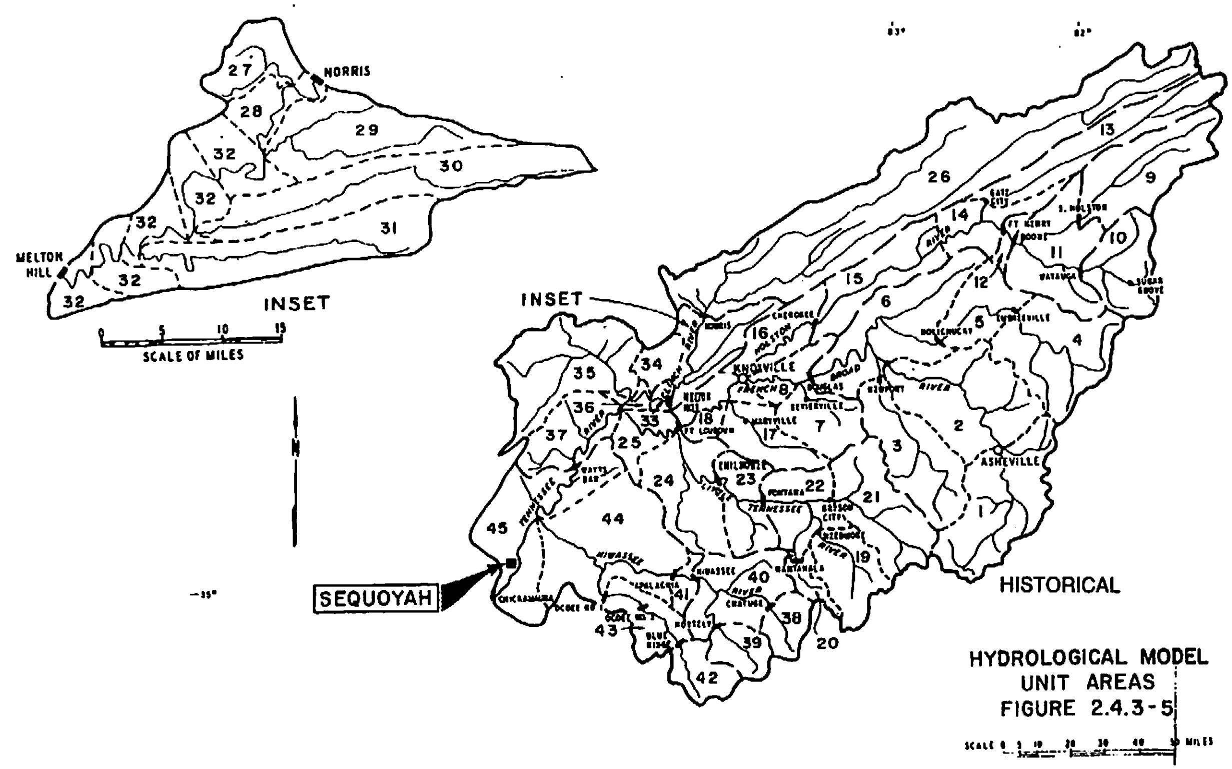
Best Available Historical Image



HISTORICAL

Revised by Amendment 17

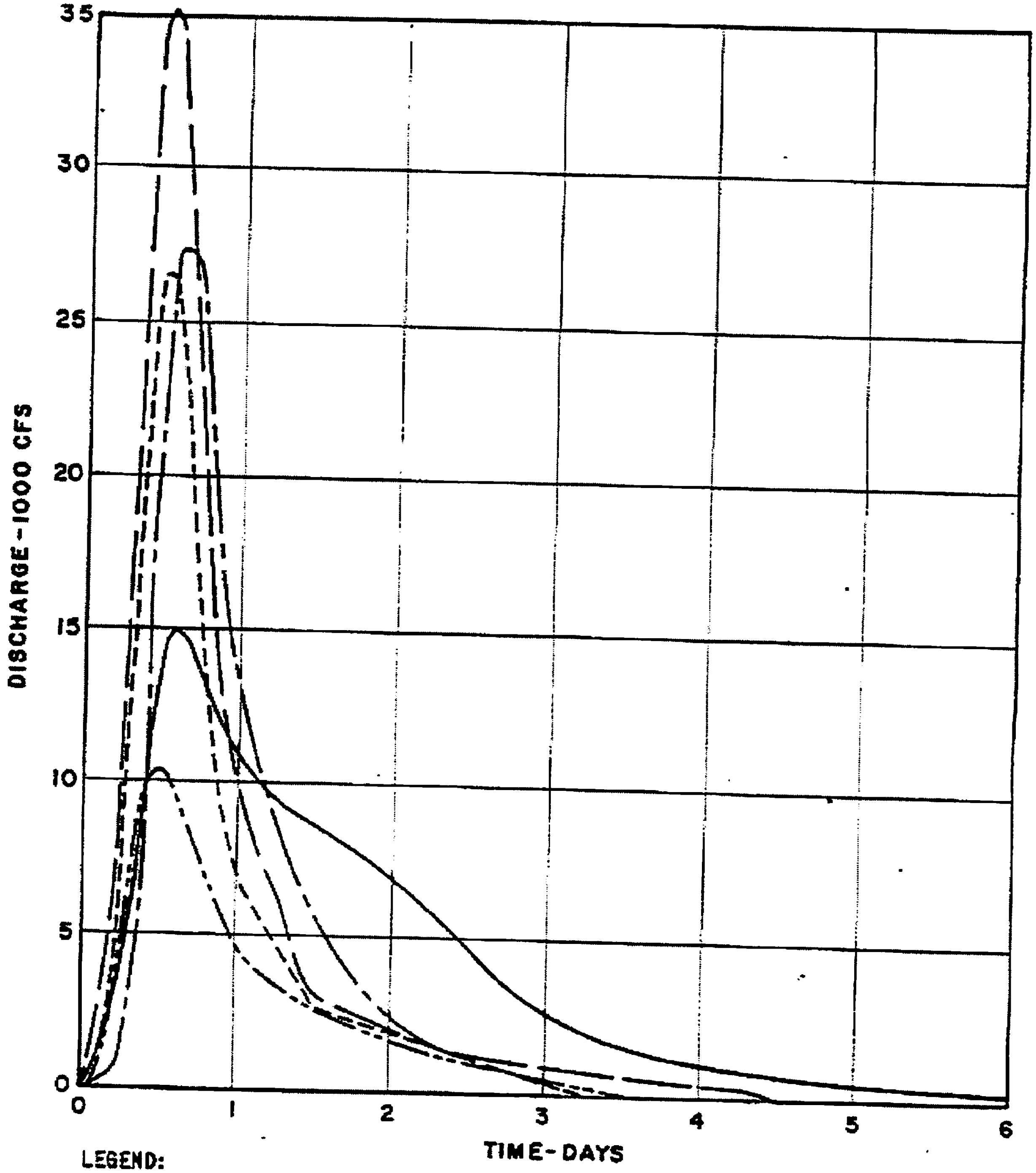
Figure 2.4.3-4 72-Hour March Probable Maximum Storm Depths (IN)



HYDROLOGICAL MODEL
UNIT AREAS
FIGURE 2.4.3-5

LEGEND:
28 AREA INDEX NUMBER
WATERSHED ABOVE GUNTERSVILLE DAM
RESERVOIR INFLOW AREAS
UNIT AREAS
STREAM GAGING STATIONS
DAMS

Revised by Amendment 17



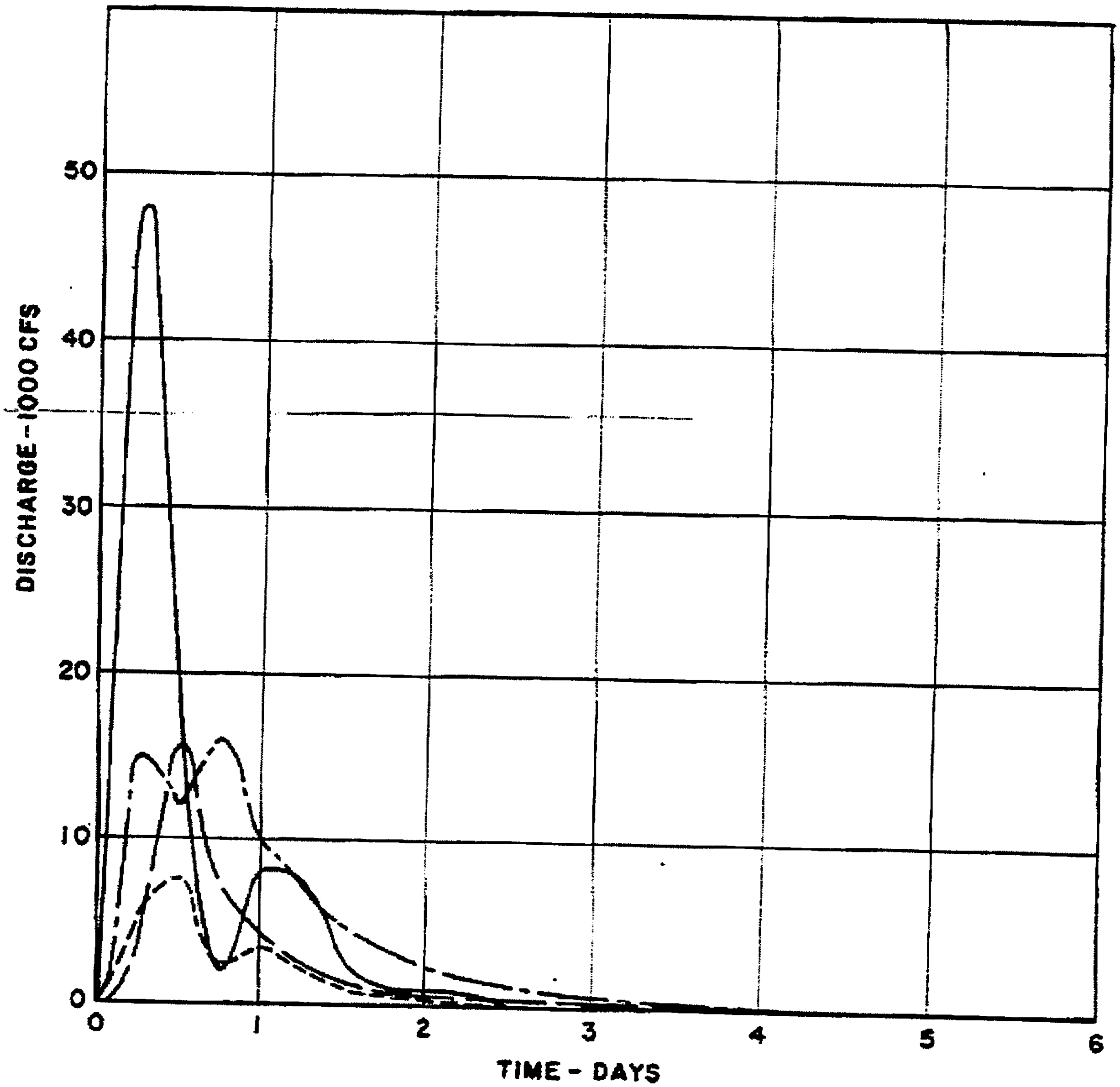
LEGEND:

AREA 1, FRENCH BROAD RIVER AT ASHEVILLE, 945 SQ. MI.
AREA 2, FRENCH BROAD RIVER, NEWPORT TO ASHEVILLE, 913 SQ. MI.
AREA 3, PIGEON RIVER AT NEWPORT, 666 SQ. MI.
AREA 4, NOLICHUCKY RIVER AT EMBREEVILLE, 805 SQ. MI.
AREA 5, NOLICHUCKY LOCAL, 378 SQ. MI.

HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 1 OF 11
FIGURE 2.4.3-6

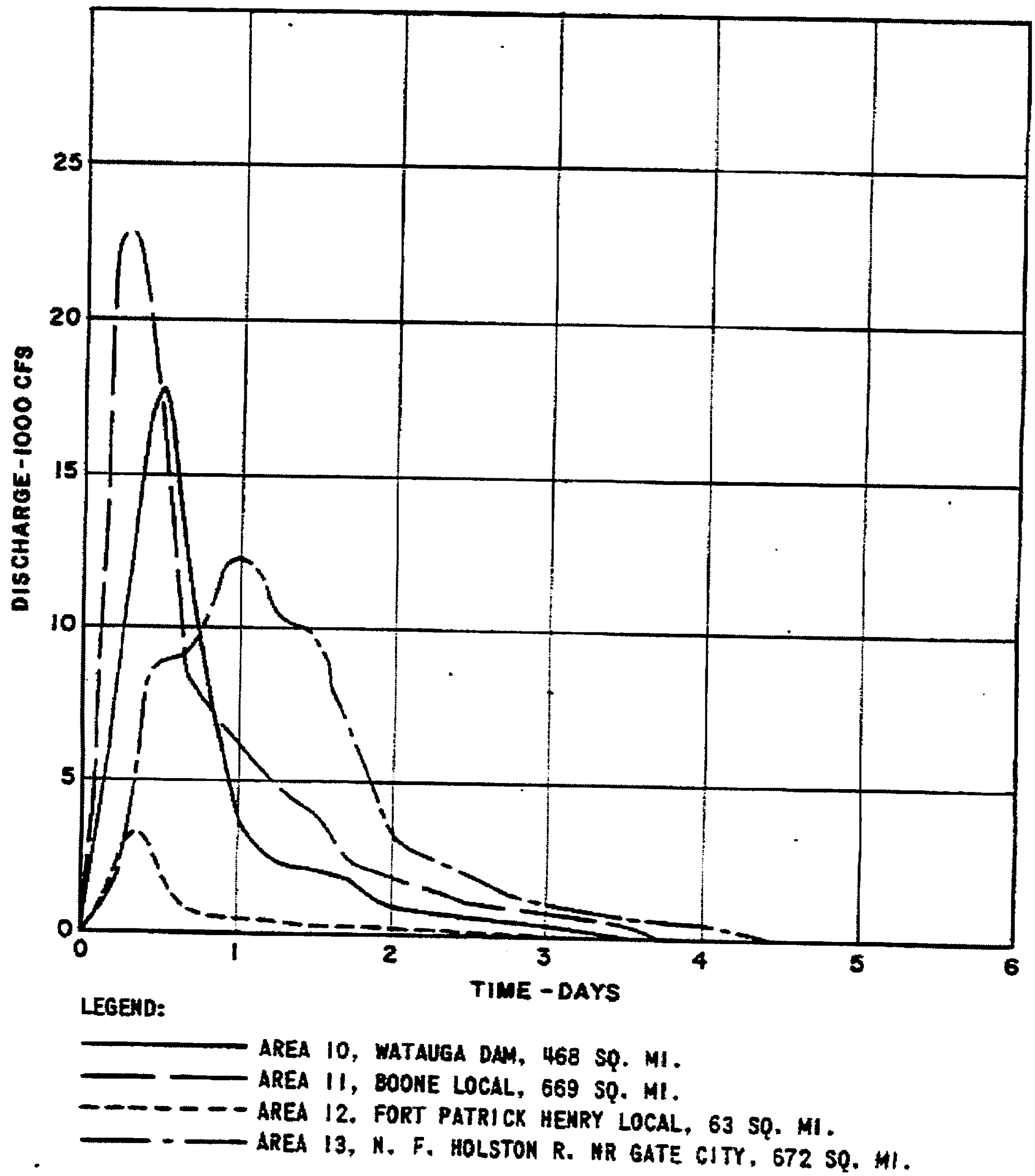


LEGEND:

AREA 6, DOUGLAS LOCAL, 832 SQ. MI.
AREA 7, LITTLE PIGEON RIVER, 353 SQ. MI.
AREA 8, FRENCH BROAD RIVER LOCAL, 207 SQ. MI.
AREA 9, SOUTH HOLSTON DAM, 703 SQ. MI.

HISTORICAL

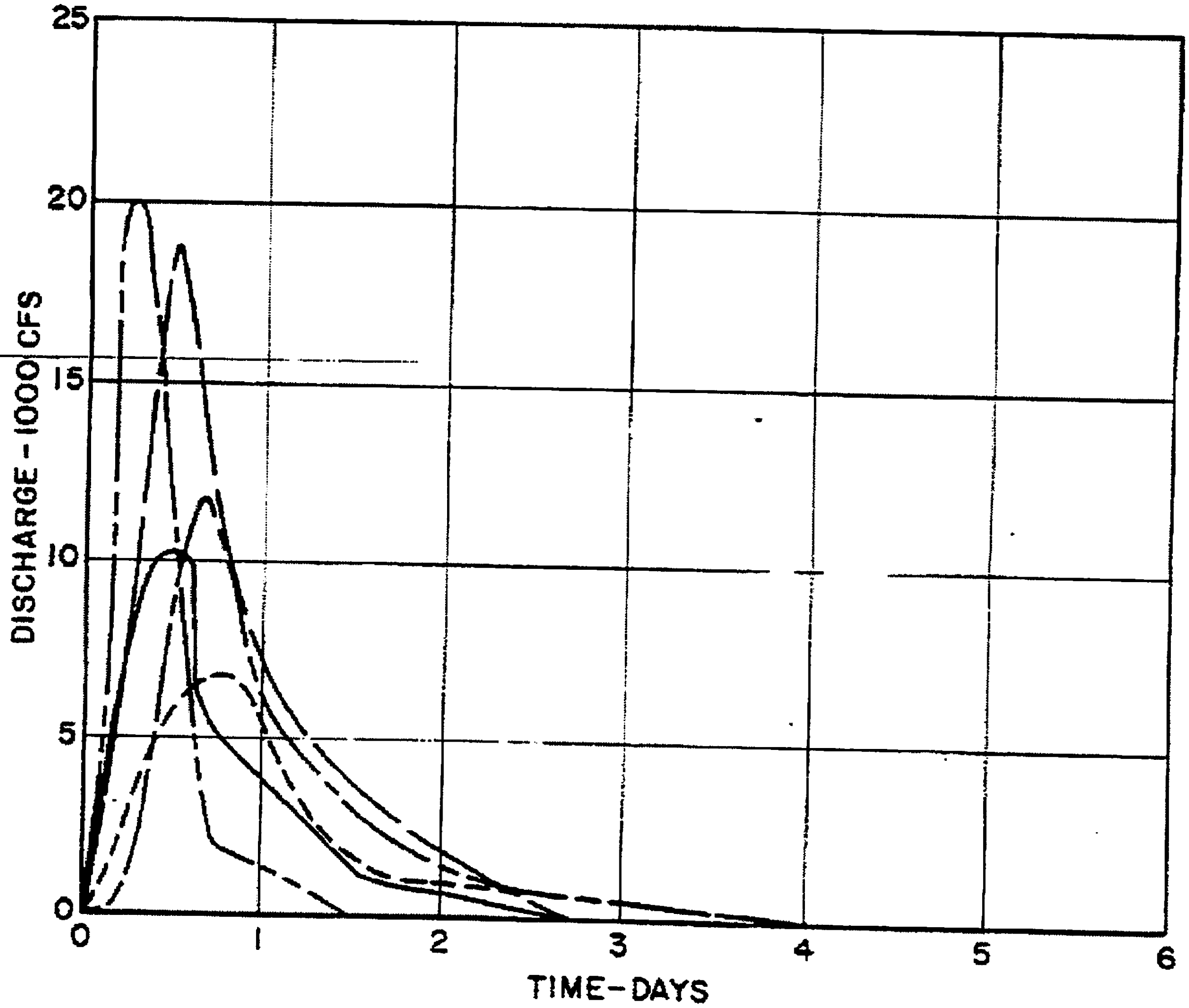
6-HOUR UNIT HYDROGRAPHS
SHEET 2 OF 11
FIGURE 2.4.3-6



HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 3 OF 11
FIGURE 2.4.3-6



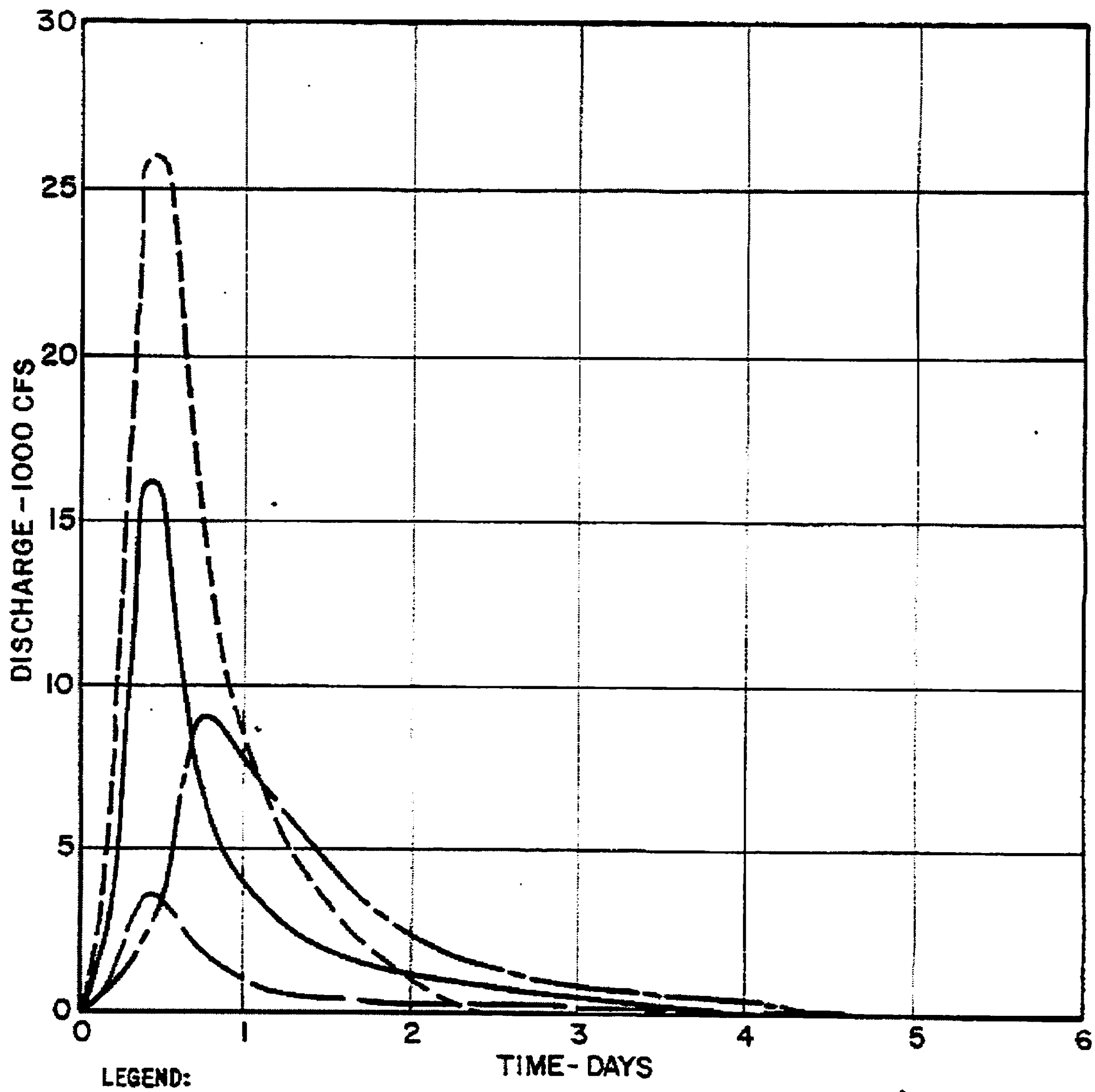
LEGEND:

AREA 14. SURGOINSVILLE LOCAL, 299 SQ. MI.
AREA 15. CHEROKEE LOCAL BELOW SURGOINSVILLE, 554 SQ. MI.
AREA 16, HOLSTON RIVER LOCAL, 289 SQ. MI.
AREA 17, LITTLE RIVER AT MOUTH, 379 SQ. MI.
AREA 18, FORT LOUDOUN LOCAL, 323 SQ. MI.

HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 4 OF 11
FIGURE 2.4.3-6



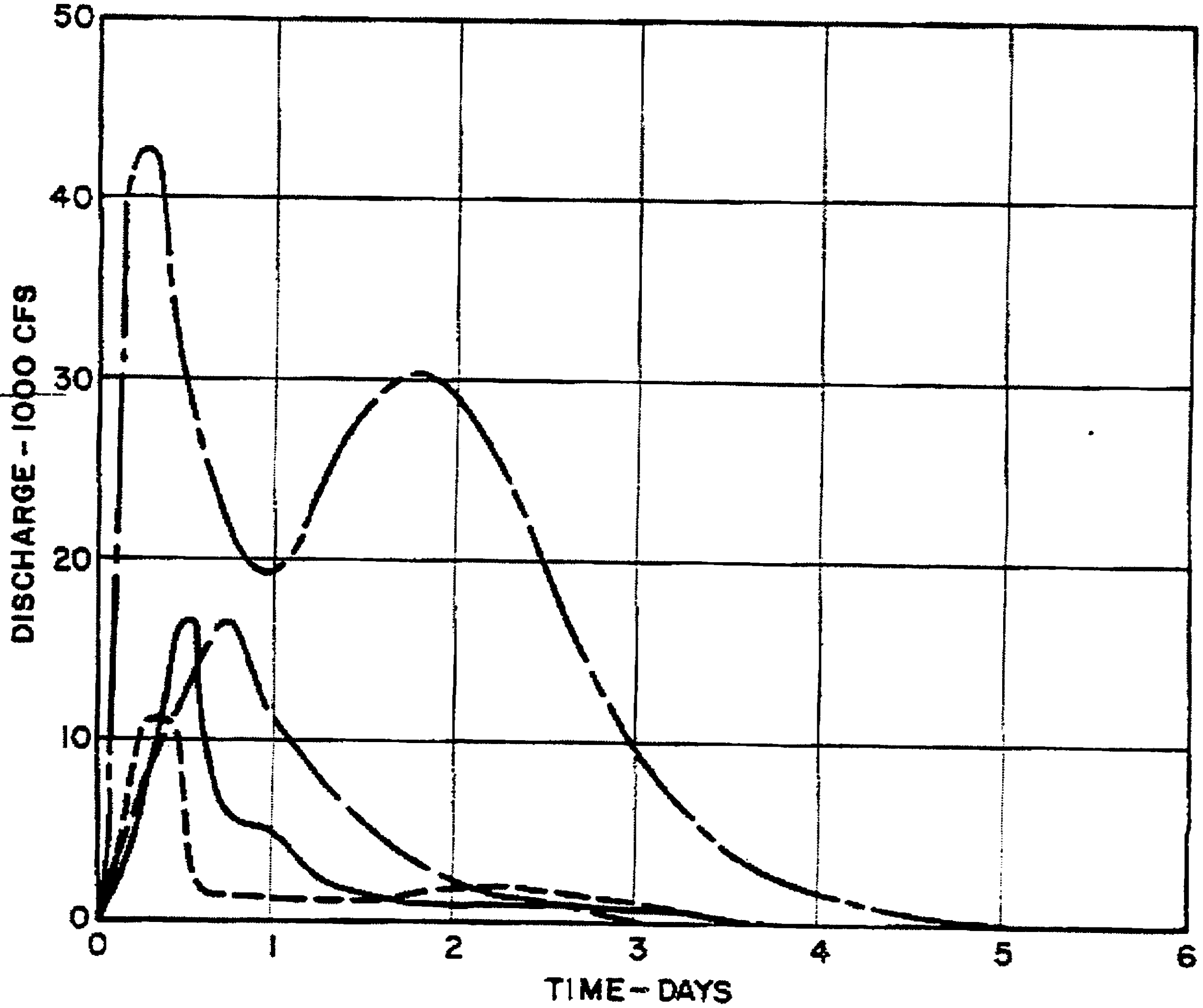
LEGEND:

- AREA 19, LITTLE TENNESSEE R. AT NEEDMORE, 436 SQ. MI.
- AREA 20, NANTAHALA, 91 SQ. MI.
- AREA 21, TUCKASEGEE R. AT BRYSON CITY, 655 SQ. MI.
- AREA 22, FONTANA LOCAL, 389 SQ. MI.

HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 5 OF 11
FIGURE 2.4.3-6

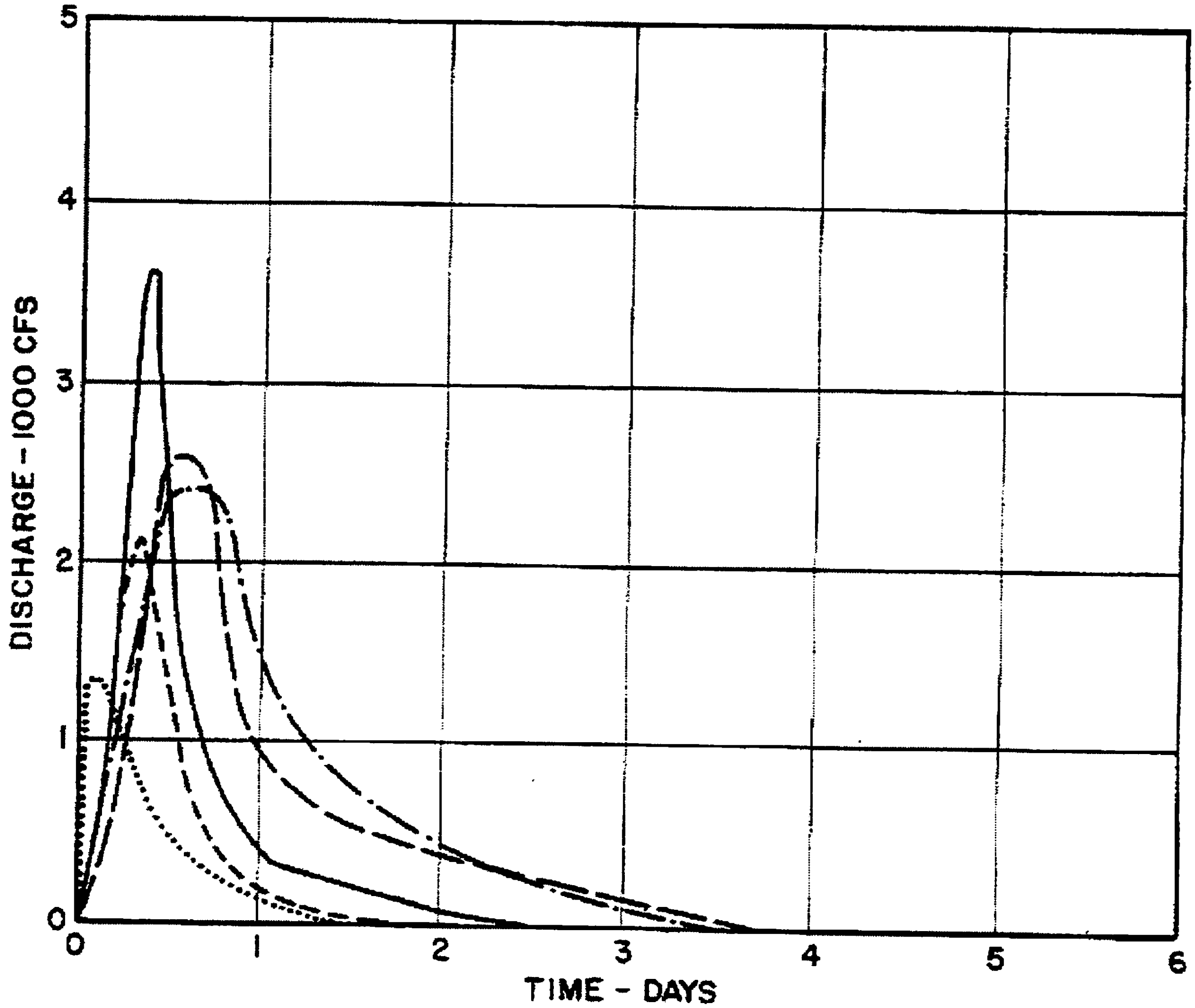


LEGEND:
- AREA 23, LITTLE TENNESSEE R. LOCAL, FONTANA TO CHILHOWEE, 406 SQ. MI.
- AREA 24, LITTLE TENNESSEE R. LOCAL, CHILHOWEE TO TO TELLICO DAM, 650 SQ. MI.
- AREA 25, WATTS BAR LOCAL ABOVE CLINCH RIVER, 293 SQ. MI.
- AREA 26, NORRIS DAM, 2912 SQ. MI.

HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 6 OF 11
FIGURE 2.4.3-6



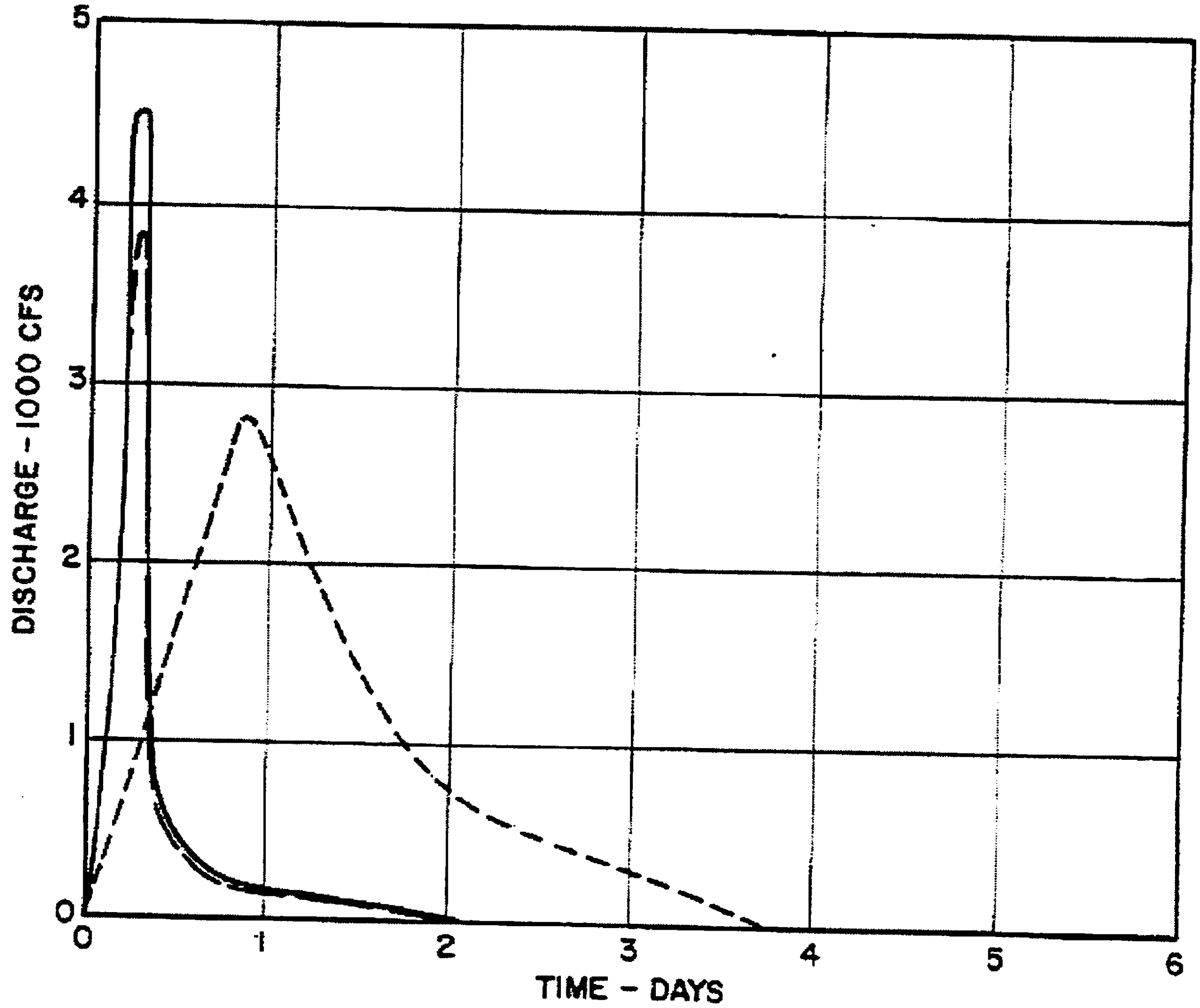
LEGEND:

AREA 27, COAL CREEK, 36.6 SQ. MI.
AREA 29, HINDS CREEK, 66.4 SQ. MI.
AREA 30, BULLRUN CREEK, 104 SQ. MI.
AREA 31, BEAVER CREEK, 90.5 SQ. MI.
AREAS 28 AND 32, CLINCH RIVER LOCAL AREAS, 22. 2 SQ. MI.

HISTORICAL

Revised by Amendment 17

2-HOUR UNIT HYDROGRAPHS
SHEET 7 OF 11
FIGURE 2.4.3-6



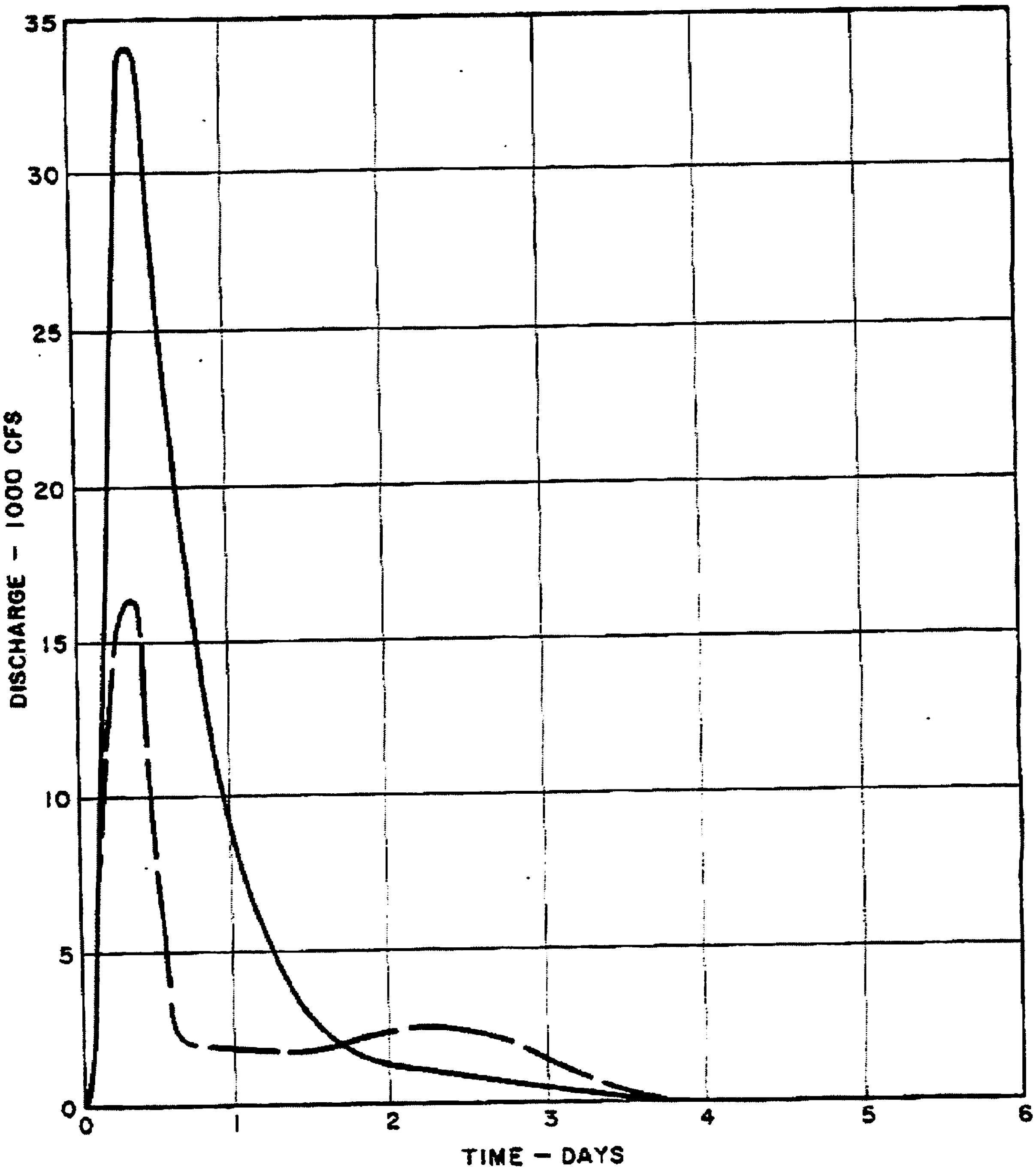
LEGEND:

AREA 33, LOCAL AREA ABOVE MI. 16, 37 SQ. MI.
AREA 34, POPLAR CREEK, 136 SQ. MI.
AREA 36, LOCAL AREA AT MOUTH, 32 SQ. MI.

HISTORICAL

Revised by Amendment 17

2-HOUR UNIT HYDROGRAPHS
SHEET 8 OF 11
FIGURE 2.4.3-6



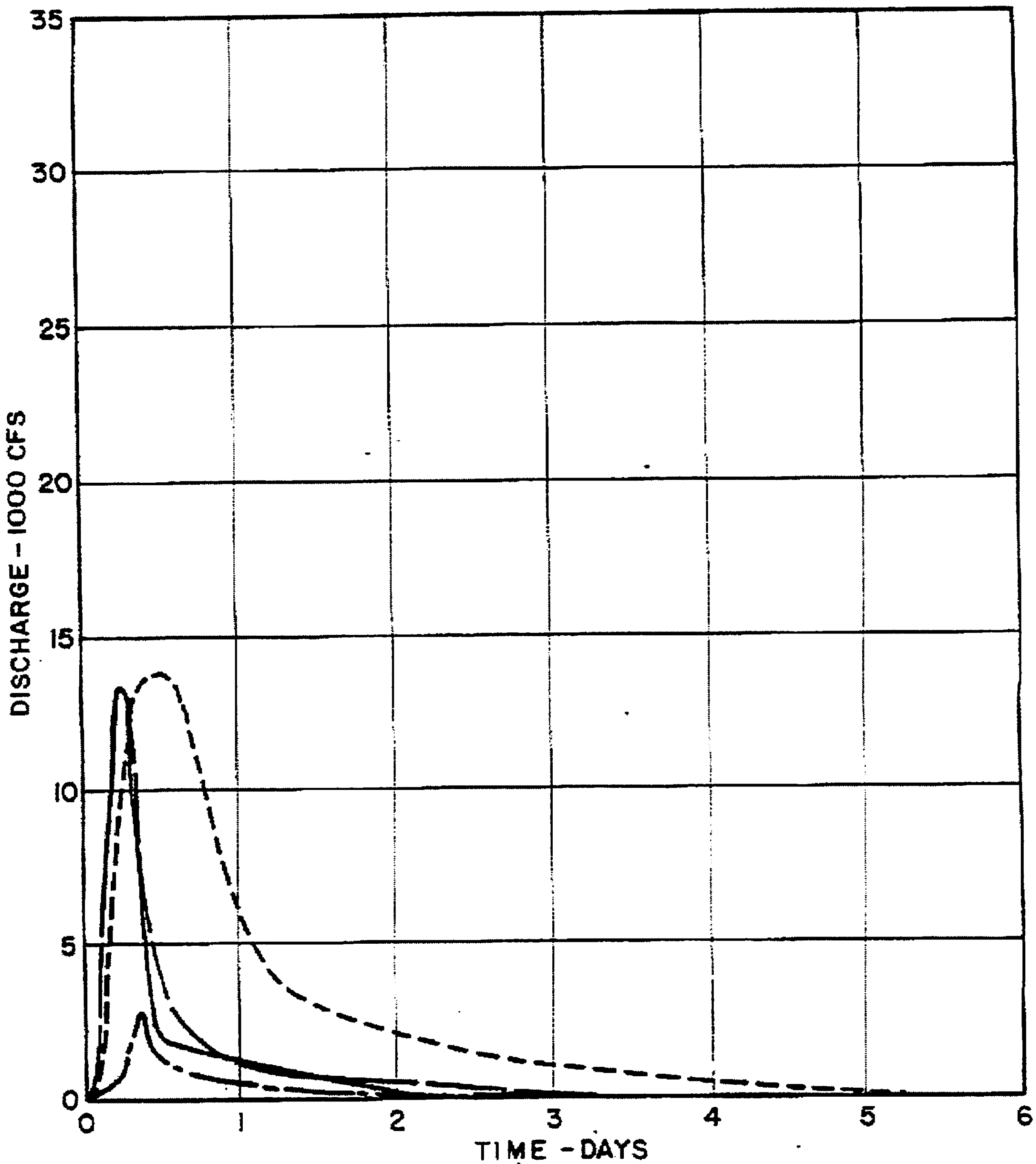
LEGEND:

——— AREA 35, EMORY RIVER AT MOUTH, 865 SQ. MI.

— — AREA 37, WATTS BAR LOCAL BELOW CLINCH RIVER, 427 SQ. MI.

HISTORICAL Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 9 OF 11
FIGURE 2.4.3-6



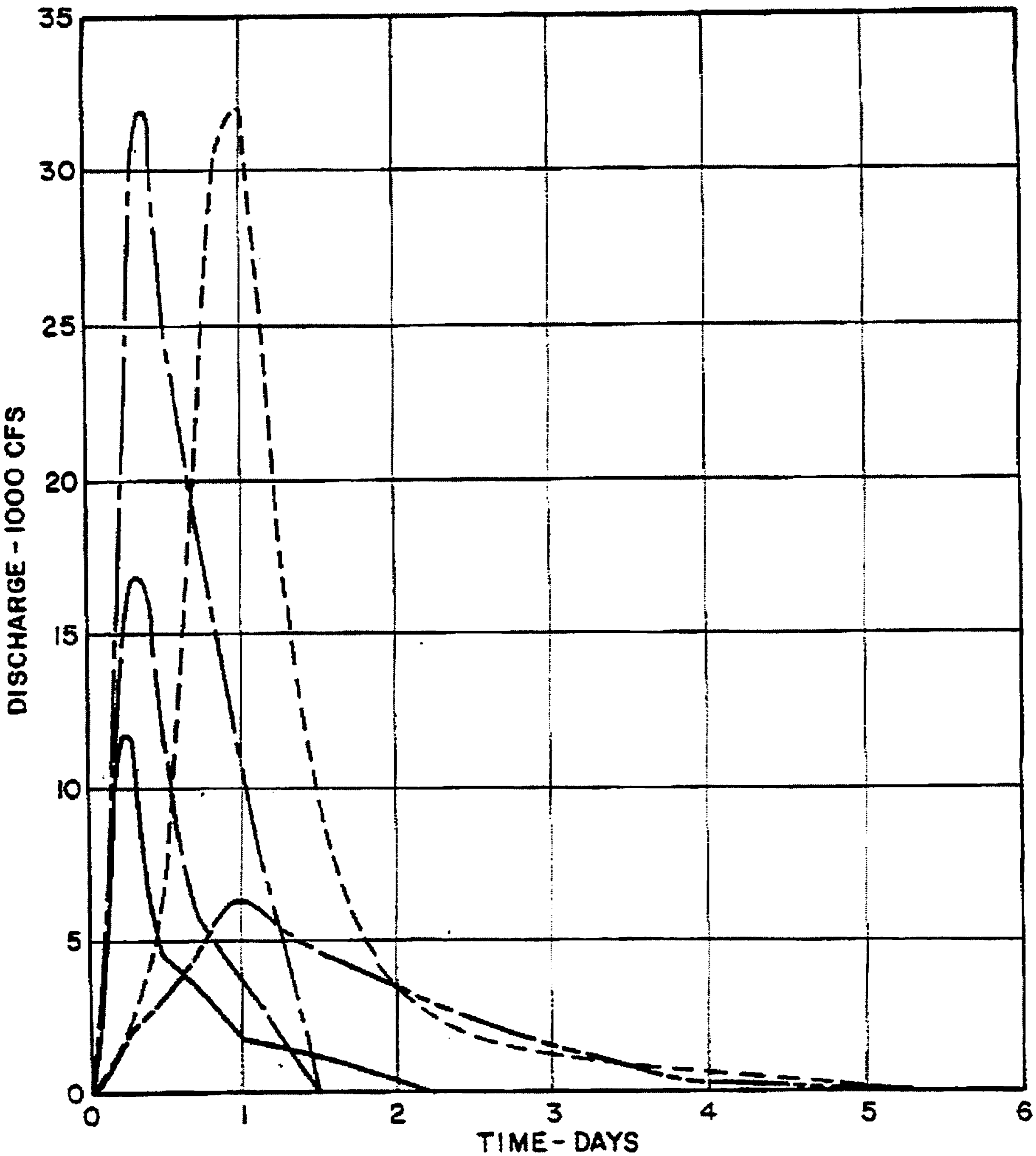
LEGEND:

AREA 38, CHATUGE DAM, 190 SQ. MI.
AREA 39, NOTTELY DAM, 215 SQ. MI.
AREA 40, HIWASSEE LOCAL, 564 SQ. MI.
AREA 41, APALACHIA, 50 SQ. MI.

HISTORICAL

Revised by Amendment

6-HOUR UNIT HYDROGRAPHS
SHEET 10 OF 11
FIGURE 2.4.3-6



LEGEND:

- (solid line) AREA 42, BLUE RIDGE DAM, 232 SQ. MI.
- (long dash) AREA 43, OCOEE NO. 1 TO BLUE RIDGE DAM. 363 SQ. MI.
- (short dash) AREA 44, LOWER HIWASSEE LOCAL, 1087 SQ. MI.
- (dash-dot) AREA 45, CHICKAMAUGA LOCAL, 780 SQ. MI.

HISTORICAL

Revised by Amendment 17

6-HOUR UNIT HYDROGRAPHS
SHEET 11 OF 11
FIGURE 2.4.3-6

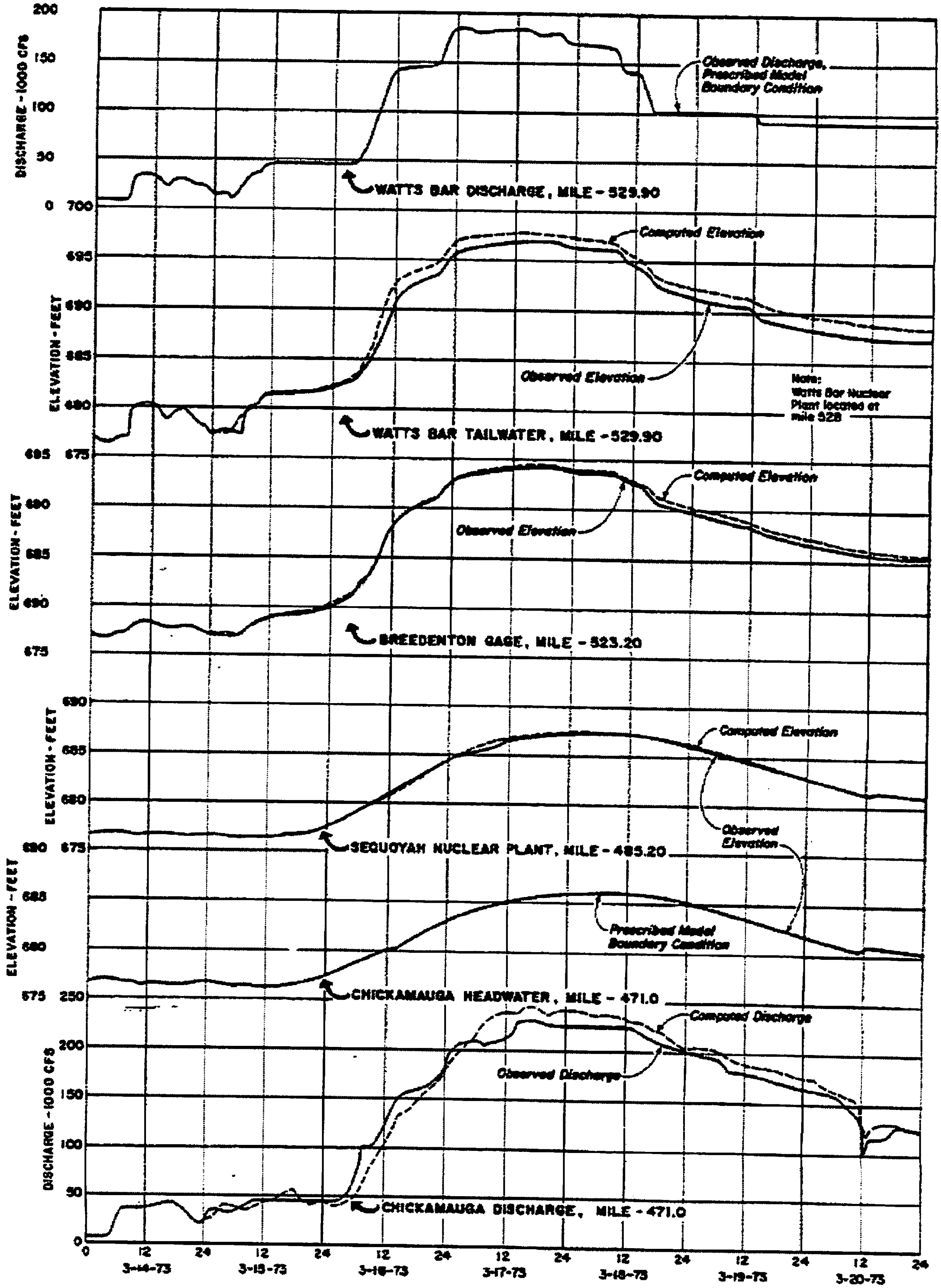
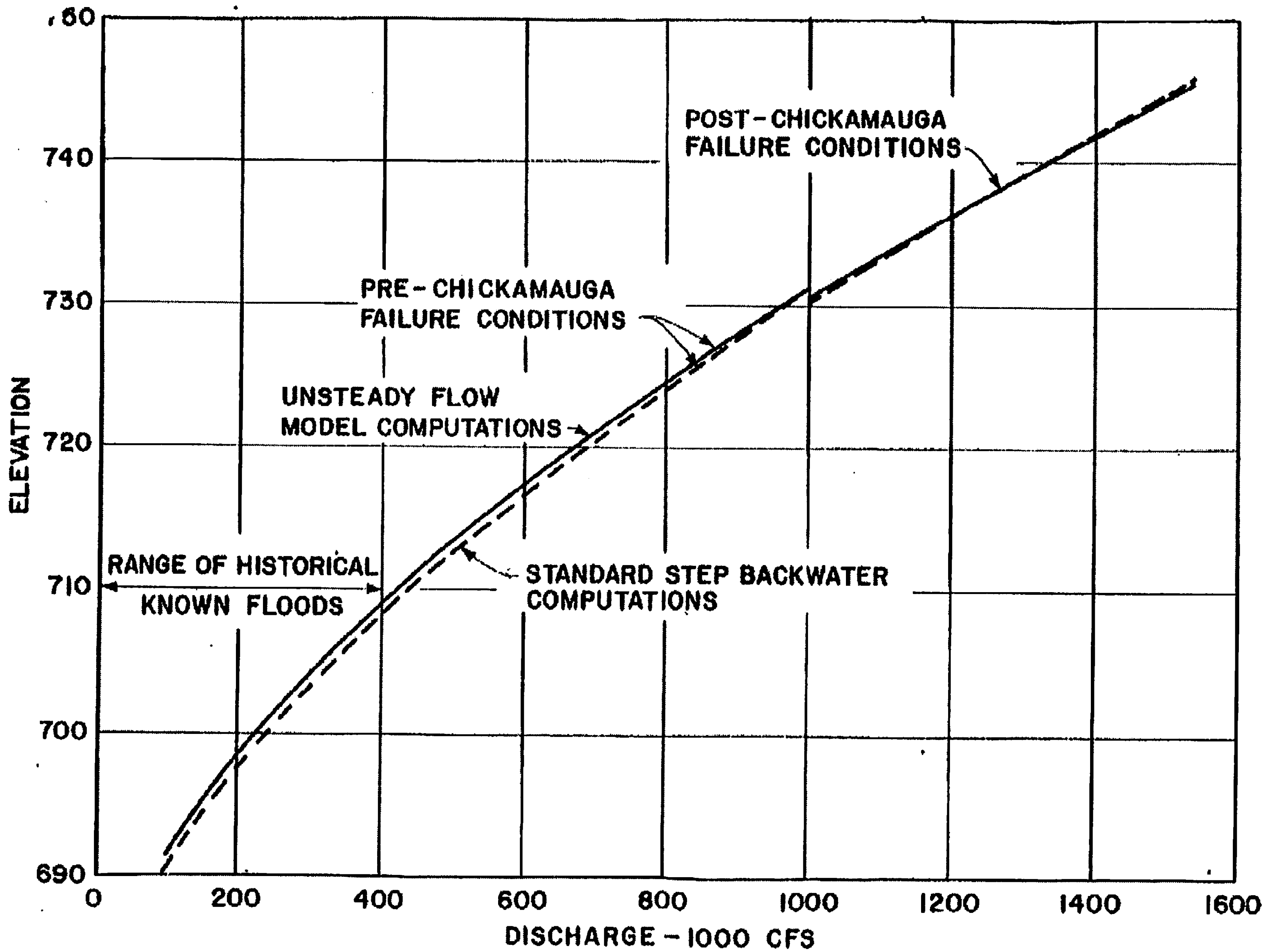


FIGURE 2.4.3-7 1973 FLOOD - CHICKAMAUGA RESERVOIR UNSTEADY FLOW MODEL VERIFICATION

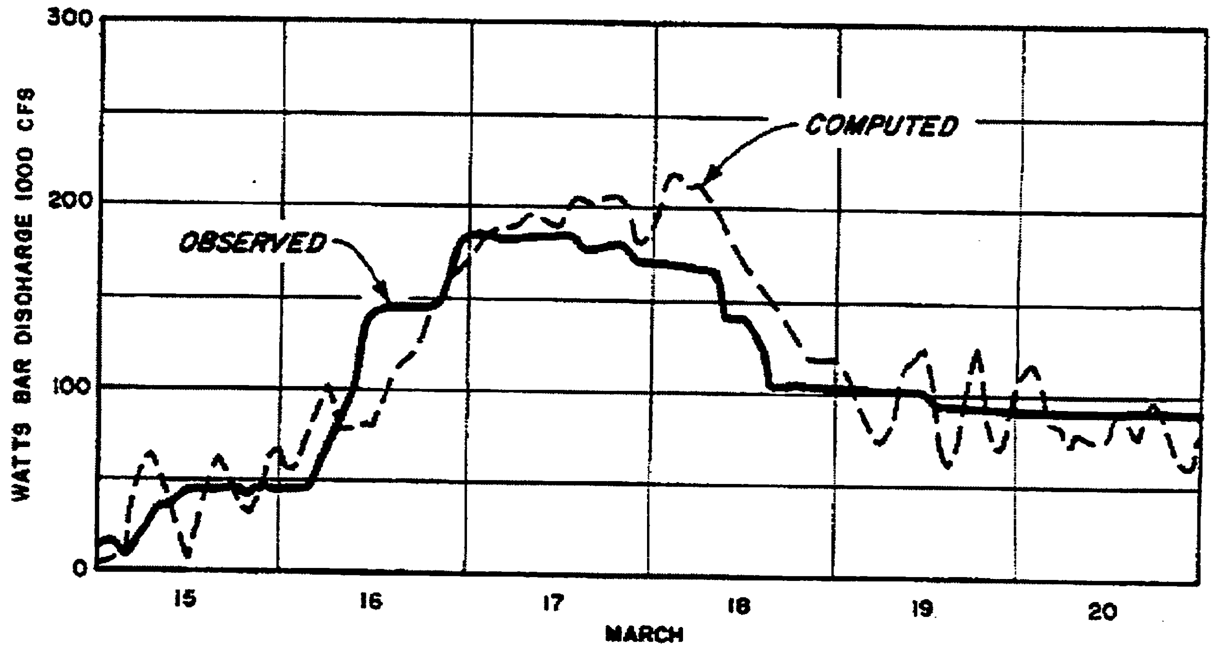
HISTORICAL

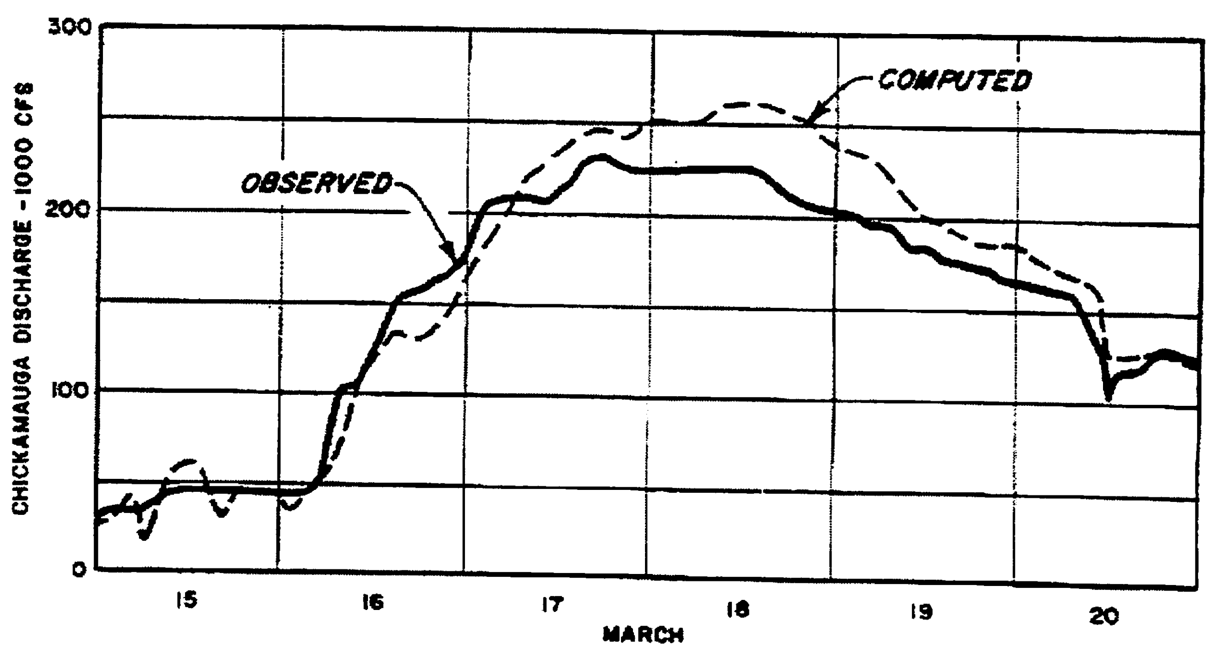
Revised by Amendment 17



STEADY-STATE MODEL VERIFICATION
WATTS BAR DAM TAILWATER RATING CURVE
FIGURE 2.4.3-8
HISTORICAL

Revised by Amendment 17



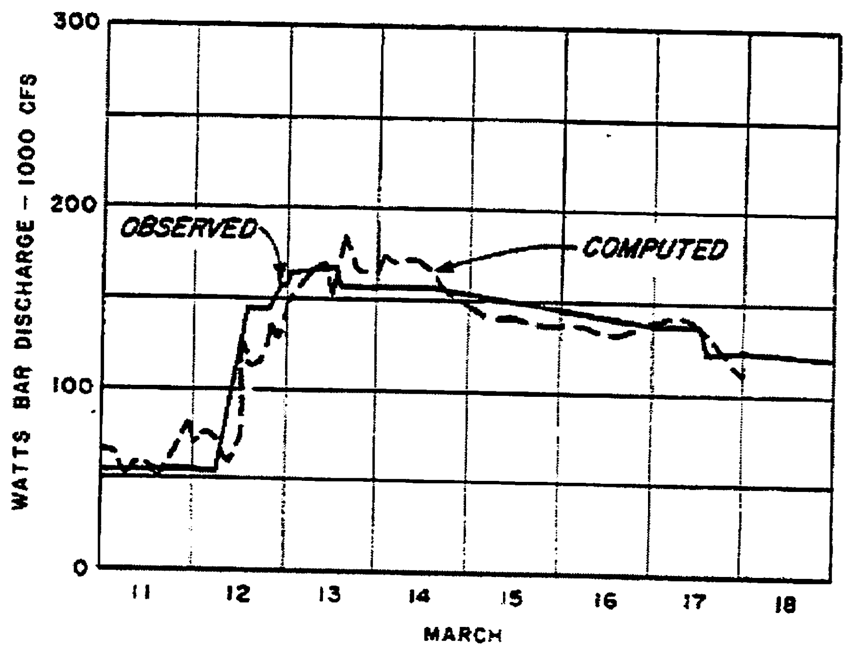


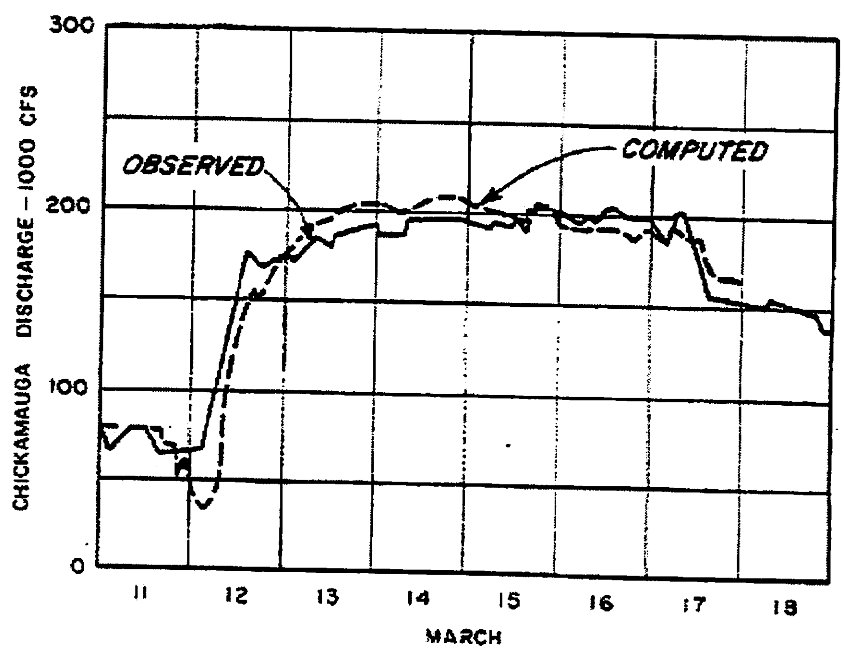
HYDROLOGIC MODEL VERIFICATION - 1973 FLOOD

FIGURE 2.4.3-9

HISTORICAL

Revised by Amendment 17





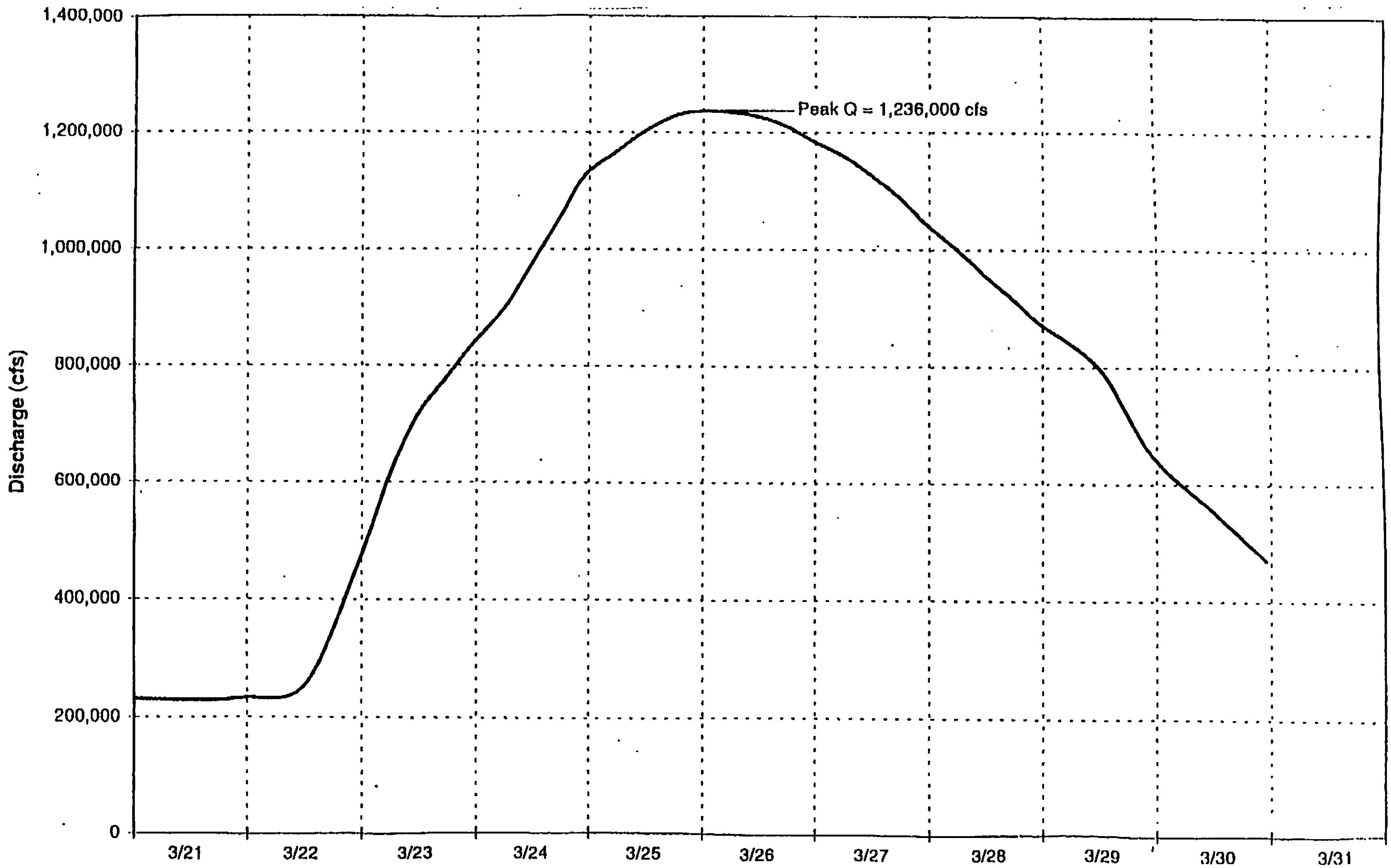
HYDROLOGIC MODEL VERIFICATION – 1963 FLOOD

FIGURE 2.4.3 - 10

HISTORICAL

Revised by Amendment 17

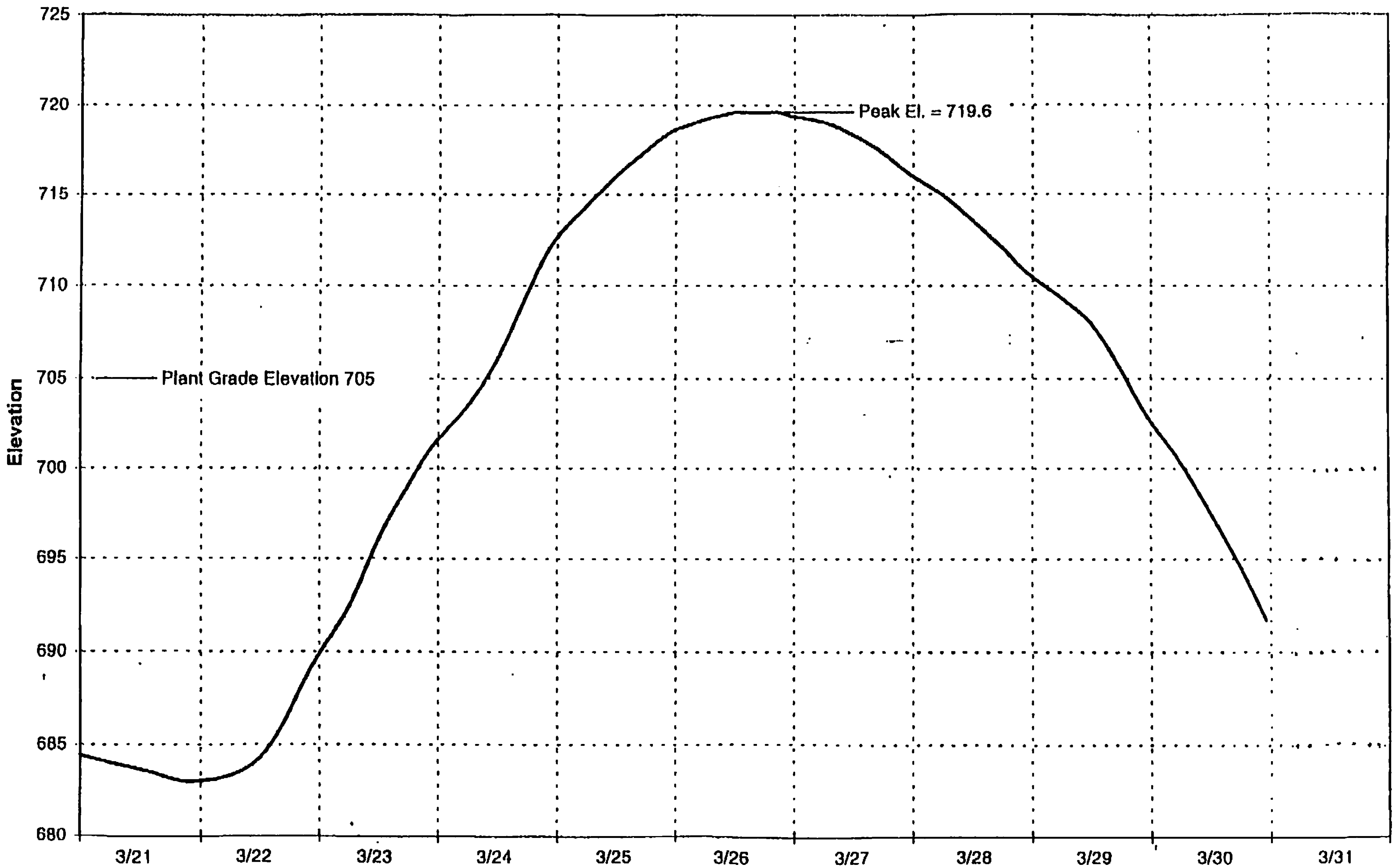
Best Available Historical Image



Sequoyah Nuclear Plant Probable Maximum Flood Discharge

Figure 2.4.3-11

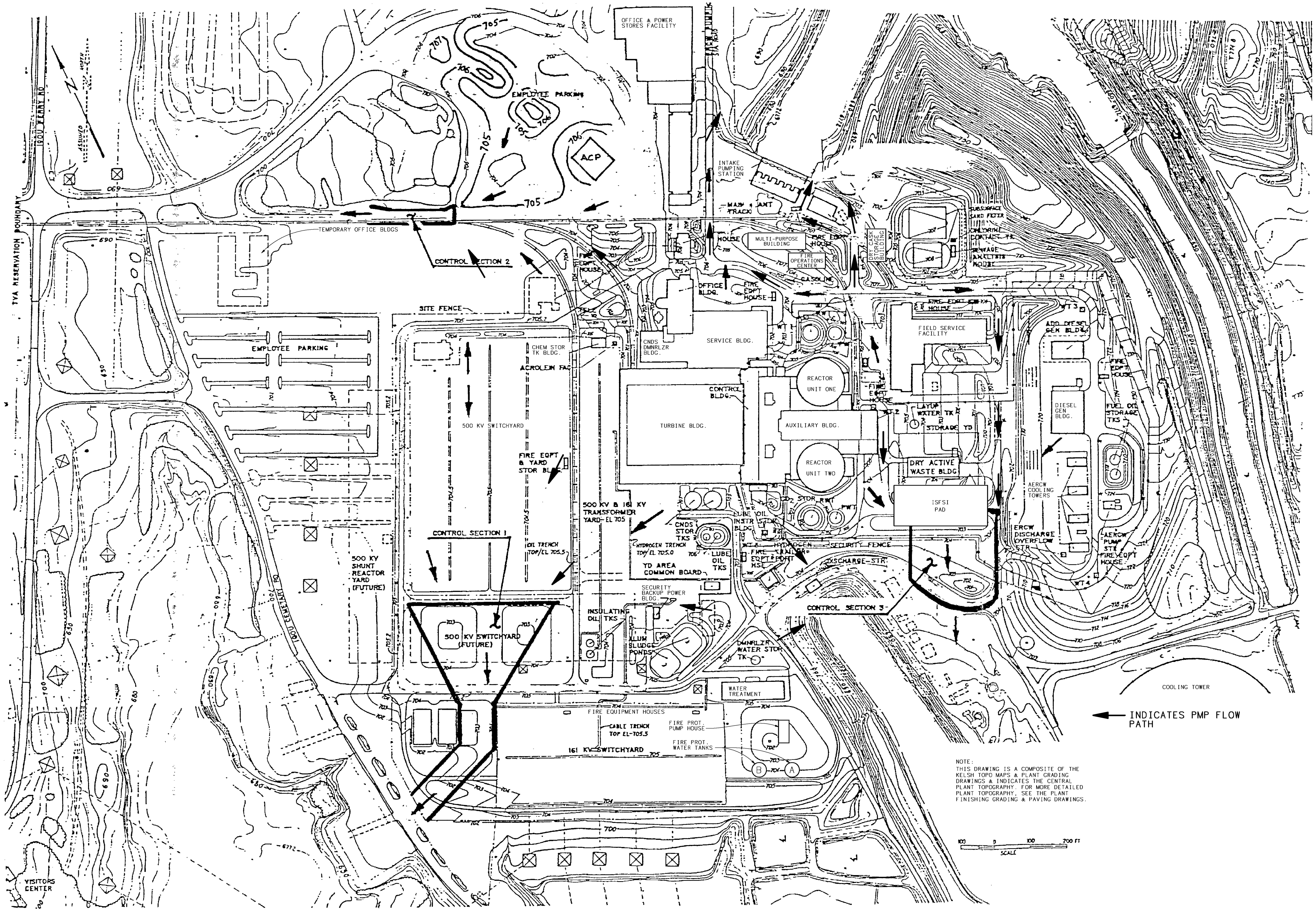
Revised by Amendment 17



Sequoyah Nuclear Plant Probable Maximum Flood Elevation

Revised by Amendment 17

Figure 2.4.3-12



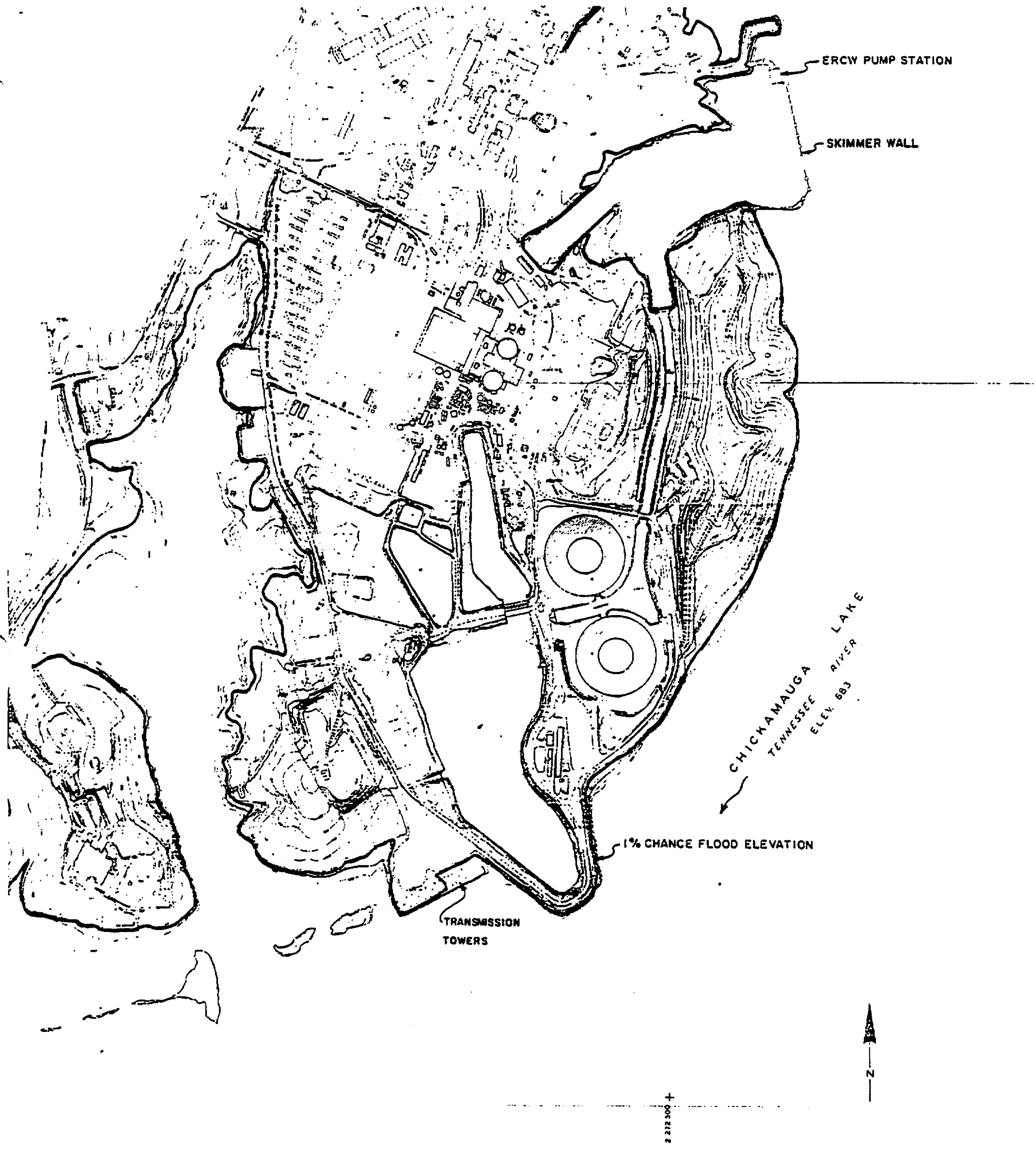
← INDICATES PMP FLOW PATH

SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 2.4.3-13A

GENERAL GRADING FOR SITE DRAINAGE
(REVISED BY AMENDMENT 19)

CAD MAINTAINED DRAWING



ERCW Pump Station Location

FIGURE 2.4.3-14

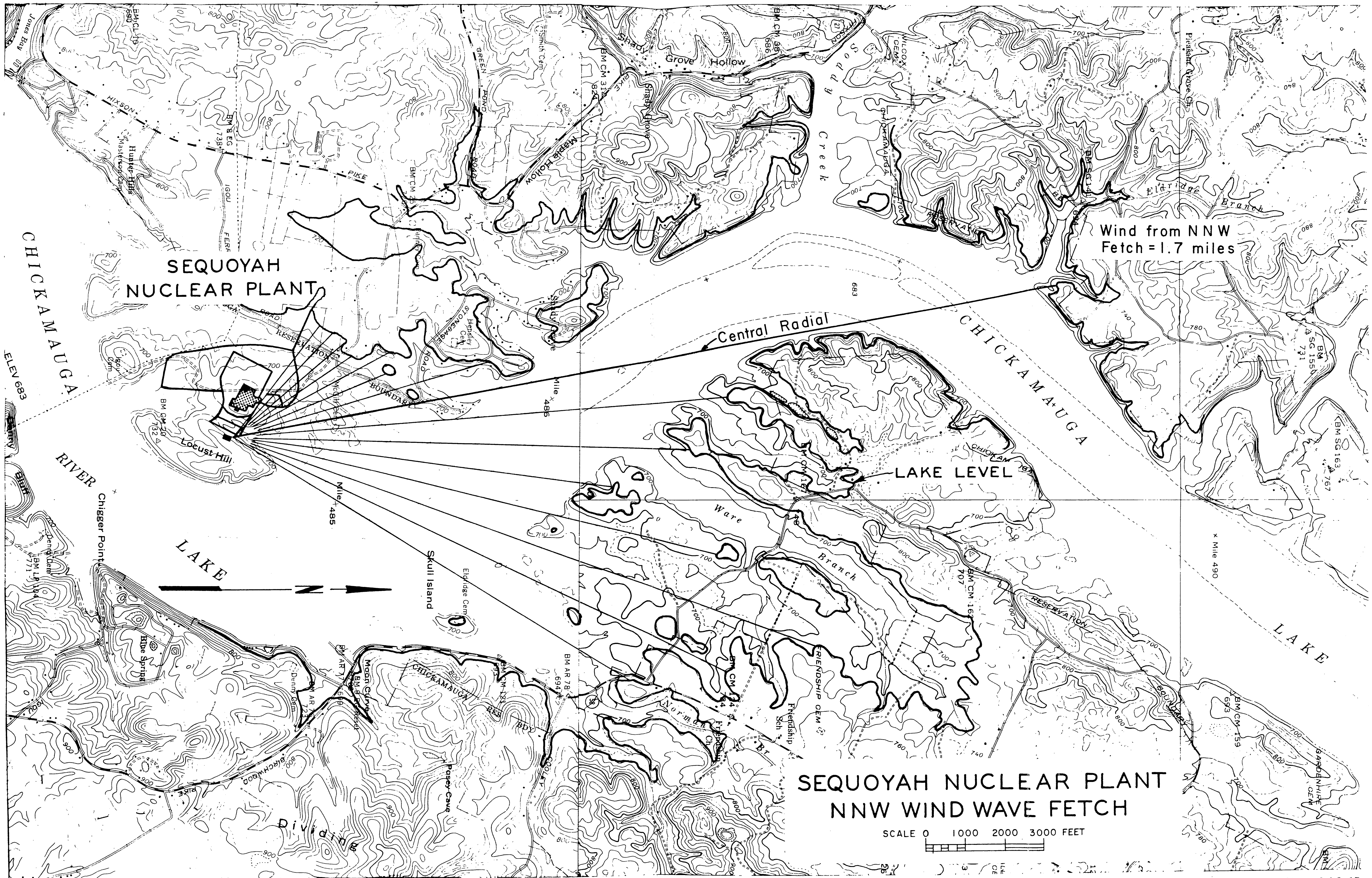


Figure 2.4.3.-15

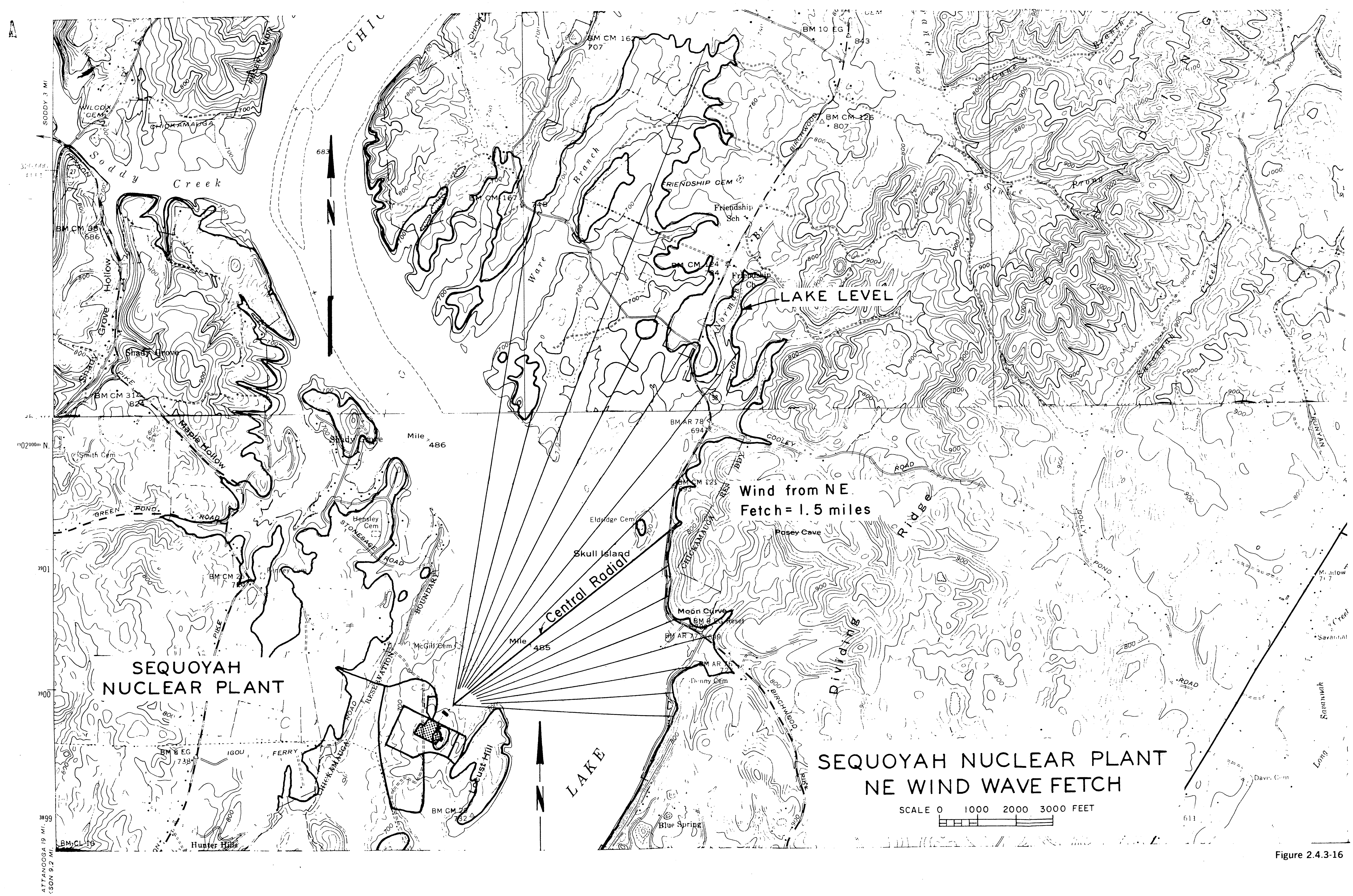


Figure 2.4.3-16

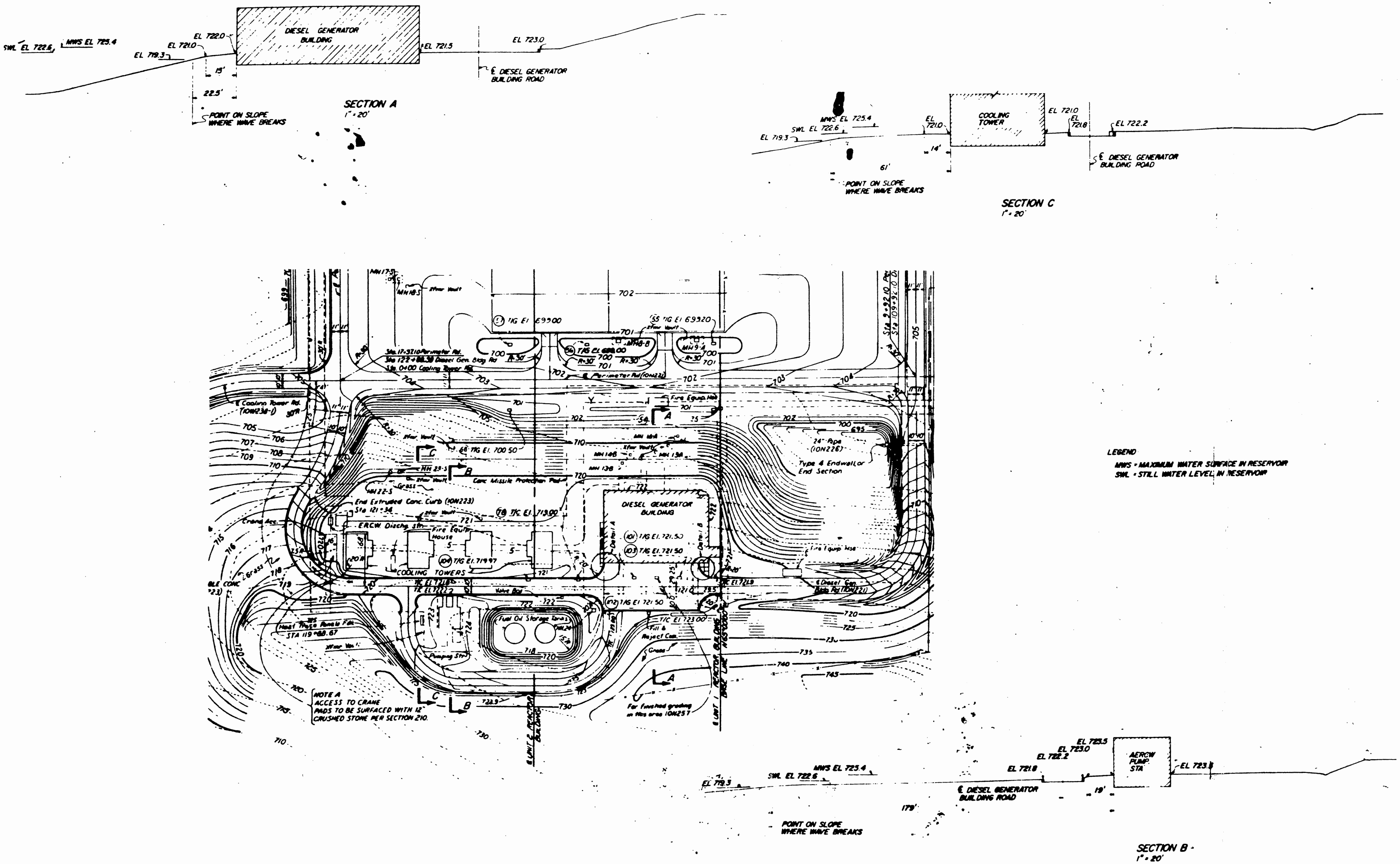


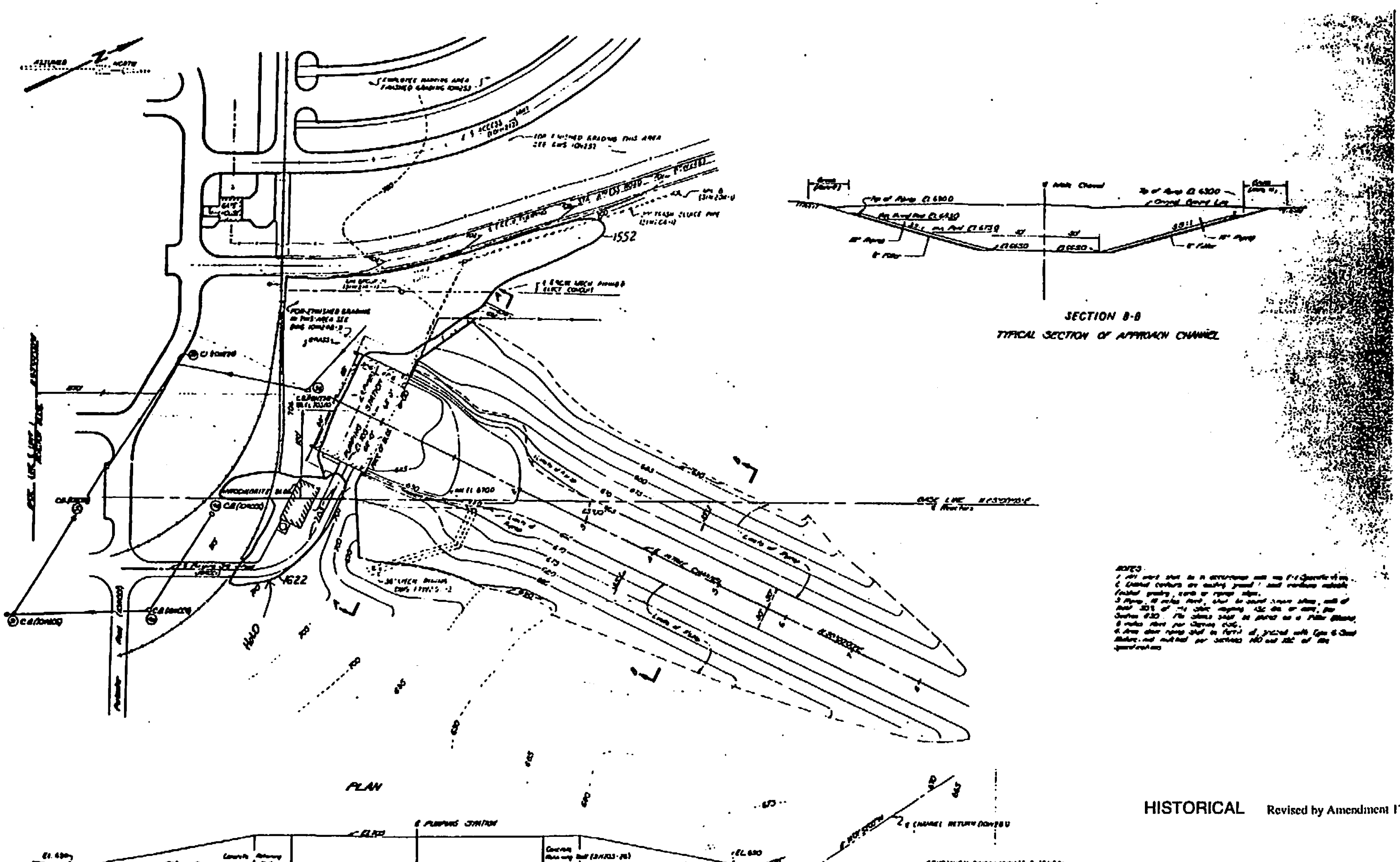
Figure 2.4.3-17

[

]

Figures 2.4.4-1 through 2.4.4-39

Best Available Historical Image



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

GRADING PLAN
INTAKE CHANNEL
DWG NO. 10N213 R4
FIGURE 2.4.8-1

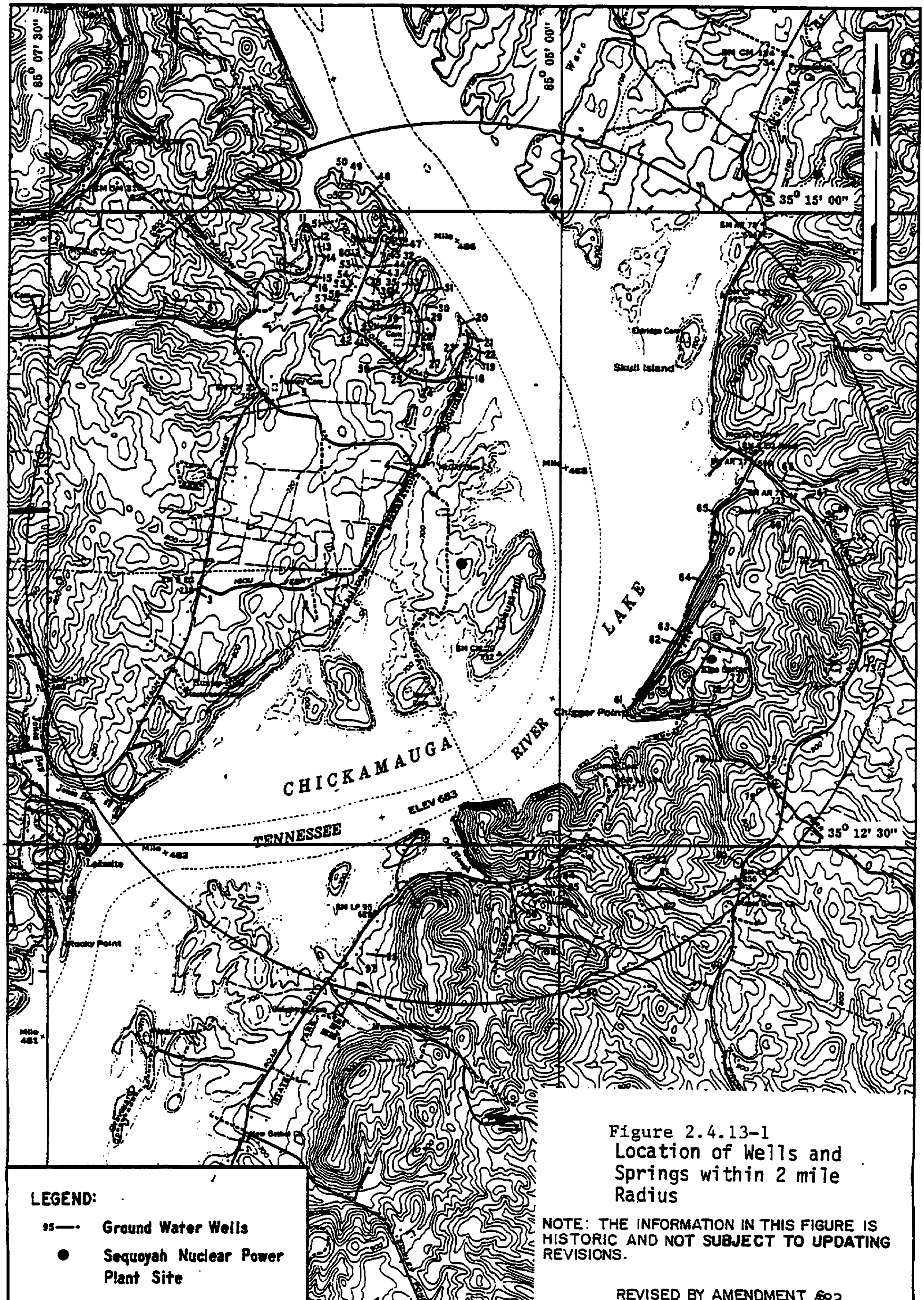
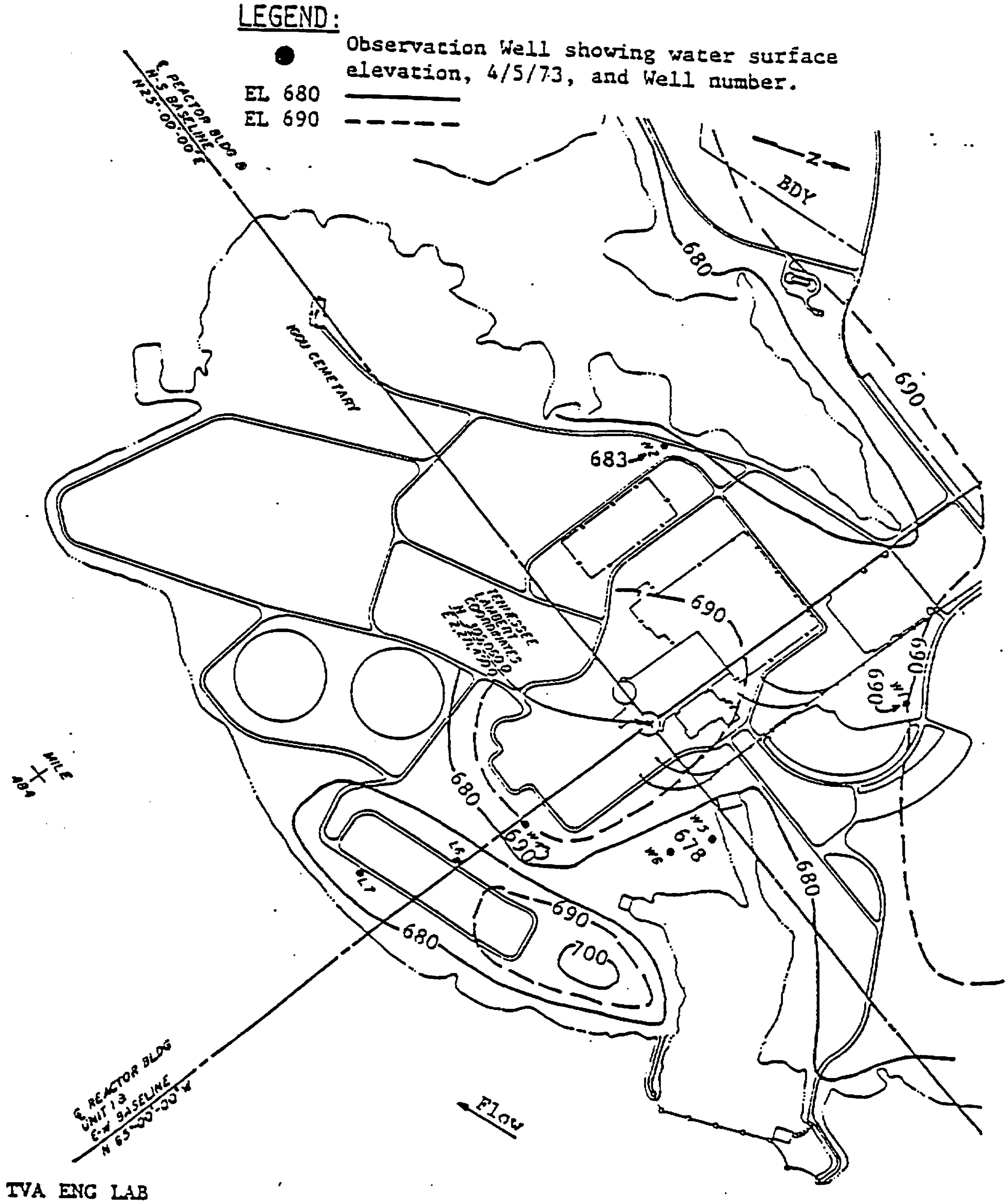


Figure 2.4.13-1
Location of Wells and Springs within 2 mile Radius

NOTE: THE INFORMATION IN THIS FIGURE IS HISTORIC AND NOT SUBJECT TO UPDATING REVISIONS.

REVISED BY AMENDMENT 683



TVA ENG LAB
May 18, 1988

Figure 2.4.13-2: Sequoyah Nuclear Plant Site Monitoring Well Locations and Generalized Water-Table Map

REVISED BY AMENDMENT 6.

APPENDIX 2.4A

FLOOD PROTECTION PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX 2.4A
FLOOD PROTECTION PLAN

2.4A.1 Introduction

This appendix describes the methods by which the Sequoyah Nuclear Plant will be made capable of tolerating floods above plant grade without jeopardizing public safety. Since flooding of this magnitude, as explained in section 2.4, is most unlikely, extreme steps are considered acceptable including actions that create or allow extensive economic damage to the plant. The actions described herein will be implemented for floods ranging from slightly below plant grade, to allow for wave runup, to the Design Basis Flood (DBF).

2.4A.1.1 Design Basis Flood

The DBF is the calculated upper limit flood that includes the probable maximum flood (PMF) plus the wave runup caused by a 45-mile-per-hour overwater wind; this is discussed in subsection 2.4.3.6. The table below gives representative levels of the DBF at different plant locations.

Design Bases Flood (DBF) Levels

Probable maximum flood (still reservoir)	719.6
DBF runup on vertical external, unprotected walls	723.8
DBF surge level within flooded structures	720.1

The lower flood elevations listed above are actual DBF elevations and are not normally used for the purpose of design but are typically used in plant procedures including procedures which direct plant actions in response to postulated DBF. For purposes of designing the flood protection for systems, structures, and components, the following higher elevations should be used thus ensuring additional margin has been included in the development of design analysis.

Design Analysis Flood Levels

Maximum still reservoir	723.5
Runup on vertical external, unprotected walls	729.5
Surge level within flooded structures	724.0

See FSAR References 2.4A.10-1 and 2.4A.10-2.

In addition to level considerations, plant flood preparations will cope with the "fastest rising" flood which is the calculated flood that can exceed plant grade with the shortest prediction notice. Reservoir levels for large floods in the Tennessee Valley can be predicted well in advance.

A minimum of 27 hours, divided into two stages, is provided for safe plant shutdown by use of this prediction capability. Stage I, a minimum of 10 hours long, will commence upon a prediction that flood-producing conditions might develop. Stage II, a minimum of 17 hours long, will commence on a confirmed estimate that conditions will provide a flood. This two-stage scheme is designed to prevent excessive economic loss in case a potential flood does not fully develop.

2.4A.1.2 Combinations of Events

Because floods above plant grade, earthquakes, tornadoes, or design basis accidents, including a loss-of-coolant accident (LOCA), are individually very unlikely, a combination of a flood plus any of these events or the occurrence of one of these during the flood recovery time or of the flood during the recovery time after one of these events is considered incredible.

Surges from seismic failure of upstream dams, however, can exceed plant grade, but to lower DBF levels, when imposed coincident with wind and certain floods. A minimum 27 hours of warning is assured so that ample time is available to prepare the plant for flooding.

2.4A.1.3 Post Flood Period

Because of the improbability of a flood above plant grade, no detailed procedures will be established for return of the plant to normal operation unless and until a flood actually occurs. If flood mode operation (subsection 2.4A.2) should ever become necessary, it will be possible to maintain this mode of operation for a sufficient period of time (100 days) so that appropriate recovery steps can be formulated and taken. The actual flood waters are expected to recede below plant grade within 1 to 6 days.

2.4A.1.4 Localized Floods

Localized plant site flooding due to the probable maximum storm (subsection 2.4.3) will not enter vital structures or endanger the plant. Plant shutdown will be forced by water ponding on the switchyard and around buildings, but this shutdown will not differ from a loss of offsite power situation as described in Chapter 15. The other steps described in this appendix are not applicable to this case.

2.4A.2 Plant Operation During Floods Above Grade

"Flood mode" operation is defined as the set of conditions described below by means of which the plant will be safely maintained during the time when flood waters exceed plant grade (elevation 705) and during the subsequent period until recovery (subsection 2.4A.7) is accomplished.

2.4A.2.1 Flooding of Structures

Only the Reactor Building, the Diesel Generator Building (DGB), and the Essential Raw Cooling Water Intake Station will be maintained dry during the flood mode. Walls and penetrations are designed to withstand all static and dynamic forces imposed by the DBF.

The lowest floor of the DGB is at elevation 722 with its doors on the uphill side facing away from the main body of flood water. This elevation is lower than the previous DBF elevation of 722.6. The 1998 reanalysis determined the still water elevation to be 719.6, with wind wave runup at the DGB to elevation 721.8. Therefore, flood levels do not exceed floor elevation of 722. The entrances into safety-related areas and all mechanical and electrical penetrations into safety-related areas are sealed to prevent major leakage into the building for water up to the PMF, including wave runup. Due to the 1998 reanalysis this only applies to below grade features. Redundant sump pumps are provided within the building to remove minor leakage.

The Essential Raw Cooling Water (ERCW) intake station is designed to remain fully functional for floods up to the PMF, including wind-wave runup. The deck elevation (elevation 720) is below the PMF plus wind wave runup, but it is protected from flooding by the outside walls. The traveling screen wells extend above the deck elevation up to the design basis surge level. The wall penetration for water drainage from the deck in nonflood conditions is below the DBF elevation, but it is designed for sealing in event of a flood. All other exterior penetrations of the station below the PMF are permanently sealed. Redundant sump pumps are provided on the deck and in the interior rooms to remove rainfall on the deck and water seepage.

All other structures, including the service, turbine, auxiliary, and control buildings, will be allowed to flood as the water exceeds their grade level entrances. All equipment, including power cables, that is located in these structures and required for operation in the flood mode is either above the DBF or designed for submerged operation.

2.4A.2.2 Fuel Cooling

Spent Fuel Pit

Fuel in the spent fuel pit will be cooled by the normal Spent Fuel Pit Cooling (SFPC) System. The pumps are located on a platform at elevation 721 which is above the surge level of 720.1. During the flood mode of operation, heat will be removed from the heat exchangers by ERCW instead of component cooling water.

As a backup to spent fuel cooling, water from the Fire Protection (FP) System can be dumped into the spent fuel pool, and steam removed by the area ventilation system.

Reactors

Residual core heat will be removed from the fuel in the reactors by natural circulation in the Reactor Coolant (RC) system. Heat removal from the steam generators will be accomplished by adding river water from the FP System (subsection 9.5.1) and relieving steam to the atmosphere through the power relief valves. Primary system pressure will be maintained at less than 500 lb/in^2g by operation of the pressurizer relief valves and heaters. This low pressure will lessen leakage from the system. Secondary side pressure will be maintained at or below 90 psig by operation of the steam line relief valves.

An analysis has been performed to ensure that the limiting atmospheric relief capacity would be sufficient to remove steam generated by decay heat. At times beyond approximately 10 hours following shutdown of the plant two relief valves have sufficient capacity to remove the steam generated by decay heat. Since a minimum of 27 hours flood warning is available it is concluded that the plant could be safely shutdown and decay heat removed by operation of only two relief valves. Reference FSAR 2.4A.10-1.

The main steam power operated relief valves will be adjusted to maintain the steam pressure at or below 90 psig. If this control system malfunctions, then the controls in the main control room can be utilized to operate the valves in an open-closed manner. Also, a manual loading station and the relief valve handwheel provide additional backup control for each relief valve. The secondary side steam pressure can be maintained for an indefinite time by the means outlined above.

The cooling water flow paths conform to the single failure criteria as defined in FSAR Section 3.1.1. In particular, all active components of the secondary side feedwater supply and ERCW supply are redundant and can therefore tolerate a single failure in the short or long term. A passive failure, consistent with the 50 gpm loss rate specified in FSAR Section 3.1.1, can be tolerated for an indefinite period without interrupting the required performance in either supply.

If one or both reactors are open to the containment atmosphere as during the refueling operations, then the decay heat of any fuel in the open unit(s) and spent fuel pit will be removed in the following manner. The refueling cavity will be filled with borated water (approximately 2000 ppm boron concentration) from the refueling water storage tank. The SFPC System pump will take suction from the spent fuel pit and will discharge to the SFPC System heat exchangers. The SFPC System heat exchanger output flow will be directed by a piping connection to the Residual Heat Removal (RHR) System heat exchanger bypass line. The tie-in locations in the SFPC System and the RHR System are shown in Figures 9.1.3-1 and 5.5.7-1, respectively. This connection will be made using prefabricated, in- position piping which is normally disconnected. During flood mode preparations, the piping will be connected using prefabricated spool pieces.

Prior to flooding, valve number 78-513 (refer to Figure 9.1.3-1) and valves FCV 74-33, and 74-35 (refer to Figure 5.5.7-1) will be closed; valves HCV 74-36, 74-37, FCV 74-16, 74-28, 63-93, and 63-94 (refer to Figure 5.5.7-1 and 6.3.1-1) will be opened or verified open. This arrangement will permit flow through the RHR heat exchangers and the four normal cold leg injection paths to the reactor vessel. The water will then flow downward through the annulus, upward through the core (thus cooling the fuel), then exit the vessel directly into the refueling cavity. This results in a water level differential between the spent fuel pit and the refueling cavity with sufficient water head to assure the required return flow through the 20-inch diameter fuel transfer tube thereby completing the path to the spent fuel pit.

Except for a portion of the RHR System piping, the only RHR System components utilized below flood elevation are the RHR System heat exchangers. Inundation of these passive components will not degrade their performance for flood mode operation. After alignment, all valves in this cooling circuit located below the maximum flood elevation will be disconnected from their power source to assure that they remain in a safe position.

The modified cooling circuit for open reactor cooling will be assured of two operable SFPC System pumps (a third pump is available as a backup) as well as two SFPC System heat exchangers. Also, the large RHR System heat exchangers are supplied with essential raw cooling water during the open reactor mode of fuel cooling; these heat exchangers provide an additional heat sink not available for normal spent fuel cooling.

Fuel coolant temperature calculations, assuming conservative heat loads and the most limiting, single active failure in the SFPC System, indicate that the coolant temperatures are acceptable.

The temperatures can be maintained at a value appreciably less than the fuel pit temperature calculated for the nonflood spent fuel cooling case when assuming the loss of one equipment train.

As further assurance, the open reactor cooling circuit was aligned and tested, during pre-operational testing, to confirm flow adequacy. Normal operation of the RHR System and SFPC System heat exchangers will confirm the heat removal capabilities of the heat exchangers.

High spent fuel pit temperature will cause an annunciation in the MCR, thus indicating equipment malfunction. Additionally, that portion of the cooling system above flood water will be frequently inspected to confirm continued proper operation.

For either mode of reactor cooling, leakage from the Reactor Coolant System will be collected, to the extent possible, in the reactor coolant drain tank; nonrecoverable leakage will be made up from supplies of clean water stored in the four cold leg accumulators, the pressurizer relief tank, the cask decontamination tank, and the demineralized water tank. If these sources prove insufficient, the FP System can be connected to the Auxiliary Charging System (subsection 9.3.5) as a backup. Whatever the source, makeup water will be filtered, demineralized, tested, and borated, as necessary, to the normal refueling concentration, and pumped by the Auxiliary Charging System into the reactor (see Figures 2.4A-2 and 2.4A-3).

Power

Electric power will be supplied by the onsite diesel generators starting at the beginning of Stage II or when offsite power is lost, whichever occurs first (subsection 2.4A.5.3).

Cooling of Plant Loads

Plant cooling requirements, with the exception of the FP System which must supply feedwater to the steam generators, will be met by the ERCW System (refer to subsection 9.2.2).

Plant Water Supply

The plant water supply is thoroughly discussed in subsection 9.2.2. The following is a summary description of the water supply provided for use during flooded plant conditions. The ERCW station is designed to remain fully functional for all floods up to and including the DBF. The intake forebay will provide a water supply for the fire/flood mode pumps. If the flood approaches DBF proportions, there is a remote possibility that Chickamauga Dam will fail. Such an event would leave the Sequoyah Plant intake forebay isolated from the river as flood water recedes below EL 665. Should this event occur, the forebay has the capacity of retained water to supply two steam generators in each unit and provide spent fuel pit with evaporation makeup flow until forebay inventory makeup is established. The ERCW station is designed to be operable for all plant conditions and includes provisions for makeup to the forebay. Reference FSAR 2.4A.10-1.

2.4A.3 Warning Plan

Plant grade elevation 705 can be exceeded by both rainfall floods and seismic-caused dam failure floods. A warning plan is needed to assure plant safety from these floods.

2.4A.3.1 Rainfall Floods

Protection of the Sequoyah Plant from the low probability rainfall floods that might exceed plant grade depends on a flood warning issued by TVA's River Operations as described in Section 2.4A.8. With TVA's extensive climate monitoring and flood predicting systems and flood control facilities, floods in the Sequoyah area can be reliably predicted well in advance. The Sequoyah Nuclear Plant flood warning plan will provide a minimum preparation time of 27 hours including a 3 hour margin for operation in the flood mode. Four additional, preceding hours will provide time to gather data and produce the warning. The warning plan will be divided into two stages--the first a minimum of 10 hours long and the second of 17 hours--so that unnecessary economic penalty can be avoided while adequate time is ensured for preparing for operation in the flood mode.

The first stage, Stage I, of shutdown will begin when there is sufficient rainfall on the ground in the upstream watershed to yield a projected plant site water level of 697 in the winter months (October 1 through April 15) and 703 in the summer (April 16 through September 30). This assures that the additional time required is available when shutdown is initiated. The water level of 703 (two feet below plant grade) will allow margin so that waves due to high winds cannot disrupt the flood mode preparation. Stage I will allow preparation steps causing some damage to be sustained but will withhold major economic damage until the Stage II warning assures a forthcoming flood above grade.

The plant preparation status will be held at Stage I until either Stage II begins or TVA's River Operations determines that flood waters will not exceed elevation 703 at the plant. The Stage II warning will be issued only when enough rain has fallen to predict that elevation 703 is likely to be exceeded.

2.4A.3.2 Seismic Dam Failure Floods

Protection of the Sequoyah plant from flood waves generated by seismically caused dam failures which exceed plant grade depends on TVA's River Operation organization to identify when a critical combination of dam failures and floods exist. There are nine upstream dams whose failure, in combination coincident with certain storm conditions, would cause a flood to exceed plant grade. These dams are Norris, Cherokee, Douglas, Fort Loudoun, Fontana, Hiwassee, Apalachia, Blue Ridge, and Tellico.

2.4A.4 Preparation for Flood Mode

At the time the initial flood warning is issued, the plant may be operating in any normal mode. This means that either or both units may be at power or either unit may be in any stage of refueling.

2.4A.4.1 Reactors Initially Operating at Power

If both reactors are operating at power, Stage I and then, if necessary, Stage II procedures will be initiated. Stage I procedures will consist of a controlled reactor shutdown and other easily revokable steps such as moving supplies necessary to the flood protection plan above the DBF level and making temporary connections and load adjustments on the onsite power supply. Stage II procedures will be the less easily revokable and more damaging steps necessary to have the plant in the flood mode when the flood exceeds plant grade. The fire/flood mode pumps may supply auxiliary feedwater for reactor cooling. Other essential plant cooling loads will be transferred from the component cooling water to the ERCW System (subsection 9.2.2). The Radioactive Waste (Chapter 11) System will be secured by filling tanks below DBF level with enough water to prevent flotation; one exception is the waste gas decay tanks, which are sealed and anchored against flotation. The CVCS hold up tank will also be filled and sealed to prevent flotation.
Some power and communication lines running beneath the DBF and not designed for submerged operation will require disconnection. Batteries beneath the DBF will be disconnected.

2.4A.4.2 Reactor Initially Refueling

If time permits, fuel will be removed from the unit(s) undergoing refueling and placed in the spent fuel pit; otherwise fuel cooling will be accomplished as described in subsection 2.4A.2.2. If the refueling canal is not already flooded, the mode of cooling described in subsection 2.4A.2.2 requires that the canal be flooded with borated water from the refueling water storage tank. If the flood warning occurs after the reactor vessel head has been removed or at a time when it could be removed before the flood exceeds plant grade, the flood mode reactor cooling water will flow directly from the vessel into the refueling cavity. If the warning time available does not permit this, then the upper head injection piping will be disconnected above the vessel head to allow the discharge of water through the four upper head injection standpipes. Additionally, it is required that the prefabricated piping be installed to connect the RHR and SFPC Systems, and that ERCW be directed to the secondary side of the RHR System and SFPC System heat exchangers.

2.4A.4.3 Plant Preparation Time

All steps needed to prepare the plant for flood mode operation can be accomplished within 24 hours of receipt of the initial warning that a flood above plant grade is possible. An additional 3 hours are available for contingency margin before wave runup from the rising flood might enter the buildings. Site grading and building design prevent any flooding before the end of the 27 hour preflood period.

2.4A.5 Equipment

Both normal plant components and specialized flood-oriented supplements will be utilized in coping with floods. All such equipment required in the flood mode is either located above the DBF or is within a nonflooded structure or is designed for submerged operation. Systems and components needed only in the preflood period are protected only during that period.

2.4A.5.1 Equipment Qualification

To ensure capable performance in this highly unlikely but rigorous, limiting design case, only high quality components will be utilized. Active components are redundant or their functions diversely supplied. Since no rapidly changing events are associated with the flood, repairability offers reinforcement for both active and passive components during the long period of flood mode operation. Equipment potentially requiring maintenance will be accessible throughout its use, including components in the Diesel Generator Building.

2.4A.5.2 Temporary Modification and Setup

Normal plant components used in flood mode operation and in preparation for flood mode operation may require modification from their normal plant operating configuration. Such modification, since it is for a limiting design condition and since extensive economic damage is acceptable, will be permitted to damage existing facilities for their normal plant functions. However, most alterations will be only temporary and nondestructive in nature. For example, the switchover of plant cooling loads from the component cooling water to the ERCW System will be done through valves and a prefabricated spool piece, causing little system disturbance or damage.

Equipment especially provided for the flood design case includes both permanently installed components and more portable apparatus that will be emplaced and connected into other systems during the preflood period.

Detailed procedures to be used under flood mode operation have been developed and are incorporated in the plant's Abnormal Operating Instructions.

2.4A.5.3 Electric Power

Because there is a possibility that high winds may destroy powerlines and disconnect the plant from offsite power at any time during the preflood transition period, only onsite power will be used once Stage II of the preparation period begins. While most equipment requiring alternating current electric power is a part of the permanent emergency onsite power system, other components will be temporarily connected, when the time comes, by prefabricated jumper cables.

All loads that are normally supplied by onsite power but are not required for the flood will be switched out of the system during the preflood period. Those loads used during the preflood period but not during flood mode operation will be disconnected when they are no longer needed. During the preparation period, all power cables running beneath the DBF level, except those especially designed for submerged operation, will be disconnected from the onsite power system. Similarly, direct current electric power will be disconnected from unused loads and potentially flooded lines. Charging will be maintained for each battery by the onsite alternating current power system as long as it is required. Batteries that are beneath the DBF will be disconnected during the preflood period when they are no longer needed.

2.4A.5.4 Instrument Control, Communication and Ventilation Systems

All instrument, control, and communication lines that will be required for operation in the flood mode are either above the DBF or within a nonflooded structure or are designed for submerged operation. Unneeded cables that run below the DBF will be disconnected to prevent short circuits.

Redundant means of communications are provided between the central control area (the main and auxiliary control rooms) and all other vital areas that might require operator attention, such as the Diesel Generator Building.

Instrumentation is provided to monitor all vital plant parameters such as the reactor coolant temperature and pressure and steam generator pressure and level. Control of the pressurizer heaters and relief valves and steam generator feedwater flow and atmospheric relief valves will ensure continued natural circulation core cooling during the flood mode. All other important plant functions will be either monitored and controlled from the main control area or, in some cases where time margins permit, from other points in the plant that are in close communication with the main control area. Ventilation, when necessary, and limited heating or air-conditioning will be maintained for all points throughout the plant where operators might be required to go or where required by equipment heat loads.

2.4A.6 Supplies

All equipment and most supplies required for the flood are on hand in the plant at all times. Some supplies will require replenishment before the end of the period in which the plant is in the flood mode. In such cases supplies on hand will be sufficient to last through the short time (subsection 2.4A.1.3) that flood waters will be above plant grade and until replenishment can be supplied. For instance, there is sufficient diesel generator fuel available at the plant to last for 3 or 4 weeks; this will allow sufficient margin for the flood to recede and for transportation routes to be reestablished.

2.4A.7 Plant Recovery

The plant is designed to continue safely in the flood mode for 100 days even though the water is not expected to remain above plant grade for more than 1 to 6 days. After recession of the flood, damage will be assessed and detailed recovery plans developed. Arrangements will then be made for reestablishment of offsite power and removal of spent fuel.

The 100-day period provides more than adequate time for the development of procedures for any maintenance, inspection, or installation of replacements for the recovery of the plant or for a continuation of flood mode operations in excess of 100 days. A decision based on economics will be made on whether or not to regain the plant for power production. In either case, detailed plans will be formulated after the flood, when damage can be accurately assessed.

2.4A.8 Basis For Flood Protection Plan In Rainfall Floods

Summary

Large Tennessee River floods can exceed plant grade elevation 705 at Sequoyah Nuclear Plant. Plant safety in such an event requires shutdown procedures which may take 24 hours to implement. TVA flood forecast procedures will provide at least 27 hours of warning before river levels reach elevation 703. Use of elevation 703, 2 feet below plant grade, provides enough freeboard to prevent waves from 45-mile-per-hour, overwater winds from endangering plant safety during the final hours of shutdown activity. For conservatism the fetches calculated for the PMF (Figures 2.4.3-15 and 2.4.3-16) were used to calculate maximum wind wave additive to the reservoir surface at elevation 703 feet msl. The maximum wind additive to the reservoir surface would be 2.8 feet and would not endanger plant safety during the final hours of shutdown. This is due to the long shallow approach and the waves breaking at the perimeter road (elevation 705 feet msl). After the waves break there is not sufficient depth or distance between the perimeter road and the safety-related facilities for new waves to be generated. Forecast will be based upon rainfall already reported to be on the ground.

Different target river level criteria are needed for winter use and for summer use to allow for seasonally varied reservoir levels and rainfall potential.

To be certain of 27 hours for preflood preparation, warnings of floods with the prospect of reaching elevation 703 must be issued early; consequently, some of the warnings may later prove to have been unnecessary. For this reason preflood preparations are divided into two stages. Stage I steps, requiring 10 hours, would be easily revokable and cause minimum damage. The estimated probability is less than 0.0026 that a Stage I warning will be issued during the 40-year life of the plant.

Additional rain and streamflow information obtained during Stage I activity will determine if the more damaging steps of Stage II need to be taken with the assurance that at least 17 hours will be available before elevation 703 is reached. The estimated probability is less than 0.0010 that shutdown will need to continue into Stage II during plant life.

Flood forecasting to assure adequate warning time for safe plant shutdown during floods will be by River Operations of River System Operations.

<u>TVA Forecast System</u> (HISTORICAL INFORMATION)

TVA has in constant use an extensive, effective system to forecast flow and elevation as needed in the Tennessee River Basin. This permits efficient operation of the reservoir system and provides warning of when water levels will exceed critical elevations at selected, sensitive locations.

Elements of the present (2001) forecast system above Sequoyah Nuclear Plant include the following:

1. One hundred sixty (160) rain gages measure rainfall, with an average density of 165 square miles per rain gage. Of these gages 112 are owned by TVA, 35 are owned by the National Weather Service (NWS), 7 are owned by the United States Geological Service (USGS), 2 are owned by the United States Corps of Engineers (USACE), and 4 are owned by Alcoa. Most of these gages are tipping buckets collector type and the transmission of the data is either by satellite or telephone. At some of the gages located at hydroplants, the data is manually read.

Information normally is received daily from the gages at 6 a.m. and at least every 6 hours during flood periods. Close interval rainfall reports can be obtained from a majority of the gages if needed.

2. Streamflow data are received for 35 gages from 16 TVA gages amd 19 USGS gages. These gages trasmit their data either by satellite or telephone or both. Discharge data are received from 26 hydroplants. Of these plants, 25 also transmit headwater elevation data, and 13 transmit tailwater elevation data. Therefore, steamflow data are available from 61 locations. Streamflow data are received daily at 8 a.m. and at least every 2 hours if needed during flood operations.

3. Weather forecasts including quantitative precipitation forecasts are received four times daily and at other times when changes are expected.

4. Computer programs which translate rainfall into streamflow based on current runoff conditions and which permit a forecast of flows and elevations based upon both observed and predicted rainfall. Two separate computers are utilized and are designed to provide backup for each other. One computer is used primarily for data collection, with the other used for executing forecasting programs for reservoir operations. The time interval between receiving input data and producing a forecast is less than 4 hours. Forecasts normally cover at least a 8-day period.

As effective as the forecast system already is, it is constantly being improved as new technology provides better methods to interrogate the watershed during floods and as the watershed mathematical model and computer system are improved. Also, in the future, improved quantitative precipitation forecasts may provide a more reliable early alert of impending major storm conditions and thus provide greater flood warning time.

The TVA forecast center is manned 24 hours a day. Normal operation produces two forecasts daily, one by 12 noon based on data collected at 6 a.m. Central time, and the second by 4 a.m. based on data collected at midnight Central Time. When serious flood situations demand, forecasts are produced every 4 hours.

Basic Analysis

To develop a forecast procedure to assure safe shutdown of Sequoyah Nuclear Plant for flooding, 17 hypothetical PMP storms, including their antecedent storms, were analyzed. They enveloped potentially critical seasonal variations and time distributions of rainfall. To be certain that fastest rising flood conditions were included, the effects of varied time distribution of rainfall were tested by alternatively placing the maximum daily PMP on the first, the middle, and the last day of the 3-day main storm. In each day the maximum 6-hour depth was placed during the second interval except when the maximum daily rain was placed on the last day. Then the maximum 6-hour amount was placed in the last 6 hours.

The procedures used to compute flood flows and elevations are described in subsections 2.4.3.1, 2.4.3.2, and 2.4.3.3. Some flood events were analyzed using earlier versions of the watershed model described in subsection 2.4.3.3. Those events which established important elements of the warning system or those where the present model might produce significant differences in warning times have been reevaluated. Events reevaluated have been noted either in tables or figures where appropriate.

The warning system is based on those storm situations which resulted in the shortest time interval between watershed rainfall and elevation 703, thus assuring that this elevation could be predicted at least 27 hours in advance.

Hydrologic Basis for Warning System

A minimum of 27 hours has been allowed for preparation of the plant for operation in the flood mode. An additional 4 hours for communication and forecasting computations are provided to translate rain on the ground to river elevations at the plant. Hence the warning plan must provide 31 hours from arrival of rain on the ground until critical elevation 703 could be reached. The 27 hours allowed for shutdown at the plant are utilized for a minimum of 10 hours of Stage I preparation and an additional 17 hours for Stage II preparation. This 27 hour allocation includes a 3-hour margin.

Although river elevation 703, 2 feet below plant grade to allow for wind waves, is critical during final stages of plant shutdown for flooding, lower forecast target levels are used in most situations to assure that the 27 hours preflood transition interval will always be available. The target river levels differ with season.

During the October 1 through April 15 "winter" season, Stage I shutdown procedures will be started as soon as target river elevation 697 has been forecast. Shutdown will be carried to completion if and when target river elevation 703 has been forecast. Corresponding target river elevation for the April 16 through September 30 "summer" season is 703. The one target river elevation in the summer season permits waiting to initiate shutdown procedures until enough rain is on the ground to forecast reaching critical elevation 703; shutdown would then be initiated and carried to completion.

Inasmuch as the hydrologic procedures and target river elevations have been designed to provide adequate shutdown time in the fastest rising flood, longer times will be available in other floods. In such cases there will be a waiting period after the Stage I 10-hour shutdown activity during which activities shall be in abeyance until it is predicted from recorded rainfall that Stage II shutdown should be implemented or it is determined from weather conditions that plant operation can be resumed.

Resumption of plant operation following Stage I shutdown activities will be allowable only after flood levels and weather conditions have returned to a condition in which 27 hours of warning will again be available.

River Scheduling of River Operations prepares at least an 8-day water level forecast seven days per week for Tennessee River locations. During prospective flooding conditions forecasts can be prepared 4 times a day so that warnings for Sequoyah will assure that 27 hours always will be available to shut down the plant and prepare it for flooding.

Hydrologic Basis for Target Stages

Figure 2.4A.-4, in four parts, shows how target forecast flood elevations at the Sequoyah plant have been determined to assure adequate warning times. The floods shown are the fastest rising floods at the site which are produced by the 21,400-square-mile PMP with downstream centering described in subsection 2.4.3.1. The storms are the main PMP amounts and have been preceded 3 days earlier by a 3-day storm having 40 percent of the main storm rainfall. This has caused soil moisture to be high and reservoirs to be well above seasonal levels when the main storm begins.

Figure 2.4A.-4 (A, B, and C) shows the winter PMP which could produce the fastest rising flood which would cross plant grade and variations caused by changed time distribution. The fastest rising flood occurs during a PMP when the 6-hour increments increase throughout the storm with the maximum 6 hours occurring in the last period. Figure 2.4A-4 (B) shows the essential elements of this storm which provides the basis for the warning scheme. In this flood 9.2 inches of rain would have fallen 31 hours (27 + 4) prior to the flood crossing elevation 703 and would produce elevation 697 at the plant. Hence, any time rain on the ground results in a predicted plant stage of 697 a Stage I shutdown warning will be issued. Examination of Figure 2.4A.-4 (A and C) shows that following this procedure in these noncritical floods would result in a lapsed time of 42 and 44 hours between when 9.2 inches had fallen and the flood would cross critical elevation 703.

An additional 2.2 inches of rain must fall promptly for a total of 11.4 inches of rain to cause the flood to cross critical elevation 703. In the fastest rising flood, Figure 2.4A.-4 (B), this rain would have fallen in the next 5 hours. A Stage II warning would be issued within the next 4 hours. Thus, the Stage II warning would be issued 5 hours after issuance of a Stage I warning and 22 hours before the flood would cross critical flood elevation 703. In the slower rising floods, Figure 2.4A.-4 (A and C), the time between issuance of a Stage I warning and when the 11.4 inches of rain required to put the flood to elevation 703 would have occurred is 6 and 10 hours respectively. This would result in issuance of a Stage II warning not less than 4 hours later or 32 and 30 hours respectively before the flood would reach elevation 703.

The summer flood shown by Figure 2.4A.-4 (D), with the maximum 1-day rain on the last day provides controlling conditions when reservoirs are at summer levels. At a time 31 hours (27 + 4) before the flood reaches elevation 703, 11 inches of rain would have fallen. This 11 inches of rain, under these runoff conditions, would produce critical elevation 703, so this level becomes both the Stage I and Stage II target.

The above criteria all relate to forecasts which use rain on the ground. In actual practice quantitative rain forecasts, which are already a part of daily operations, would be used to provide advance alerts that need for shutdown may be imminent. Only rain on the ground, however, is included in the procedure for firm warning use.

Because the above analyses have used fastest possible rising floods at the plant, all other floods will allow longer warning times than required for all physical plant shutdown activity.

In summary, the predicted target levels which will assure adequate shutdown times are:

Season	Forecast Flood Elevations at Sequoyah For Stage I Shutdown	For Stage II Shutdown
Winter (October 1-April 15)	697	703
Summer (April 16-September 30)	703	703

Communications Reliability (HISTORICAL INFORMATION)

Communication between projects in the TVA power system is via (a) TVA owned microwave network, (b) Fiber-Optic System, and (c) by commercial telephone. In emergencies, additional communication links are provided by Transmission Power Supply radio network. The four networks provide a high level of dependability against emergencies.

The hydrologic network for the watershed above Sequoyah that would be available in flood emergencies if commecial telephone communications is lost include 138 rainfall gages (24 at power installations and 114 satellite and file transfer gages) and 47 streamflow gages (26 at hydroplants, 20 satellite gages, and 1 file transfer gage). River Scheduling is linked to the TVA power system by all four communication networks. The data from the satellite gages are received via a data collection platform-satellite computer system located in the River Scheduling's office. These are so distributed over the watershed that reasonable flood forecasting can be done from this data while the balance of data is being secured from the remaining hydrologic network stations.

The preferred, complete coverage of the watershed, employ 160 rainfall and 61 streamflow locations above the Sequoyah plant. Involved in the communications link to these locations are routine radio, radio satellite, and commercial telephone system networks. In an emergency, available radio communications would be called upon to assist.

The various networks proved to be capable in the large floods of 1957, 1963, 1973, 1984, 1994, and 1998 of providing the rain and streamflow data needed for reliable forecasts.

2.4A.9 Basis for Flood Protection Plan in Seismic-Caused Dam Failures

Floods resulting from combined seismic and flood events can exceed plant grade, thus requiring emergency measures. The 1998 reanalysis showed that only two combinations of seismic dam failures coincident with a flood would result in floods above plant grade: (1) failure of Fontana, Hiwassee, Apalachia, and Blue Ridge Dams in the one-half SSE concurrent with a 1/2 PMF, (2) SSE failure of Norris, Cherokee, and Douglas concurrent with a 25 year flood. As shown in Table 2.4.4-1 all other potentially critical candidates would create flood levels below plant grade elevation 705.

Dam failure during non-flood periods would not present a problem at the plant. The reanalysis showed that failure in a non-flood period and at summer flood guide levels in the most critical dam failure combination (SSE failure of Norris, Cherokee and Douglas) would produce a maximum elevation of 703.6 at the plant, 1.4 feet below plant grade. All other combinations in non-flood periods would produce elevations much lower.

The time from seismic occurrence to arrival of failure surge at the plant is adequate to permit safe plant shutdown in readiness for flooding. Table 2.4A-2 lists the time between the postulated seismic event and when the flood wave would exceed plant grade elevation 705 and elevation 703. Use of elevation 703 provides a margin for possible wind wave effects.

The warning plan for safe plant shutdown is based on the fact that a combination of critically centered large earthquake and rain produced flood conditions must coincide before the flood wave from seismically caused dam failures will cross plant grade. In flood situations, an extreme earthquake must be precisely located to fail three or more major dams before a flood threat to the site would exist.

The combination producing the shortest time interval between seismic event and plant grade crossing is a one-half SSE located so as to fail Fontana, Hiwassee, Apalachia, and Blue Ridge Dams during the one-half PMF. The time between the seismic event and the resulting flood wave crossing plant grade elevation 705 is 40 hours. The time to elevation 703, which allows a margin for wind wave considerations, is 35 hours. The event producing the next shortest time interval to elevation 703 involves the SSE failure of Norris, Cherokee, and Douglas during the 25-year flood resulting in a time interval of 63 hours.

The warning system utilizes TVA's flood forecast system to identify when flood conditions will be such that seismic failure of critical dams could cause a flood wave to exceed elevation 703 at the plant site.

Two levels of warning will be provided: (1) an early warning will be issued to SQN whenever a dam failure has occurred or is imminent for any single critical dam; or it appears from rain and flood forecasts that a critical situation may develop and (2) a flood warning or alert to begin preparation for plant shutdown when a critical situation exists that will result in the flood level to exceeding plant grade. A Stage I flood warning is declared once failure of critical dams has been confirmed and flood conditions are such that the flood surge will exceed plant grade. It shall be issued at least 27 hours before the flood level exceeds elevation 703 at the site. A Stage II flood warning will be issued at least 17 hours before the flood level exceeds elevation 703 at the site. Communication will be established and maintained during these two levels of warning to assure the 27 hour flood preparation period. Any prolonged interruption of communication or failure to confirm that a critical case has not occurred will result in the initiation of flood preparation at the plant site. The flood preparation shall continue until completion, unless communication is re-established and the site is notified that a critical case has not occurred.

Communications between the plant, dams, power system control center, and River Operations at Knoxville, Tennessee, are provided by microwave networks, fiber-optic network, radio networks, and commercial telephone service.

2.4A.10 References

1. SQN-DC-V-1.1, Design of Reinforced Concrete Structures Design Criteria

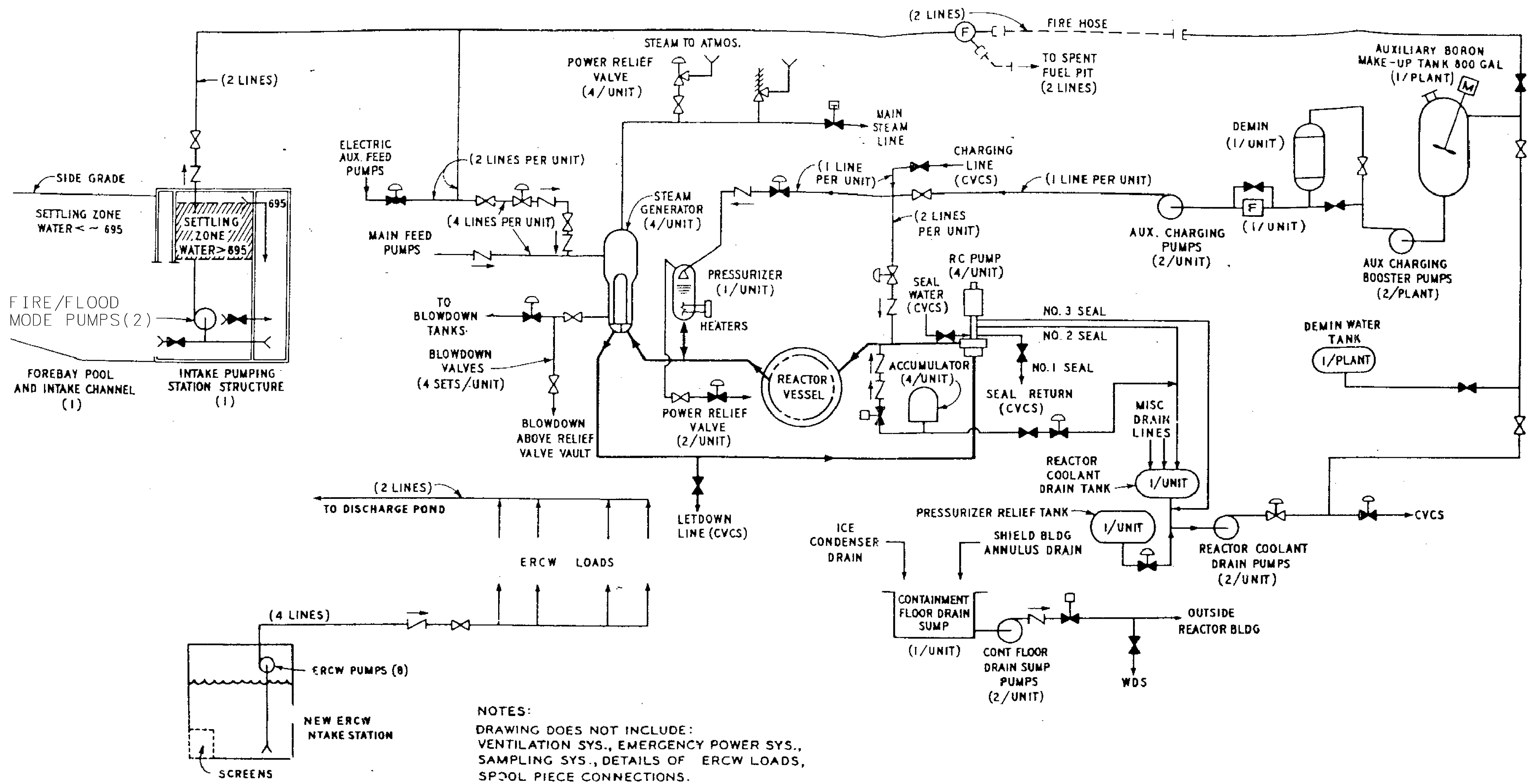
2. SQN-DC-V-12.1, Flood Protection Provisions Design Criteria

TABLE 2.4A-2

CRITICAL CASES - SEISMIC CAUSED DAM FAILURES
TIME BETWEEN SEISMIC EVENT AND SELECTED PLANTSITE FLOOD ELEVATION

Dam Failed	Time in Hours Between Event and Plantside Elevation 703	705
One-half SSE failures with one-half probable maximum flood		
1. Norris	(2)	(1)
2. Cherokee-Douglas	(2)	(1)
3. Fontana	(2)	46 (1)
4. Fontana-Hiwassee-Apalachia-Blue Ridge	35	40
SSE failures with 25-year flood		
5. Norris-Cherokee-Douglas	63	70
6. Norris-Douglas-Fort Loudoun-Tellico	(2)	(1)

(1) Elevation 705 not reached
(2) Elevation 703 not reached

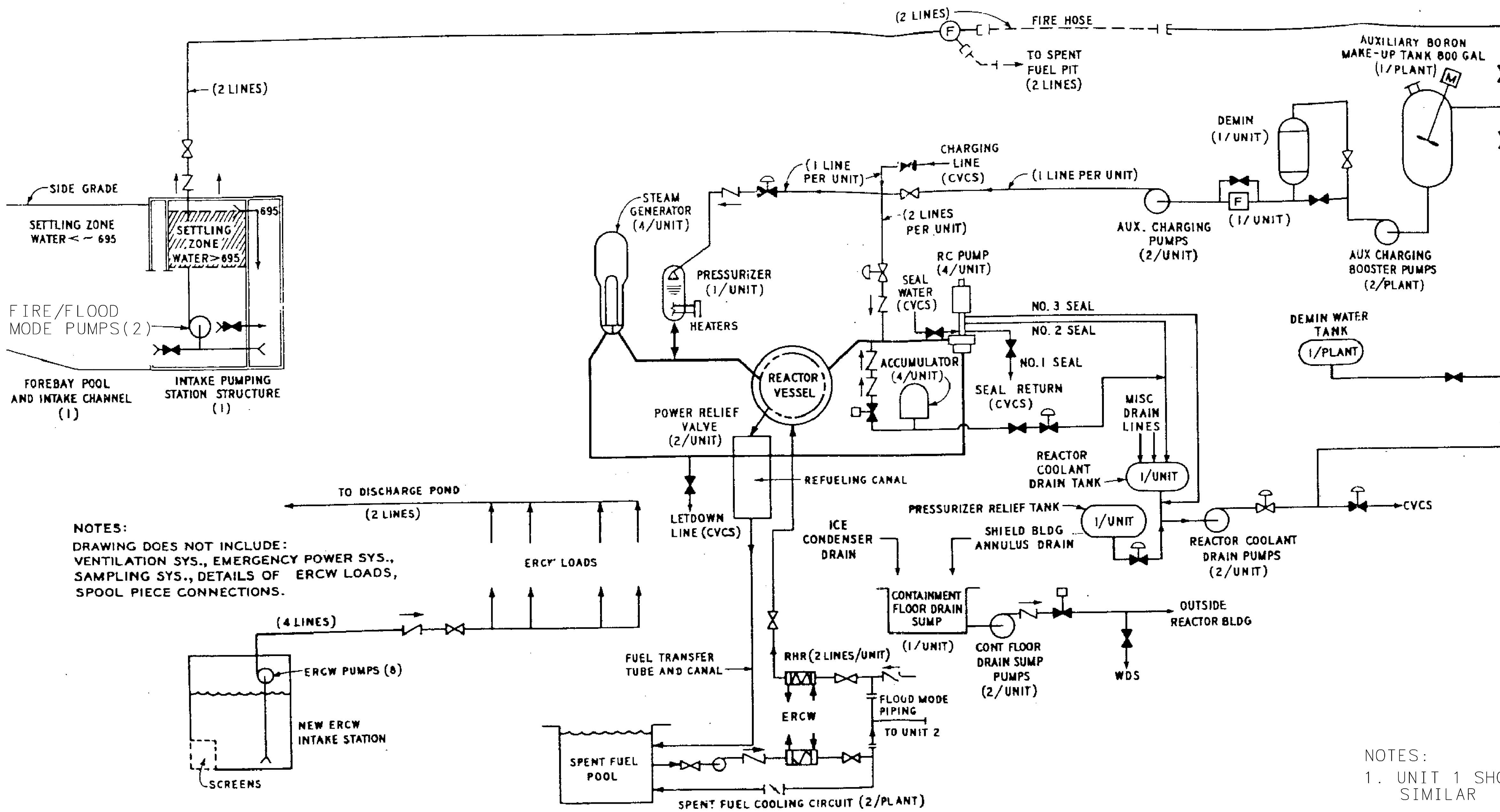


NOTES:
DRAWING DOES NOT INCLUDE:
VENTILATION SYS., EMERGENCY POWER SYS.,
SAMPLING SYS., DETAILS OF ERCW LOADS,
SPOOL PIECE CONNECTIONS.

NOTES:
1. UNIT 1 SHOWN, UNIT 2 SIMILAR

SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 2.4A-2
FLOW DIAGRAM-FLOOD PROTECTION PROVISIONS WITH NEW ERCW INTAKE STATION IN OPERATION-NATURAL CONVECTION COOLING
(REVISED BY AMENDMENT 15)



NOTES:

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

NOTES:

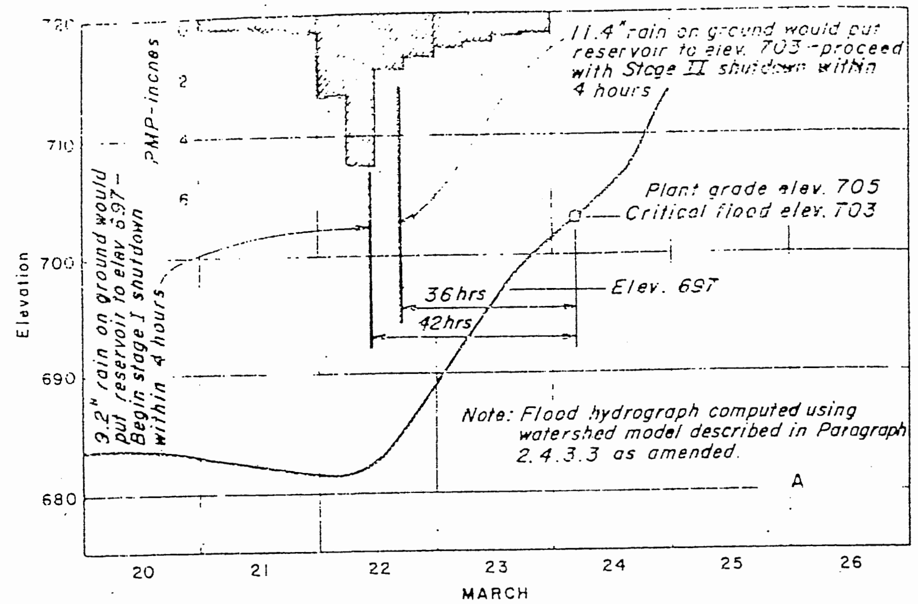
1. UNIT 1 SHOWN, UNIT 2 SIMILAR

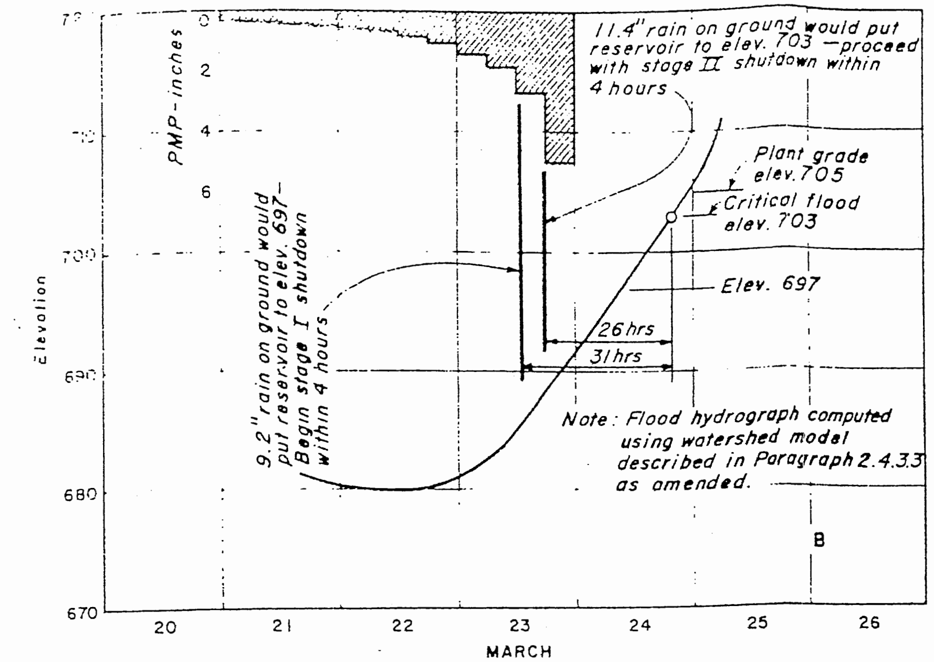
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 2.4A-3
FLOW DIAGRAM-FLOOD PROTECTION PROVISIONS WITH NEW ERCW INTAKE STATION IN OPERATION-OPEN REACTOR COOLING

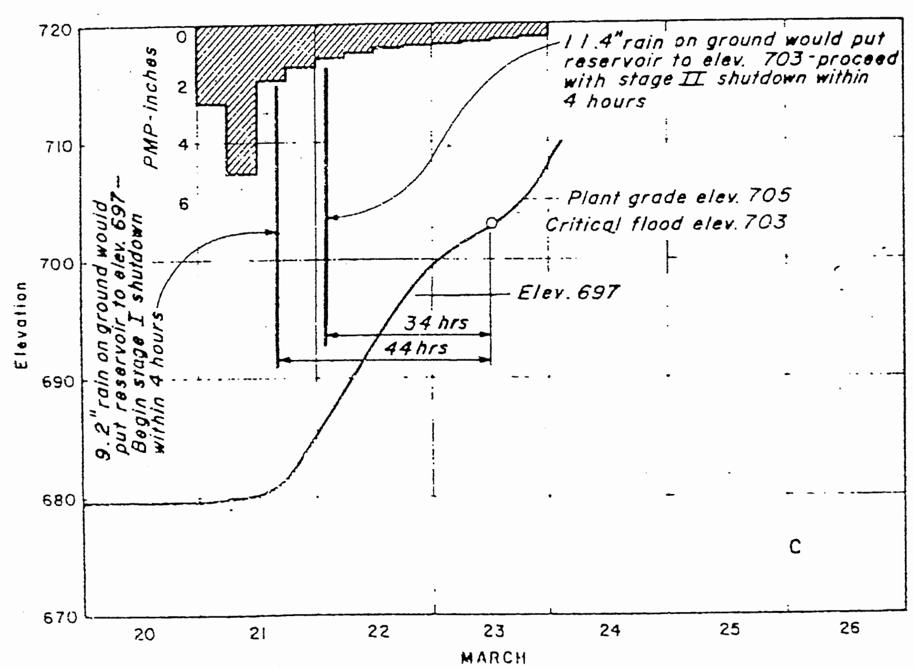
(REVISED BY AMENDMENT 15)

Histroical These graphs would be impacted by the safety modifications to the dam. But their use, as is, results in equal or greater flood proection.





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



SEQUOYAH NUCLEAR PLANT FLOOD PROTECTION PLAN
BASIS FOR SAFE SHUTDOWN FOR PLANT FLOODING

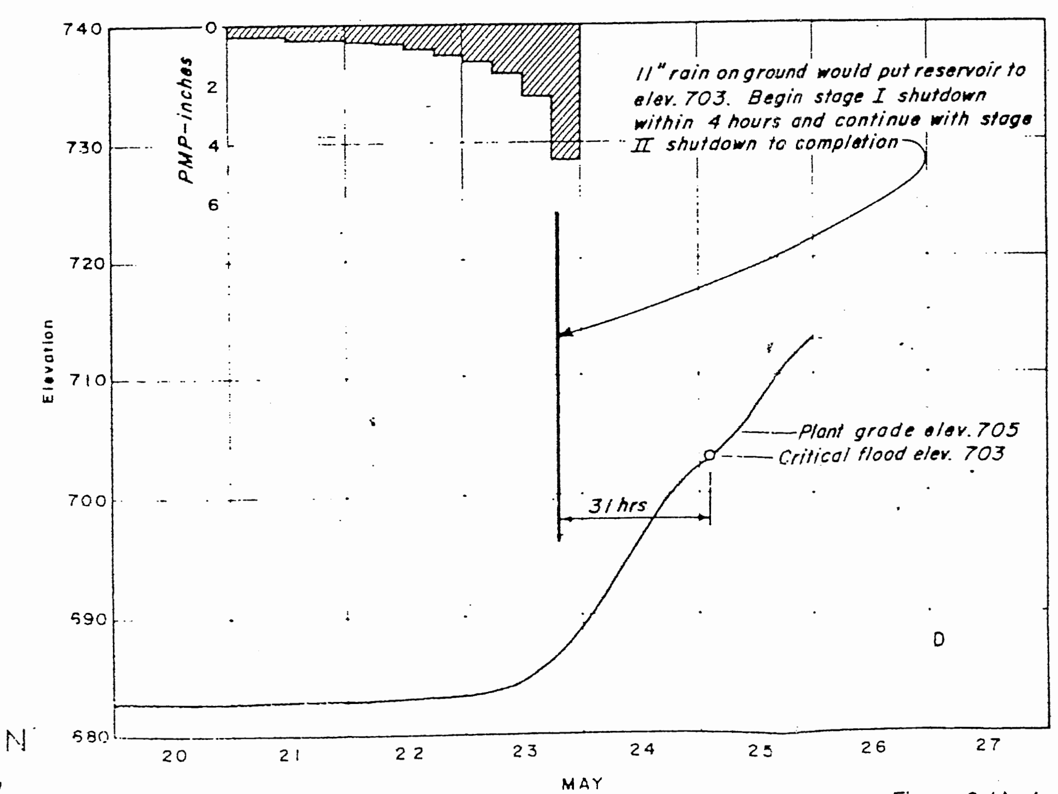


Figure 2.4A- 4
HISTORICAL
Revised by Amendment 17

2.5 GEOLOGY AND SEISMOLOGY

2.5.1 Basic Geologic and Seismic Data

2.5.1.1 Site Location and Scope of Exploration

The Sequoyah plant site lies in Hamilton County, Tennessee, on a peninsula extending from the right shore into Chickamauga Lake between river miles 484 and 485 (Figure 2.5.1-1).

The site first was explored in 1953. Twenty-nine holes were drilled into rock while 17 were fishtailed to the top of sound rock.

From September 1968 to February 1969 additional holes were drilled to fill in a 100-foot grid in the control and auxiliary building area, and in the reactor areas, with holes drilled at the intake structure and other locations in the general plant area. In addition to obtaining information on the foundation conditions, the holes in the reactor areas were used for dynamic seismic investigations.

During September and October 1969 a third drilling program was carried out to further investigate the reactor, control and auxiliary areas on a 50-foot spacing, and to examine the condition of the Kingston fault northwest of the plant site. For further details see ref. 84.

2.5.1.2 Physiography

The Sequoyah site is located in the Appalachian Valley subregion of the Valley and Ridge Province of the Appalachian Highlands (Figure 2.5.1-1). Physiographically, this subregion is characterized by long narrow ridges and somewhat broader intervening valleys having a northeast-southwest trend. The ridges are roughly parallel and fairly evenly topped. They are developed in areas underlain by resistant sandstones and the more siliceous limestones and dolomites. The valleys have been excavated in the areas underlain by easily weathered shales and the more soluble limestone formations.

In the vicinity of the Sequoyah site, the Tennessee River, prior to the impoundment of Chickamauga Lake, had entrenched its course to elevation 640. The small tributary Valley floors slope from the river up to around elevation 800, while the crests of the intervening ridges range between 900 and 1000 feet in elevation.

2.5.1.3 Geologic History

The Sequoyah area lies near the western border of what was the active part of the Appalachian geosyncline during most of the Paleozoic era. During this time, the area was below sea level and more than 20,000 feet of sedimentary rocks were deposited. At the end of the Paleozoic era, some 250,000,000 years ago, the area was uplifted and subjected to compressive forces acting from the southeast. Folds developed which were compressed tightly, overturned to the northwest, and finally broken by thrust faults along their axial planes. The resultant structure, there- fore, is characterized by a series of overlapping linear fault blocks which dip to the southeast. Since this period of uplift, the area apparently has been above sea level and has been subjected to numerous cycles of erosion. This erosion accentuated the underlying geologic structure by differential weathering of the more resistant and less resistant strata resulting in the development of parallel ridges and valleys which are characteristic of the region.

2.5.1.4 Stratigraphy

Conasauga Formation

The bedrock at the site is the Conasauga formation of Middle Cambrian age. In this region, the Conasauga is composed of interbedded limestone and shale in varying proportions. The shale, where fresh and unweathered, is dark gray, banded, and somewhat fissile in character. The limestone is predominantly light gray, medium grained to coarse crystalline to oolitic, with many shaly partings. A statistical analysis of the cores obtained from the site area indicates a ratio of 56 percent shale to 44 percent limestone. Farther to the southeast, higher in the geologic section, the amount of limestone increases in exposures along the shore of the lake.

2.5.1.5 Structure

The controlling features of the geologic structure at the Sequoyah plant site are the Kingston Thrust fault and a major overturned anticline which resulted from the movement along the fault. This fault lies about a mile northwest of the plant site (Figure 2.5.1-2) and can be traced for 75 miles northeastward and 70 miles southwestward. The fault dips to the southeast, under the plant site, and along it steeply dipping beds of the Knox dolomite have been thrust over gently dipping strata of the Chickamauga limestone. The distance from the plant site, about one mile, and the dip of the fault, 30 degrees or more, will carry the plane of the fault at least 2000 feet below the surface at the plant site.

The major overturned anticline results in the Conasauga formation at the plant site resting upon the underlying Knox dolomite which normally overlies it (Figure 2.5.1-3). As a result of the ancient structural movement of the fault and major fold, the Conasauga formation at the plant site is highly folded, complexly contorted, and cut by many very small subsidiary faults and shears. The general strike of these beds are N 30 degrees E and the overall dip is to the southeast, but the many small tightly folded, steeply pitching anticlines and synclines result in many local variations to the normal trend.

In some of the drill cores, small faults and shears were noted intersecting the bedding at various angles. These dislocations are the result of shearing along the limbs of the minor folds which developed contemporaneously with the major movement along the Kingston fault.

The Kingston fault is only one of the several lengthy thrust faults which characterize the geologic structure of the Appalachian Valley, a part of the "Valley and Ridge" physiographic province. A study of any one of these faults involves a consideration of the major structural features of the Valley as a whole.

Structurally, the Appalachian Valley in eastern Tennessee is characterized very largely by a series of overlapping linear fault blocks of northeast-southwest strike and southeast dips.

Most studies have attributed the deformation in the Southern Appalachians to the Appalachian orogeny at the end of the Paleozoic era. It has been assumed that the major tectonic structures have been inactive since the cessation of the orogenic movement. The duration of this orogenic epoch cannot be determined precisely in the Southern Appalachians since the Pennsylvanian strata are the youngest rocks known to have been affected. That some deformation continued after the major faults had attained their present development is attested by folded and faulted thrust sheets. These late structures may represent the final phase of the orogeny.

The only undeformed materials occurring in the Valley as mappable units are the unconsolidated materials: alluvial deposits, including the high level terrace deposits as well as the recent floodplain alluvium, and the residuum that nearly everywhere mantles bedrock. The alluvium along the Tennessee River and its tributaries ranges in age from less than a decade at the top up to several tens of thousand years at the base. The higher terrace deposits are much older than the lower terraces. The high level terraces have been considered as Pleistocene (King, 1949, page 89) or even older.

The residuum which blankets the bedrock in the Appalachian Valley ranges in thickness from a feather's edge up to a maximum of a hundred feet or more. The age range within a thick accumulation of residuum has not been determined, but the oldest part of the residuum may be of Paleocene or even later Upper Cretaceous age. In several areas of the Valley, masses of bauxite occur in association with brown iron ores and lignite in the thick residuum over limestones and dolomites. The bauxite and the associated materials accumulated in the sinks or sink-like depressions. Bridge (1950, page 194) considers these deposits to be late Paleocene. The following quotation is from Rodgers: "The age of the residuum is even less definite. Weathering is going on and presumably some residuum is being formed now, yet some residuum was apparently already present when the bauxite-bearing clay bodies formed in their sinkholes." Thus it has probably been forming virtually throughout Cenozoic time, though perhaps at a greater rate at certain times, such as those of little stream erosion, than at others. Several lines of evidence suggest a time of particularly intensive chemical decay and activity during or after the formation of the "Valley Flood Peneplain" in the Appalachian Valley, perhaps in the earlier Cenozoic (King and others, 1944, pages 24-25, 59; Rogers, 1948, pages 15, 40; King, 1949, pages 82-83; Bridge, 1950).

As indicated above, the age of the various unconsolidated materials in the Appalachian Valley of eastern Tennessee can be at best only estimated in very general terms. The bedrock and its structures are concealed very largely by these materials. The lack of any evidence of faulting, creep, or renewed movement in the unconsolidated materials even along the major tectonic faults indicates that there has been no movement along these faults for a very long time. This is true of the Kingston fault and all of the other numerous faults in the area.

No formal trenching or age dating was attempted at the Sequoyah plant. The evidence previously cited is related to general observations and the field mapping experience of dozens of geologists for the past 100 years. None of the reports published by geologists working in east Tennessee mention any evidence of actual observations of displacement of surface features which relate to fault movement in historic time. More positive evidence comes from a branch of the Kingston fault called the Missionary Ridge Fault.

The Missionary Ridge fault is a branch, or subsidiary, fault of the Kingston fault (Rodgers 1953, page 130-131, Plate 15, Figure 10). It runs northwest from the Kingston fault and has a total length of approximately 25 miles extending southwestward from the point where it diverges from the Kingston fault, 3 miles southwest of the Sequoyah site, and dying out in northwest Georgia (Hardeman, 1966; Butts and Gildersleeve, 1948). Along most of its length Cambro-Ordovician Knox dolomite and limestone are thrust over Middle and Upper Ordovician Chickamauga limestone. Near its southern terminus Knox is thrust over the Silurian Red Mountain formation.

The Missionary Ridge fault crosses the Tennessee River just upstream from Chickamauga Dam. In 1848 a railroad tunnel was driven through Missionary Ridge in Chattanooga and in the process the tunnel crossed the Missionary Ridge fault. The lining of this tunnel was inspected in 1974 and no cracking of the lining, offset along joints, or other signs of structural defects were found that would indicate any evidence or movement along the Missionary Ridge fault in the last 125 years. Three other vehicular tunnels through Missionary Ridge were also inspected and no structural indications of possible fault movement were found.

TVA has drilled through some of the major faults in eastern Tennessee. Diamond core borings at Chickamauga Dam (1935-1936) went through the Missionary Ridge fault and the cores through the fault zone came out unbroken. The fault was not simply "healed" or recemented with secondary deposits of calcite or dolomite, but was a very tight contact along which apparently pulverized material had recrystallized.

The recrystallization and solidification of the material along the fault plane indicated that this material had not been disturbed by renewed movements for an unknown, but apparently very long, period. Until recently, no indication of how long a period since the last movement was available. In studies for the Clinch River Breeder Reactor Plant, Law Engineering obtained similar material from the Copper Creek fault, one of the same family of faults as the Kingston and Missionary Ridge faults in east Tennessee, and obtained radiometric dates of 280 to 290 million years, ± 10 million years. The results of these tests indicate that the last movements on these faults occurred during the late Paleozoic.

Core borings have been made through at least one other major thrust fault in eastern Tennessee. It was reported to be "solid" similar to that through the Missionary Ridge fault.

Although light earthquakes occasionally occur in the Valley of eastern Tennessee, there has not been a single instance in which the surface was deformed. The shocks are of "normal" focus, 15 to 20 km, but even at such shallow depths, the hypocenters are in the crystalline basement rock well below the sedimentary rocks.

As previously stated, a study of any one of our major thrust faults involves a consideration of all the other similar faults. Many of the geologists who have spent years doing geologic work in eastern Tennessee believe that the several named faults are merely branches of a single nearly flat sole fault developed in some relatively incompetent formation just above the crystalline basement. Some, if not all, of the thrust sheets flatten out with depth, and some of them are cut through by erosion.

It was not until early 1974 that definitive evidence was released to support the "thin-skinned" hypothesis. At that time Geophysical Services Incorporated published an advertising brochure describing reflection seismic data they had available for sale. The example of a reflection profile used in their brochure was made along U.S. Highway 70 from near Kingston, Tennessee, to the vicinity of Knoxville, Tennessee. This profile essentially at right angles to the regional strike is reproduced in Figure 2.5.1-4.

The vertical scale of this profile is represented in seconds. This indicates the double travel time necessary for the shock wave to descend to the reflector and return to the surface. Assuming a wave velocity of 20,000 ft/s, the times indicated equate to depths in thousands of feet. The "thin-skinned" tectonic structure of the upper strata, above the 1.5 second (15,000 foot) line, is clearly indicated. The depth of approximately 15,000 feet to basement strata in this area is confirmed by gravity and magnetic data (Watkins, 1964).

The significance of the confirmation of "thin-skinned" tectonics in the area in relation to the geologic and seismic considerations of the Sequoyah plant lies in the fact that data now exist to show the separation of faults cropping out at the surface from geologic structures in the basement at a depth of approximately 15,000 feet or 4.5 km. This means that earthquakes with hypocenters at depths of five or more kilometers cannot be associated with faults cropping out at the surface even though the epicenter (surface projection of the hypocenter) falls on or near the trace of the fault.

The evidence available from all of the geologic studies that have been made suggests that all of the Appalachian Valley faults, including the Kingston fault, are inactive. In the voluminous literature on the geologic structure of the Southern Appalachians, there is no mention of the possibility that any of the faults may still be potentially active.

2.5.1.6 Groundwater

See Section 2.4.13.

2.5.1.7 Physical Character of the Rocks

Unconfined compressive strength determinations were made on seven core samples from the Sequoyah site. The results of these tests gave compressive strengths varying from 16,794 lb/in^2 and 11,936 lb/in^2 for limestone and 5758 lb/in^2 for shale. Seismic methods were used to determine the dynamic moduli of the foundation. The results of this work are explained below.

Seismic measurements were made in boreholes located in the two proposed reactor foundations. The purpose of these measurements was to determine the dynamic modulus of elasticity, E, for these foundations so that an earthquake design criteria could be established. Laboratory velocity measurements of core samples were not made because the varying changes in rock types would not give valid results.

The bedrock in which the seismic measurements were made is the Conasauga formation of middle Cambrian age. It is composed of inter-bedded lime- stone and shale in varying proportions. The shale, when unweathered, is dark gray to green, and somewhat fissile in character. In its weathered state it is very soft and in some cases has some of the characteristics of clay. The limestone is predominantly light gray, medium to coarse crystalline, oolitic, with many shaly partings and calcite healed fractures. The rock is badly contorted with dips ranging from 5 degrees to 90 degrees.

Results of the Dynamic Testing Program

Tables 2.5.1-1 and 2.5.1-2 give the results of the seismic studies that were made for each of the two reactor foundations. The average density of the rock is approximately 170 lb/ft^3. Density values from representative core samples were established at 170 lb/ft^3 and 169 lb/ft^3.

Tables 2.5.1-1 and 2.5.1-2 give the up-hole and cross-hole velocity measurements by which the E was calculated from formulae shown on Table 2.5.1-3. The difference in the values is thought to be attributed primarily to the changes in dip and rock type for each borehole. The average up-hole modulus for both reactor foundations is 4.2 x 10E6 and for the cross-hole modulus it is 4.4 x 10E6 lb/in^2.

2.5.1.8 Foundation Conditions

As shown on Figures 2.5.1-5 through 2.5.1-8, bedrock was mantled by a varying thickness of residual material derived from the weathering of the underlying shale and limestone. As would be expected in a foundation composed of alternating strata of different composition and competency, the configuration of the bedrock surface was irregular. The strike of the rock strata is approximately parallel to the centerline of the reactors. Preliminary excavation down to 18 inches above design grade resulted in a series of alternating ridges of harder limestone separated by troughs underlain by the softer shale trending across the plant area. The last 18 inches were removed by careful and controlled means so as to limit breakage below the design grade to a minimum. Once foundation grade was reached, the area was carefully cleaned and then inspected jointly by engineers and geologists to determine what, if any, additional material needed to be removed because of weathering or shattering by blasting.

After the final excavation was approved, the area was covered either by a coating of thick grout or a fill pour of concrete to prevent breakdown of the shale interbeds due to prolonged exposure.

Observation of rock exposed in the foundation areas, examination of cores, and investigations of the walls of exploratory holes with a borehole television camera all indicated that solution cavities or caves are not a major problem in the foundation. Verified cavities generally were limited to the upper few feet or rock where solution developed in limestone beds near the overburden-rock interface. Practically all of this zone was above design grade and was removed. Inspection of other areas of nonrecovery of core at greater depths by the borehole television equipment proved that so-called cavities as reported by the drillers were in fact interbeds of shale that had been ground between overlying and underlying harder limestone strata. In the walls of the holes the camera showed solid shale in these nonrecovery areas. Large solution cavities are not to be expected in formations such as the Conasauga which are made up of interbedded limestone and shale. The insolubility of the shale precludes the development of large openings.

Inspection of the walls of the exploratory holes with television disclosed thin, less than 0.05 foot, near-horizontal openings in some of the limestone beds. At the corresponding position, the drill cores showed unweathered breaks. These open partings are interpreted as "relief joints" developed by unloading either from erosion or excavation. The majority were found in the upper few feet of rock, but some were observed as deep as 131 feet below the rock surface.

A consolidation grouting program was carried on from February 18, 1970 through June 15, 1970 in the foundation areas for the Reactor, Auxiliary, and Control Buildings at the Sequoyah Nuclear Plant. The extent of the area treated is shown on Figures 2.5.1-9 and 2.5.1-10.

The purpose of this program was twofold. The first was to consolidate near-surface fractures predominantly caused by blasting and excavation. The second was to treat any localized open joints, bedding planes, fractures, or isolated small cavities that pre-construction exploratory drilling indicated might be present to a depth of 45 feet below the design foundation grade.

In the excavated area the contact between the residual material and essentially unweathered rock occurs at an average elevation of 680. The highest design level for the plant foundation grade under the Class I structures is at elevation 665. As a result, the preliminary excavation averaged a minimum of 15 feet in rock. Over most of the area the rock was suitable for foundation purposes at elevation 665.

In two areas, however, additional rock had to be excavated to remove localized pockets of deeper weathering. These zones were confined in two synclinal areas which crossed the excavation parallel with the north- south baseline. The axis of one lies approximately 70 feet plant east of the baseline and the axis of the other is approximately 140 feet plant west of the baseline. These trough-like synclines had channeled ground- water movement toward and along their axes with the result that weathering had progressed deeper in these areas. Generally, less than 10 feet of additional rock had to be removed from the synclinal zones to obtain a satisfactory foundation; however, in the vicinity of W 140; S 220, on the south side of the Auxiliary Building, as much as 30 feet of weathered rock was removed. The limits of the synclinal areas are reflected on Figure 2.5.1-10 as zones of appreciable grout take. Elsewhere in the foundation area grout takes were minimal.

This treatment program was approached in the same manner as a consolidation grouting program under a major dam. Grout crews with experience in grouting dam foundations were used, and the onsite technical direction of the program was performed by a member of the Geologic Branch who had previously supervised grouting operations at major dams. All grouting was done in strict accordance with TVA specification G-26, Pressure Grouting of Rock Foundations with Portland Cement. While the grouting was in progress, the program was reviewed in the field at least weekly by a senior member of the Geologic Branch.

Prior to the start of any grouting, it was proposed to excavate the foundation area to be treated to a depth of two feet below required design grade. In practice, due to the irregularities of the rock foundation, this overexcavation varied from a minimum of 18 inches to a maximum of nearly 30 feet. As each section of the foundation was prepared, it was inspected and approved by a joint team consisting of representatives of the Division of Construction, the Division of Engineering Design, and the Geologic Branch. When the area was released by the inspection team, fill concrete was poured up to the design foundation grade. This fill pour acted as a grout cap, protected the shale strata in the bedrock from any tendency to slake or ravel due to prolonged exposure, and provided a good working surface for the grouting operations.

The data contained in columns 3 and 5 of Table 2.5.1-4 indicate the tightness of the foundation. As shown in column 3, in the primary holes--those drilled over the entire area on a 20-foot grid--only 11 percent of the 10-foot-deep holes and 23 percent of the 45-foot-deep holes accepted any grout. This confirms the assumption made from the evaluation of the exploratory drilling, that grout takes would be confined to localized areas. Further confirmation is supplied by the relatively low percentage of holes with grout takes in the subsequent series of split spaced holes. Normally, it would be expected that a high percentage of the split-spaced holes, especially the secondary holes, would accept grout because they were drilled in areas shown by the primary holes to require further treatment. Although these percentages were higher than for the primary holes, they never exceeded 50 percent and usually were less than 40 percent.

A layout of the investigative programs for the other category I structures is presented as Figure 2.5.1-11.

Sections of Category I structures supported on soil, piles, or caissons are provided on Figures 2.5.1-12,-12a, and -12b. The ERCW piping and conduit support slab which is founded on piles to rock is shown in section on FSAR Figure 3.8.4-9. The sections show general details of excavation and backfill limits for the Category I structures as well as the type of foundation. The classifications of borrow materials are discussed in Subsection 2.5.1.11.

The Sequoyah foundation was completed prior to the time Atomic Energy Commission (AEC) began requesting commitments to produce geologic maps of the foundation. Therefore, detailed data such as were presented for the Watts Bar Nuclear Plant are not available.

There are available several hundred photographs of the rock foundation. TVA has submitted by letter a series of photographs which give the best representation of the overall foundation. In addition to the photographs, quality assurance forms were included which indicate approval of rock conditions prior to all concrete subpours in the Reactor, Auxiliary, and Control Building areas. Rock inspections were made by a senior geologist and by senior design engineers who initiated the forms.

2.5.1.9 Physical Characteristics of Soils

2.5.1.9.1 Static Physical Characteristics of Soils

A soils exploration program was conducted at the plant site to determine the static physical characteristics of the soils. Standard penetration split-spoon borings and undisturbed borings were made. Figure 2.5.1-13 shows the location of all borings made at the site for in situ soil sampling and testing. Graphic logs of all borings are kept on file by TVA.

2.5.1.9.2 Dynamic Characteristics of Soils

In situ soil dynamic studies were made at the plant site to obtain data for computation of elastic moduli for earthquake design criteria. The areas investigated at the site were the Diesel Generator Building, the Low Level Radwaste Storage Facilities, the ERCW pipeline, the Additional Diesel Generator Building, and the Primary Water Storage Tank.

1. Diesel Generator Building

   Down-hole seismic surveys and a seismic refraction survey were performed. The results are tabulated on Table 2.5.1-9.

2. Low Level Radwaste Storage Facilities

Both compressional and shear wave velocities were obtained through a series of cross-hole and down-hole measurements. The results are tabulated on Table 2.5.1-10 and 2.5.1-11.

3. Essential Raw Cooling Water Pipeline

Down-hole seismic surveys were made. The results are tabulated on Table 2.5.1-12.

4. Additional Diesel Generator Building

Cross-hole and down-hole seismic surveys were performed. The results are tabulated on Table 2.5.1-13.

5. Primary Refueling Water Tanks

Seismic refraction surveys were made. The results are tabulated on Table 2.5.1-14.

2.5.1.10 Detailed Safety-Related Criteria and Computed Factors of Safety For the Materials Underlying the Foundations for Category I Structures

1. Category I Rock-Supported Structures

The allowable rock-bearing pressure for sustained loading was determined based on the strength and stratigraphy of the foundation rock. The result using the physical characteristics of the foundation rock as described in section 2.5.1.7, and the geologic characteristics given in section 2.5.1.4 provided a reasonable bearing pressure. The allowable rock-bearing capacity is less than the ultimate bearing capacity by a factor of 2.5.

Table 2.5.1-5 lists the structures which are constructed with a base slab directly on rock. The table shows the allowable static and dynamic bearing pressures.

2. Category I Structures Supported by H-Piles or Caissons to Rock

There are four Category I structures founded on piles or caissons. The structures are the East Steam Valve Room, the Waste Packaging Area, the Condensate Demineralizer Waste Evaporator Building, and the ERCW piping and conduit support slab in the ERCW pumping station access dike.The East Steam Valve Rooms were backfitted with caissons into rock after experiencing some settlement.

The Waste Packaging Area, the Condensate Demineralizer Waste Evaporator Building, and the ERCW piping and conduit support slab in the ERCW pumping station access dike are all supported on H-piles founded on rock.

3. Category I Soil-Supported Structures

The allowable soil-bearing capacity for sustained loading is determined using the general shear failure formula, developed by Terzaghi and modified by Meyerhof.

The allowable bearing pressure for sustained loads is less than the ultimate bearing by at least a factor of three.

For dynamic loading the soil-bearing pressure is permitted to exceed the allowable for sustained loading. In no instance is the ratio of the ultimate soil-bearing pressure to the allowable soil pressure less than two.

Table 2.5.1-6 contains a summary of the allowable soil-bearing capacities and factors of safety for the soil-supported Category I structures.

4. Category I Embankments

See Subsection 2.5.6.

2.5.1.11 Compaction Criteria for Engineering Backfill

2.5.1.11.1 Earthfill

Prior to and during construction, borrow investigations were made. These investigations were made on an as needed basis.

The borrow samples were tested by the central materials laboratory according to ASTM D-698 to develop compaction control curves. The compaction curves were divided into subclasses, and these compaction curves are shown on Figures 2.5.1-14 and -15. These curves were used by the project laboratory to control compaction of earthfill at the site.

At Sequoyah Nuclear Plant, Type A backfill was placed around all Category I structures. This material, which was selected earth placed in not more than 6-inch layers, has a minimum required compaction of 95 percent of the maximum dry density at optimum moisture content.

The limits of excavation and the backfill around the Category I structures are shown in Figures 2.5.1-12,-12a, and -12b. Tables 2.5.1-7 and 2.5.1-8 are a summary of field control tests on Type A backfill.

2.5.1.11.2 Granular Fill

Crushed Stone Fill

A free draining granular fill material, consisting of crushed stone or sand and gravel, was placed below or next to Category I structures. This material was obtained commercially from off-site sources.

The granular fill was suitable for compaction to a dense, stable mass and consisted of sound, durable particles which are graded within the following limits:

	Percent by Weight	
Passing	Minimum	Maximum
1-1/4-inch sieve		100
1-inch sieve	95	100

Passing	Percent by Weight Minimum	Maximum
3/4-inch sieve	70	100
3/8-inch sieve	50	85
No. 4 sieve	33	65
No. 10 sieve	20	45
No. 40 sieve	8	25
No. 200 sieve	0	10

The material was free of disintegrated stone, soft friable particles, shale, salt, alkali, organic matter, or an adherent coating and reasonably free of thin, flat, or elongated pieces.

The granular fill material was used; for structural support, to replace earthfill as a backfill material around piping or conduits during wet weather, and to provide a working base above wet soil. The material, when used for structural support, or replacement for earthfill, was compacted to a required relative density as determined by ASTM D 2049. When used for structural support, such as for the refueling water storage tank (Figure 2.5.1-12b), an average relative density of 85 percent or greater with a minimum relative density of 80 was required. When used as a replacement for earthfill, a relative density between 70 and 85 percent was required.

Limestone Sand Fill

A granular fill material that meets the gradation requirements of ASTM C 33 was used as backfill material around the ERCW piping along the piping alignment from the intake Pumping Station to the ERCW Pumping Station access dike. The gradation limits for the material are:

Passing	Percent by Weight Minimum	Maximum
3/8" sieve	100	
No. 4 sieve	95	100
No. 8 sieve	80	100
No. 16 sieve	50	85
No. 30 sieve	25	60
No. 50 sieve	10	30
No. 100 sieve	2	10

The granular fill was compacted to an average relative density of 75 percent or greater, with a minimum relative density of 70 percent as determined by ASTM D 2049.

2.5.1.11.3 Crushed Rock

A crushed rock material that meets the gradation requirements shown below was used to construct the core of the ERCW access dike and the material was also used for remedial treatment in local areas. The gradation limits for the material are:

Passing	Percent by Weight Minimum	Maximum
3-inch sieve	95	100
2-inch sieve	25	55
1-1/2-inch sieve	0	15
1-inch sieve	0	2

The material consisted of sound durable particles; free of soft friable particles, shale, salt, organic matter, or an adherent coating (other than dust); and reasonably free of thin, flat or elongated pieces.

ERCW Access Dike

The ERCW Access Dike as shown on Figure 3.8.4-9 connects the ERCW Pumping Station Access Cells with the shore. The dike core was placed by end dumping the rockfill material between the shore and the access cells up to elevation 676.75 (1.75 feet above normal minimum reservoir level). Compaction was obtained using a vibratory roller. Above elevation 676.75, between the access cells and the shore, the rockfill material was placed in lifts and compacted using the same vibrating roller.

Remedial Treatment

The rockfill material was used in several locations at the site to improve the soil. This was generally done where moisture caused the soil to be unsatisfactory as a base for earthfill placement. The material was used in a limited area at the refueling water tank pipe tunnel.

The material was placed in approximate 6-inch loose layers and rolled into the soil. If the required stiffness for the placement of earthfill was achieved, lifts of earth- fill or crushed stone fill were placed. If the required stiffness was not achieved, then additional lifts of the material were placed and rolled to obtain the desired stiffness. If shearing or pumping accurred in placement of the first lift, additional lifts of the material were placed as necessary.

2.5.2 Vibratory Ground Motion

The lithologic, stratigraphic, and structural conditions at the site and in the surrounding area and the geologic history of the region have been discussed previously in Paragraphs 2.5.1.3, 2.5.1.4, and 2.5.1.5, and will not be repeated here. The static and dynamic engineering properties of the materials underlying the site are described in Paragraphs 2.5.1.7 through 2.5.1.9.

2.5.2.1 Regional Tectonics

The fact that Pennsylvanian strata were involved in the deformation of the Valley and Ridge province in the Southern Appalachian area has in the past been taken as conclusive evidence that the structural features of the Appalachian system were formed near the end of the Paleozoic

Era. This has been termed the "Appalachian Revolution." This late Paleozoic orogeny, however, may have been only one of many movements, and in fact may have been a relatively mild concluding phase.

The orogenic and tectonic history of the southern Appalachian geosyncline is composite. The lower part, up to about the middle of the Ordovician, is a thick mass of carbonates with sandstone at the base. These deposits indicate a time of crustal quiescence, with slow sinking of the area of deposition, and low marginal lands. The succeeding clastics, laid down in Middle Ordovician and later times, express a radical change in the environment of the geosyncline. The source of the sediments was now from the southeast and was probably orogenic in origin.

In the southern Appalachians, the first orogenic movement indicated by the sediments of the geosyncline took place in Middle Ordovician time. This is somewhat earlier than the late Ordovician and early Silurian Taconian movements of the northern Appalachians, but may be considered a phase of the Taconian orogeny. To the southeast is a thick mass of shales and sandstones of Middle Ordovician Age, succeeded by red sandstones and siltstones, probably also Middle Ordovician. Farther northwest, all the Middle Ordovician is limestone, but the Upper Ordovician includes shales and red beds. These beds are topped by cleanly washed, quartzose Silurian sandstones, a post-orogenic deposit.

Orogenic movements at about this time in the metamorphic and plutonic belt on the southeast are suggested by radioactive determinations which indicate that some of the pegmatites of that area are of Ordovician Age.

Acadian, or late Devonian and early Mississippian, orogeny of the northern Appalachians seems to be poorly represented in the southern Appalachians. Slight early Mississippian movements, possibly a late phase of the Acadian orogeny, are expressed by clastic rocks of early Mississippian Age. However, Middle Paleozoic time in the southern Appalachians seems to have been mainly one of quiescence and readjustment, following the Ordovician orogeny.

The next period of orogeny suggested by the sediments of the Valley and Ridge province probably took place in late Mississippian and early Pennsylvanian time, or at about the same time as the Wichita orogeny west of the Mississippi Embayment. Deposits of late Mississippian and early Pennsylvanian age thicken markedly southwestward along the Valley and Ridge province and reach their climax in the southeastern belts of outcrop in Alabama. If these thick late Mississippian and early Pennsylvanian deposits are related to orogeny, that orogeny must have occurred in the region southeast of the present belts of outcrop, for the deposits lie with apparent conformity on the beds beneath and share with them the strong folding and faulting of the Valley and Ridge province. No Paleozoic deposits younger than the Pottsville are present southwest of West Virginia and Kentucky. There may have been Arbuckle movements of late Pennsylvanian and early Permian age, and there may have been also Appalachian movements of late Permian age.

Since the end of the Paleozoic the southern Appalachian mountain system has stood as a positive area and has undergone profound erosion. The present topography is the result of differential weathering of strata of varying resistance. The more durable units underlie the higher areas and the valleys are cut in softer formations. This differential erosion in the Valley and

Ridge Province has accentuated the long northeast-southwest trending series of fault belts that developed in the Paleozoic and have remained quiescent since. The Valley and Ridge Province from Roanoke, Virginia, southwestward is characterized by a series of overlapping linear fault blocks of northeast-southwest strike and southeast dip. Along the southeast margin of the province the Lower Cambrian and Pre-Cambrian strata have moved northwestward along the Great Smoky fault as much as 20 to 30 mi. as evidenced by exposures of Upper Cambrian and Ordovician strata in windows eroded through the thrust plate far southeast of the present mountain front. While this was happening, the less competent strata to the northwest were shingled into a series of imbricate thrust plates. The soles of these plates are normally incompetent shales in or below the Middle Cambrian Rome formation. On the present surface as many as 10 of these sheets can be defined across the Valley and Ridge Province in Tennessee. Most geologists familiar with the area now believe that there are two to four "master thrusts," such as the Pulaski, Saltville, and Pine Mountain, and others are subsidiary branches off the major faults. It is also believed that these faults do not extend into the basement but are a series of decollements developed in some relatively incompetent formation above the crystalline basement.

There is no geologic evidence indicating that any of these faults could be considered to be "active" faults; that is, still undergoing movement. On the contrary, all geologic evidence points to the fact that they have not moved since the close of the Paleozoic era. Drainage patterns are controlled by the relative competency or incompetency of the strata crossed by the streams and do not indicate offsets where crossing faults.

There is no evidence of creep, faulting, or renewed movement in the unconsolidated residual or alluvial deposits overlying the fault traces nor any observable offset of Plio-Pleistocene high level alluvial terraces.

In exploration for various sites in the TVA area, some of these major fault planes have been intersected by exploratory drill holes. As an example, during the exploration for Chickamauga Dam near Chattanooga, Tennessee, cores across the Missionary Ridge fault were recovered unbroken. The fault was not simply "healed" or recemented with secondary deposits of calcite or dolomite, but was a very tight contact along which apparently pulverized material had recrystallized. In another instance at the Tellico Project near Knoxville, Tennessee, the Knoxville fault was cored in 10 holes and again the core across the fault was recovered unbroken although the stratigraphic displacement is in the neighborhood of 10,000 feet and the lateral displacement can be measured in miles. The evidence available from all of the geologic studies that have been made indicates that all of the thrusts in the Valley and Ridge Province are inactive. In the voluminous literature on the geologic structure of the southern Appalachians, there is no mention of the possibility that any of the faults may still be potentially active.

Although light earthquakes occasionally occur in the region, there has not been a single instance where the surface has been deformed. These shocks are all of "normal" focus, 15-20 km deep, but even at these relatively shallow depths the hypocenters are well into the crystalline basement rocks far below the 5 km maximum thickness of the sedimentary cover. For this reason, any map showing epicenters of earthquakes in this area plotted in relation to fault traces gives an erroneous impression, for any such map drawn to a reasonable scale will show some epicenters falling near or on some of the relatively closely spaced thrust faults to which they are in no way related.

2.5.2.2 Site Area Tectonics

In recognition of the fact that sites in the southern Appalachians cannot reasonably be tied to any one "tectonic structure," NRC (formally AEC) in the preliminary evaluation of the Sequoyah Nuclear Plant defined a "Southern Appalachian Tectonic Province." This province is bounded on the east by the western margin of the Piedmont Province; on the west by the western limits of the Cumberland Plateau; on the south by the overlap of the Gulf Coastal Plain Province; and on the north by the re-entrant in the Valley and Ridge Province near Roanoke, Virginia. The limits of the province are shown on Figure 2.5.2-1. Under this concept accelerations at the site will be determined by assuming that the largest historic earthquake known in the province occurred adjacent to the site. For the Sequoyah site, this earthquake would be the May 31, 1897 quake in Giles County, Virginia, which had a reported epicentral intensity of MM VIII.

In the specific site area there is no physical evidence of disturbance of surficial materials during prior earthquakes. Minor dislocations and shears in the substrata are directly related to movements along the major thrust faults which moved in the Paleozoic and have been "fossilized" since that time. The majority of these are healed and recemented although they do serve as loci for near-surface development of solution and cavities in the limestone strata.

2.5.2.3 Seismic History

The evaluation of the earthquake hazard at the Sequoyah site involves a consideration of the known seismic history of a large surrounding area. By plotting the epicenters of hundreds of earthquake shocks, the areas of continuing seismic activity become apparent. The more active areas are described in the following summary.

1. Mississippi Valley, especially the New Madrid region of Arkansas, Kentucky, Missouri, and Tennessee. This region has been active seismically since the appearance of the white man and very probably long before that. A few great earthquakes and thousands of light to moderately strong shocks have been centered in the Mississippi Valley. Light to moderate shocks are still occurring at an average frequency of a few per year. The New Madrid region is more than 250 miles northwest of the Sequoyah site.

2. The Lower Wabash Valley of Illinois and Indiana. This area has been the center of several moderately strong earthquakes, some of which were felt as far south as Nashville, Tennessee. It is about 260 miles northwest of the Sequoyah site.

3. Charleston area, South Carolina. One of the country's greatest earthquakes was centered in the Charleston area. Earlier, many light to moderate shocks had been centered in the area long before the great earthquake, and the activity has continued to the present time. Charleston is more than 300 miles east of the Sequoyah site.

4. The Appalachian Mountains of eastern Tennessee and western North Carolina. The mountain belt of eastern Tennessee and western North Carolina is a region of continuing minor activity. Light to moderate shocks occur at an average frequency of one or two per year. The activity is not uniform, as periods of several shocks per year are followed by longer periods of no perceptible shocks. This region is centered more than 50 miles to the east of the Sequoyah site.

In addition to these areas, shocks of light to moderate intensity have occurred at numerous other localities in the southeastern states at various distances from the Sequoyah site. At many of these localities, only a few light to moderate shocks from widely scattered epicenters are known. A few such shocks have occurred to the north and east of Huntsville, Alabama. Numerous light shocks have occurred in Knoxville and its environs.

An annotated list of the earthquakes which have either affected the Sequoyah area or were centered somewhere near the area is presented below. In each case, the maximum intensity, or that applicable to the Sequoyah area, is assessed in terms of the modified Mercalli scale.

1811, December 16:	36.6° N - 89.6° W
1812, January 23:	36.6° N - 89.6° W
1812, February 7:	36.6° N - 89.6° W

These were the strongest shocks of the great series of earthquakes of 1811-1812 centered in the Mississippi Valley and known collectively as the New Madrid earthquake. This series consisted of thousands of individual shocks, many of which were strong. The three strongest shocks had an intensity of XII in their epicentral areas, and were felt over an area of about 2,000,000 square miles. Topographic changes were effected over an area of 3000 to 5000 square miles in the Mississippi Valley. The three great shocks and many of the other strong shocks were felt in the Sequoyah area, where some of them may have attained intensities as high as VI or VII (Figure 2.5.2-2).

<u>1843, January 4</u>: 35.2° N - 90° W. A severe earthquake centered in the Mississippi Valley was felt over some 400,000 square miles in a 12-state area. Chimneys were thrown down in Memphis, Nashville, and St. Louis. Although the intensity was perhaps as high as in the epicentral area, it is not known to have attained damaging intensities in Alabama. This shock was perceptibly felt over the entire Tennessee Valley and may have had an intensity as high as V or VI in the Sequoyah area.

<u>1861, August 31</u>: A strong earthquake, thought to have been centered in Virginia, was felt from Washington, D.C., southward to Wilmington, North Carolina, and westward to Knoxville, Cincinnati, and Louisville. At Knoxville it was described as a "heavy shock" which "alarmed the encamped military very much." It may have affected the Sequoyah area at an intensity of III or IV.

<u>1886, August 31</u>: 32.9° N - 80.0° W. The great Charleston, South Carolina, earthquake was felt over the entire eastern U.S. Its maximum intensity in the epicentral area was X, but in eastern Tennessee it was perhaps between VI and VII, as shown on Figure 2.5.2-3.

<u>1886, September 1</u>: A shock reported at Chattanooga was believed to be an aftershock of the Charleston earthquake, many of which were felt in Tennessee.

<u>1892, December 2</u>: A very perceptible earthquake shock was felt in Chattanooga from Hill City (now north Chattanooga) to Missionary Ridge. According to contemporary reports, the motion was from north to south. Doors in houses flew open, piles of lumber were upset, coal at chutes rolled down, and water vibrated. These effects were reportedly limited to an area of 6.25 square miles, but a larger area probably was affected.

<u>1895, October 31</u>: 37.0° N - 89.4° W. A strong earthquake centered at Charleston, Missouri, affected an area of 1,000,000 square miles in 23 states. It threw down chimneys and damaged buildings at various places in the Mississippi Valley, including Memphis, Tennessee. The earthquake was felt over the entire Tennessee Valley, but it was of low intensity in eastern Tennessee.

<u>1897, May 31</u>: 37.3° N - 80.7° W. A strong earthquake centered in Giles County, Virginia, was felt over an area of more than 250,000 square miles. It was felt throughout eastern Tennessee as far west as Tullahoma, but did not attain damaging intensities outside the epicentral area.

<u>1902, May 29</u>: A "strong shock" (intensity V) shook houses and awakened sleepers in Chattanooga.

<u>1902, October 18</u>: 35.0° N - 85.3° W. A moderate shock affected some 1,500 square miles in Georgia and Tennessee. It was felt from Dalton to Chattanooga. The maximum intensity was IV-V, but it is not known to have been felt as far to the northeast as the Sequoyah plant site.

<u>1904, March 4</u>: 35.7° N - 83.5° W. The epicenter of this earthquake was between Maryville and Sevierville, but the disturbance was felt along the mountain front over a distance of 90 to 100 miles. The shock affected an area of about 5,000 square miles, but the intensity was nowhere above V and over much of the felt area it was much lower.

<u>1913, April 17</u>: 35.3° N - 84.2° W. This moderately strong earthquake was felt over an area of about 3,500 square miles in eastern Tennessee, western North Carolina, northern Georgia, and northwestern South Carolina. The intensity was higher (V-VI) along the major axis of the affected area between Ducktown and Kiser. As shown by the map (Figure 2.5.2-4), the earthquake was not felt in the Sequoyah area, but it was felt some miles away.

<u>1913, May 2</u>: A light shock of several seconds duration was felt near Madisonville, Tennessee. This shock, intensity III, was centered nearly 50 miles from the plant site.

<u>1914, January 23</u>: 35.60 N - 84.50 W. A sharp local shock (V) was felt at Niota and Sweetwater, some 35 miles from the plant site.

<u>1916, February 21</u>: 35.50 N - 82.50 W. The strong earthquake, intensity VII, was centered in the mountains of western North Carolina. It affected an area of 500,000 square miles in the Carolinas, Georgia, Tennessee, Alabama, Kentucky, and Virginia. It was felt over nearly all of Tennessee, but was most severe in the mountains of eastern Tennessee. Chimneys were damaged at Sevierville and plaster was shaken from walls at Bristol, Morristown, and Knoxville. At Memphis, there was considerable motion in the higher stories of buildings. The earthquake affected the Sequoyah area at intensities between III and IV (Figure 2.5.2-5).

<u>1916, October 18</u>: 33.50 N - 86.20 W. A strong earthquake centered near Easonville, Alabama, was felt over an area of 100,000 square miles in a seven-state area. About two-thirds of Tennessee was affected by this earthquake, but there was no damage in the state. The

disturbance was felt strongly at Chattanooga, Nashville, Waynesboro, Carthage, Sparta, McMinville, Lewisburg, and other points in central Tennessee. A light shock was noticed in Knoxville and Clinton. At the Sequoyah plant site, the intensity was not more than IV (Figure 2.5.2-6).

1918, June 21: 36.10 N - 84.10 W. Centered near Lenoir City, this moderate shock (IV-V) affected an area of 3000 square miles. It is not known to have affected the Sequoyah area.

1920, December 24: 36.00 N - 85.00 W. A moderately strong shock was felt at a number of localities in eastern Tennessee including Rockwood, Glen Alice, Spring City, Harriman, Decatur, and Crossville. Many sleepers were awakened and the entire village of Glen Alice was aroused. This earthquake, with a maximum intensity of V, was centered about 45 miles from the Sequoyah plant site and is not known to have affected the site area.

1921, December 15: An earthquake of "considerable intensity" was felt along the western portion of the Appalachian Valley from Kingston and Rockwood to Decatur and Dayton and as far eastward as Athens. The maximum intensity was V, but the shock is not known to have been felt any nearer to Sequoyah than Dayton.

1924, October 20: 35.0° N - 82.6° W. A strong earthquake (V-VI) centered in Pickens County, South Carolina, was felt over 56,000 square miles in the Carolinas, Georgia, Tennessee, Virginia, and Florida. Although buildings were strongly shaken in the epicentral area, there was little damage. The intensity in eastern Tennessee was nowhere greater than III. At the Sequoyah plant site, the intensity was less than II (Figure 2.5.2-7).

1927, October 8: A moderately strong earthquake was felt in all parts of Chattanooga and suburban areas, including north Chattanooga, East Ridge, Lookout Mountain, Signal Mountain, St. Elmo, and Red Bank. The shock was felt in small and large buildings. Lights trembled and loose objects were disturbed. Other mild shocks were reported within a few hours following this shock. The shock is not known to have been felt in the Sequoyah area.

1928, November 2: 35.8° N - 82.8° W. A strong earthquake centered in the mountains of Madison County, North Carolina, was felt over an area of 40,000 square miles in a six-State area. The maximum intensity was VII, but in Tennessee the intensity diminished from VI along the state line to extinction somewhere in central Tennessee. At the Sequoyah plant site, the intensity was less than III (Figure 2.5.2-8).

1930, August 30: 35.9° N - 84.4° W. This earthquake was felt at Kingston, Lenoir City, Lawnville, Oliver Springs, and other points west and southwest of Knoxville. The maximum intensity was V. This shock is not known to have affected the Sequoyah site area perceptibly.

1938, March 31: An earthquake centered in the mountains in the Little Tennessee Basin was widely felt in Tennessee and North Carolina. In Tennessee it was felt at Copperhill, Parksville, Knoxville, and Sweetwater where the intensities ranged from III to I. The shock is not known to have affected any part of Tennessee west of Sweetwater.

1940, October 19: An earthquake which shook houses and rattled loose objects awoke thousands of sleepers in Chattanooga. It affected some 1,100 square miles in Tennessee and Georgia. It was felt as far north as Charleston and Birchwood but at very low intensities (Figure 2.5.2-9).

1941, September 8: An earthquake was felt throughout Chattanooga and as far west as Jasper. It was especially strong in the Lookout Mountain area where walls vibrated, loose objects rattled, and glassware was broken. This earthquake is not known to have been felt upstream from Chattanooga.

1945, June 13: This shock, centered near Cleveland, Tennessee, where the intensity was V, was felt over an area of 4,000 square miles in southeastern Tennessee and northwestern Georgia. It was felt north-eastward to Knoxville, southwestward to Chattanooga, and southeastward to Blue Ridge, Georgia. The felt area of this shock was never mapped, but the shock may have affected the Sequoyah area at an intensity of III or less.

1946, April 6: Another light shock was felt at Cleveland, Tennessee. This shock was not reported felt outside of the city.

1947, December 27: A light earthquake (IV) felt in Chattanooga, Tennessee; and Fort Oglethorpe, Rossville, Ringgold, and Boynton, Georgia, affected an area of 300 miles. It was centered east of the Missionary Ridge fault, where houses shook, loose objects rattled and piano wires popped. The shock is not known to have been felt any nearer to Sequoyah than Chattanooga.

1954, January 22: A light earthquake was felt over much of McMinn County from Athens to Etowah and Englewood. It is not known to have been felt outside of the county.

1957, June 23: 35° 54' N - 84° 14' W. A light local earthquake was felt in western Knox County and nearby sections of Anderson and Loudon Counties. At Dixie Lee Junction and in neighboring communities, people were awakened by the "jumping" of houses and the rattling of loose objects.

1959, June 12: 35° 21' N - 84° 20' W. A light earthquake was felt over an area of 900 square miles in eastern Tennessee and western North Carolina. It was most strongly felt at Tellico Plains and Mount Vernon where an intensity of IV was attained.

1960, April 15: 35.8° N - 83.9° W. A shock of intensity V, centered near Knoxville, Tennessee, was felt over a 1,300 square mile area. It was not reported as felt in the Sequoyah area.

1966, August 24: 35.9° N - 83.9° W. This shock of intensity IV, centered near Knoxville, Tennessee, was not felt in the Sequoyah area.

1968, November 9: 38.0° N - 88.5° W. This earthquake, centered in southern Illinois, with an epicentral intensity of VII was felt over a 400,000 square mile area in 23 states, including Tennessee, and in Canada. In the Sequoyah area it had an approximate intensity between II and III.

1969, July 13: 36.1° N - 83.7° W. The epicenter of this intensity IV shock was located northeast of Knoxville, Tennessee. This shock was not felt in the Sequoyah area (Figure 2.5.2-10).

1969, November 20: 37.4° N - 81.0° W. This intensity V shock, with its epicenter in southern West Virginia, was not reported felt in the Sequoyah area.

1971, July 12: 35.9° N - 84.3°. A light local tremor (MM III-IV) was felt at 10:00 p.m. in the Knoxville-Oak Ridge area. It was not felt in the Sequoyah area.

A list of all seismic events to 1982 and within a 200-miles radius of the plant site is presented as Table 2.5.2-1.

The seismic history of the southeastern U.S. has been known for only about a century and a half, but so far as can be determined from the records the Sequoyah site is as stable seismically as any area in the State. Great distant earthquakes have affected the area with intensities equal to or greater than the maximum intensities of the several shocks centered within 50 or 60 miles of the site. Of the 40 earthquakes identified in the foregoing annotated list, only 12 are positively known to have been felt at Sequoyah. Of these, four were centered in the Mississippi Valley, one at Charleston, South Carolina, one in Alabama, one in Illinois, and five at various centers in east Tennessee, Virginia, and western North Carolina. In addition to these, it is probable that a few other shocks might have affected the area at very low intensities.

On Figure 2.5.2-1, epicenters of all historic quakes within 120 miles of the Sequoyah site and all epicenters of historic quakes with MM intensities of V or greater up to and beyond 250 miles from the site are plotted.

2.5.2.4 Site Seismic Evaluation

The known seismic history of the southeastern United States suggests that the earthquake hazard is negligible at the Sequoyah site. There are no active faults in the vicinity of the site and there is no physical evidence of any seismic activity at the site. There have been several shocks in the general area including two shocks of intensity MM V centered within 15 and 20 miles of the site. However, the nearest known epicenter of damaging intensity (MM VII) is 100 miles northeast of the site. The maximum intensity to have been felt at the site in the recorded history of the area is probably MM V and certainly no more than MM VI. On the basis of present knowledge, the maximum historic felt intensity was derived from major earthquakes centered at distant points, especially in the Mississippi Valley. There is continuing seismic activity in the Mississippi Valley and the possibility of another great earthquake in the New Madrid region cannot be discounted. An earthquake of intensity MM X to MM XII at New Madrid might be felt at Sequoyah with an intensity of MM V or MM VI.

There is no known correlation between earthquakes observed in the region and any surficial tectonic structures. The site lies in the Southern Appalachian tectonic province as defined during the preliminary evaluation of the Sequoyah Nuclear Plant site. This province is bounded on the east by the western edge of the Piedmont Province; on the west by the western limits of the Cumberland Plateau; on the south by the overlap of the Gulf Coastal Plain Province; and on The north by the re-entrant in the Valley and Ridge Province near Roanoke, Virginia (Figure 2.5.2-1).

The maximum historic quake reported in this province was assigned an intensity of MM VIII although there is reason to believe it should have been rated as MM VII. It occurred in Giles County, Virginia, in 1897. Although this earthquake occurred 285 miles northeast of the site, this intensity is assumed to occur at the site for the purpose of defining the Safe Shutdown Earthquake (SSE). The maximum acceleration for an intensity of this level is estimated to be 0.14 g. This peak acceleration has been estimated from empirical relationships which are based almost exclusively on data obtained on overburden and hence provide some margin of conservatism for a rock site (seismic site studies indicate a shear wave velocity of 7,000 ft/s).

Initially, it was felt the Housner spectrum for maximum top of rock acceleration of 0.14 g for the SSE best represented the historic seismic threat at the site, i.e., large shocks at long distances. This information was submitted to TVA's consultant (Weston Geophysical Research, Incorporated) for their review. TVA's consultant agreed that the maximum ground acceleration values were conservative but felt the Housner spectra did not give sufficient weight to the effect of close earthquakes. TVA's consultant recommended a spectrum reflecting more energy in the 5 to 10 Hz frequency range, and his recommendations were accepted by TVA. Another consultant was contracted to produce such a spectrum and a set of four artificial earthquake records whose average response would approximate this spectrum.

During the course of the Sequoyah PSAR review, a special meeting was called on November 13, 1969 to discuss earthquake design criteria. AEC structural and geological-seismological consultants for Sequoyah were present. At this meeting, AEC's geological-seismological consultants took the position that maximum top of rock accelerations should be 0.18 g for the SSE. AEC's structural consultants stated that 0.18 g coupled with a Housner spectrum would be considered satisfactory as a minimum design basis. TVA stated that it would use the arithmetically averaged response spectra generated by four artificial records previously mentioned after the high frequency end had been raised to coincide with the 0.18 g Housner spectra. The structural consultants agreed that if TVA wished to use these records, which give more conservative results, this would certainly be acceptable to them.

Accordingly, the plant is designed so that all structures, systems, and components important to safety will remain functional when subjected to an SSE having maximum horizontal acceleration of 0.18 g and maximum vertical ground acceleration of 0.12 g.

10 CFR Part 100, Appendix A, 1971, allowed the utilities to independently select the g-level for the Operating Basis Earthquake (OBE). Accordingly, TVA selected 0.00g as the OBE. The regulations required, however, the establishment of a "1/2 SSE" which was based on a g-level of 1/2 of the SSE. The 1/2 SSE for Sequoyah was therefore 0.09g (i.e., 1/2 of the 0.18g maximum horizontal ground acceleration).

The seismic design basis for Sequoyah Nuclear Plant is the 0.18 g modified Housner spectrum discussed above. However, in the course of their review for the operating license, NRC requested additional information concerning the seismic design basis. This culminated in the development of a site specific response spectrum. This spectrum represents the 84th percentile of 13 actual earthquake recordings and has a peak acceleration of 0.22 g. This site specific spectrum was used for evaluation of present designs and not as a design basis. The development of the site specific spectrum is presented in the following reports.

1. Justification of the Seismic Design Criteria Used for the Sequoyah, Watts Bar, and Bellefonte Nuclear Plants - Phase I, TVA, April 1978.

2. Justification of the Seismic Design Criteria Used for the Sequoyah, Watts Bar, and Bellefonte Nuclear Plants - Phase II, TVA, August 1978.

3. Prediction of strong motions for Eastern North America on the Basis of Magnitude, Weston Geophysical Report for TVA, August 1978.

4. Earthquake Ground Motion Study in the Vicinity of the Sequoyah Nuclear Power Plant, Weston Geophysical Report for TVA, February 1979.

5. Justification of the Seismic Design Criteria Used for the Sequoyah, Watts Bar, and Bellefonte Nuclear Plants - Phase II - Responses to NRC Questions 1 to 6, TVA, June 1979.

Therefore, as a result of the development of the site specific response spectrum in 1979, an SSE of 0.22g has been considered. 10 CFR Part 100, Appendix A, 1973, regulations no longer require a 1/2 SSE; however, applicants are required to select an OBE equal to at least 1/2 of the SSE unless supporting data are presented to clearly justify otherwise. TVA presented such data (reports 2 and 5, above) and justified an OBE of 0.09g, less than 1/2 of the present site specific SSE of 0.22g and the same as the 1/2 SSE used in early seismic analyses.

Figures 2.5.2-11 through 2.5.2-14 illustrate the relationship between the minimum design response spectra and the actual site seismic design response spectra for the SSE for all damping ratios used in the design of rock-supported structures.

2.5.3 Surface Faulting

The lithologic, stratigraphic, and structural conditions at the site and in the surrounding area and the geologic history of the region have been discussed previously in Paragraphs 2.5.1.3, 2.5.1.4, and 2.5.1.5, and will not be repeated here.

2.5.4 Stability of Surface Materials

2.5.4.1 Subsidence

Most major Category I structures are founded on bedrock and no subsidence is to be expected. In most instances the weight of rock removed in foundation excavation equals or exceeds the weight imposed by the structure. Sufficient exploratory drilling has been done to assure there are no karstic solution zones underlying the plant that would allow collapse. Any small solution areas below foundation grade have been grouted in the routine course of construction.

No mining or extensive groundwater withdrawal, either of which might allow subsidence, occurs in the area.

Loads imposed by the plant structures are not of sufficient magnitude to develop compaction subsidence in material having compressive strengths ranging from 5,000 to 15,000 lb/in^2. No regional warping is known in the southern Appalachian area of sufficient magnitude to impose unequal stresses on the plant structures.

2.5.4.2 Zone of Deformed or Weak Material

Sufficient exploration was done prior to final location of the individual structures to insure that weak or deformed zones are not present in the foundation areas. Any minor defects that were disclosed during excavation were treated appropriately as a standard construction procedure.

2.5.4.3 Bedrock Stresses

No specific investigations of residual stress accumulations in the foundation strata were made. Experience at numerous previous major construction projects in the region has shown that this is not a consideration. Such stress effects as "popping," rock bursts, and foundation "heaving" were not observed during foundation evacuation.

2.5.5 Stability of Subsurface Materials

2.5.5.1 Excavations and Backfill

Excavations and backfill are described in Paragraph 2.5.1.11.

2.5.5.2 Liquefaction Potential

The liquefaction potential of all slopes and soil deposits were evaluated by using empirical rules based on observed performance and by comparing the soil conditions and earthquake characteristics at the site with similar sites that have liquefied.

The empirical rules used are based on the Japanese experience during the Niigata earthquake. It was observed that the following general conditions could cause liquefaction:

1. The percentage of silt and clay-size particles should be less than 10 percent.
2. The particle diameter at 60 percent passing should be between 0.2 mm and 1.0 mm.
3. The uniformity coefficient should be between 2 and 5.
4. The blow count from Standard Penetration Tests should be less than 15.

Using these rules there were no soils which indicated potential liquefaction. A comparison of the soil conditions and the earthquake characteristics at the site with similar sites that have liquefied indicated that there were no potentially liquefiable soils at the site.

2.5.5.3 Static Analysis

2.5.5.3.1 Settlement Analysis

Soil supported Category I structures were investigated to determine the amount of settlement each would undergo. Settlement calculations were made for the Diesel Generator Building and the Low Level Radwaste Storage Facility.

Diesel Generator Building

The Diesel Generator Building (DGB) had a net increase in load on the soil.

The settlement calculations contain several conservative assumptions which make the estimated value of settlement an upper bound. As a result of these conservative assumptions, the settlement actually experienced is less than estimated.

A time-settlement rate was not determined for the original calculations, as we were committed to waiting for settlement to stabilize. We determined that settlement had stabilized sufficiently in the first two years (see Figure 2.5.5-1).

Low Level Radwaste Storage Facility

The Low Level Radwaste Storage (LLRW) Facility is located in an area that underwent significant changes during the construction of the plant. Initially, the area served as a borrow source, and material was excavated to approximately the final grade for the LLRW facility. The area was then used for a yard storage area and later as a storage area for spoil material. Prior to its use for the LLRW facility, the spoil material and some additional in situ material were removed to reach final grade. The maximum net increase in soil pressure due to the LLRW facility above the original overburden load was 0.32 tons/ft2. The resultant theoretical settlement due to the imposed load was less than the allowable settlement. A settlement monitoring program for the LLRW facility has been established and is described in section 2.5.5.3.2.

2.5.5.3.2 Settlement Monitoring

Settlement monitoring programs were developed for the Diesel Generator Building, the East Steam Valve Rooms, the Low Level Radwaste Storage Facility, and the ERCW Support Slab and Pumping Station. Settlement programs were not developed for the Waste Packing Area and the Condensate Demineralizer Waste Evaporator Building. The details of each program or the reasons for not developing a settlement program are given below.

Diesel Generator Building - This soil supported structure was monitored for settlement. It has a uniform bearing pressure of 1400 lb/ft2. Settlement monuments were placed at each corner of the structure. Readings were started in January 1973 and read monthly until January 1974 and then quarterly until January 1975. No readings were then made until April 1979.

Based on available data and our past experience, there are no adverse trends being exhibited; settlements are not significant; and there has been no adverse structural performance. Settlement readings will no longer be reported for this structure.

The construction period for the DGB extended from June 1972 to September 1973. The base slab and the first lift of the exterior walls were constructed before the settlement markers were placed and the first settlement readings were taken. The electrical conduit connections were made between November 1974 and January 1975. The piping connections were made after July 1978.

East Steam Valve Room - This structure was originally supported on soil but due to excessive settlement was underpinned with caissons. The caissons were completed between February and

August 1976. Negligible settlement has occurred since the caissons were installed. Because of this excellent performance, a continued settlement monitoring program is not warranted.

The electrical conduit connections were made between May 1978 and the present. The piping connections were made between September 1977 and October 1978. All of these were installed after the caissons were in place.

ERCW Support Slab and Pump Station - The ERCW support slab is supported on piles driven to rock. The ERCW pumping station is supported on rock. A settlement monitoring program was developed for both of these features. The survey markers were read monthly from June 1979 to March 1980, semiannually from March 1980 to September 1981, and annually from September 1981 to September 1984. Negligible settlement was found during the monitoring program. The settlement monitoring program was discontinued in September 1984 after 5 years of monitoring.

Waste Packaging Area and Condensate Demineralizer Waste Evaporator Building - These structures are supported on piles driven to rock. No settlement monitoring program was developed for these structures. Since the piles are driven to rock, there is no need to monitor settlement.

The supporting piles were driven to rock before placement of the foundation mat. For the Waste Packaging Area, the piles were completed in October 1975, and the electrical conduit connections were made between January 1977 and December 1978. There is no Category I piping for this building. For the Condensate Demineralizer Waste Evaporator Building, the piles were completed in June 1977. The piping connections were made in August 1978.

Low Level Radwaste Storage Facility

Each storage module has four individual compartments with each compartment being composed of five unit cells. The storage modules are designed for a total settlement of 9 inches, a differential settlement of 4 inches over an individual storage compartment, and a differential settlement of 4 inches between individual compartments. Settlement monitoring points are established on each corner of each compartment of each module and settlements are recorded annually until settlement has essentially ceased.

2.5.6 Slope Stability

2.5.6.1 Slope Characteristics

2.5.6.1.1 Slopes at Diesel Generator Building and Cooling Towers

The Diesel Generator Building and Cooling Towers are located on a gently sloping hillside southeast of the main plant area. A cross section of the hillside is shown in Figure 2.5.6-1.

The soil properties are obtained as described in Paragraph 2.5.1.9.

The R-test strengths of the soil are used in the seismic pseudo-static stability analyses. The soil properties used in the seismic pseudostatic stability analyses are shown in Figure 2.5.6-1.

2.5.6.1.2 Condenser Cooling Water Pumping Station Intake Channel Slopes

The intake channel shown in Figure 2.1.2-1 is located on the north side of the main plant area. The side slopes of both the approach channel and the forebay area are cut on a 3.5 horizontal to 1 vertical slope. Typical cross sections of the approach channel and forebay slopes are shown in Figure 2.4.8-1.

The side slopes in the forebay area are Category I slopes and are constructed to remain stable for the most critical design conditions. Enough water is retained in the forebay for plant shutdown using a closed mode of operation and therefore the approach channel slopes are not designed as Category I slopes.

The soil properties used in the seismic pseudostatic stability analysis of the side slopes are shown in Figure 2.5.6-2. See paragraph 2.5.1.9 for additional information on the soil properties.

2.5.6.1.3 Dike Slopes at the ERCW Pumping Station

The dike leading to the ERCW pumping station on Chickamauga Reservoir shown in Figure 2.1.2-1 is located northeast of the main plant across the embayment from the condenser cooling water supply pumping station. The dike has Category I slopes and is designed to remain stable for the most critical design conditions.

2.5.6.2 Design Criteria and Analysis

2.5.6.2.1 Design Criteria and Analysis of Slopes at Diesel Generator Building and Cooling Towers

The seismic stability analysis of the hillside is performed assuming circular failure arcs using the Modified Swedish Method with Slices and a Newmark analysis. Horizontal and vertical seismic accelerations are used in the analyses. The accelerations for the Safe Shutdown Earthquake in the soil deposit and on these soil-supported structures are obtained as discussed in Paragraphs 3.7.1.6 and 3.7.2.1.

The worst location for failure is a section which includes the Diesel Generator Building since it is the heaviest structure and has the largest seismic forces acting on it. The water table in the soil deposit is conservative assumed at elevation 705.0. The factor of safety during a Safe Shutdown Earthquake must be greater than 1.0.

Several circular failure arcs are considered to determine the location of the critical arc. The critical failure arc is shown in Figure 2.5.6-1. A Newmark analysis is performed for this critical failure arc. The Newmark analysis shows that the Design Basis Earthquake will not induce sliding along this failure arc. From these analyses it is concluded that the hillside will be stable during a Safe Shutdown Earthquake.

2.5.6.2.2 Design Criteria and Analysis of (Condenser Cooling Water Pumping Station) Intake Channel Slopes

The side slopes of the forebay portion of the intake channel are designed and constructed such that they remain stable for the most critical design condition, the occurrence of a Safe Shutdown Earthquake coincident with a sudden drawdown of the reservoir water level.

The stability analyses of the slopes were performed assuming circular failure planes using the Modified Swedish Method with Slices. Horizontal and vertical seismic coefficients were used in the analyses. The accelerations for the Safe Shutdown Earthquake in the soil deposit were obtained as discussed in Paragraph 3.7.1.6.

Several circular failure planes were considered and the minimum factor of safety was found to be 1.31. This failure plane is shown in Figure 2.5.6-2.

In addition a level ledge with a 15-foot-minimum width extends from the toe of the slide slopes to the edge of the forebay. This precludes the spillage of material into the forebay from a localized slippage of the slope.

2.5.6.2.3 Design Criteria and Analyses of Dike Slopes at the ERCW Pumping Station

The Category I slopes of the dike leading to the ERCW pumping station are designed such that they remain stable for the most critical design condition; the occurrence of a Safe Shutdown Earthquake coincident with normal reservoir level. The dike is also designed to remain stable during the PMF and subsequent drawdown.

The stability analysis of the slopes were performed using wedge analysis techniques. Pseudo-static analyses were used in all the seismic evaluations. Horizontal seismic coefficients were used in these analyses. The accelerations in the dike from the Safe Shutdown Earthquake were obtained as discussed in paragraph 3.7.1.6. The minimum factor of safety was determined to be 1.22.

Calculations were also performed to approximate the deformations which might be expected to occur as a result of stresses caused by a seismic event. This calculation considered the effect of vertical acceleration. The resulting deformations were shown to have no significant effect on the buried ERCW pipes.

2.5.6.3 Compaction Specifications

See Paragraph 2.5.1.11.

2.5.7 References

1. Bollinger, G. A., Harding, S. T., Langer, C. J., 1974, Alcoa Maryville Tennessee, Earthquake Swarm of November-December, 1973, Geological Society of America, Abstracts with Programs, Vol. 6, No. 4, p. 336.

2. Bridge, Josiah, 1950, Bauxite Deposits of the Southeastern United States, 1949 Symposium on Mineral Resources of the Southeastern United States, University of Tennessee Press, Knoxville, Tennessee, pp. 170-201.

3. Butts, Charles, and Gildersleeve, Benjamin, 1948, Geology and Mineral Resources of the Paleozoic Area in Northwest Georgia, Georgia Department of Mines, Mining, and Geology, Bulletin 54, p. 176.

4. Campbell, M. R., 1899, Bristol Quadrangle, USGS Geologic Atlas, Folio 59.

5. Colton, G. W., 1970, The Appalachian Basin - Its Depositional Sequences and Their Geologic Relationships, Studies of Appalachian Geology, Central and Southern, John Wiley and Sons, pp. 5-47.

6. Cooper, B. M., 1961, Grand Appalachian Field Excursion, Geologic Society of America, 74th Annual Meeting, Guidebook Trip 1, p. 187.

7. 1964, Relation of Stratigraphy to Structure in the Southern Appalachians, in Tectonics of the Southern Appalachians, VPI Memoir 1, pp. 81-114.

8. Dietz, R. S., 1972, Geosynclines, Mountains, and Continent - Building, Scientific American, Vol. 226, No. 3, pp. 30-38.

9. Fenneman, N. M., 1938, Physiography of the Eastern United States, McGraw-Hill Company, New York, New York.

10. Ferguson, H. W. and Jewell, W. B., 1951, Geology and Barite Deposits of the DelRio District, Cocke County, Tennessee, Tennessee Division of Geology, Bulletin 57, p. 235.

11. Grant, L. F., Concept of Curtain Grouting Evaluation, Journal of Soil Mechanics Division of the ASCE, Vol. 90, SM 1, (1964).

12. Gwinn, V.E., 1964, Thin-skinned Tectonics in the Plateau and Northwestern Valley and Ridge Provinces of the Central Appalachians, Geological Society of America Bulletin, Vol. 75, pp. 863-899.

13. Hack, J. T., 1965, Geomorphology of the Shenandoah Valley, Virginia and West Virginia, USGS Professional Paper 484, p. 84.

14. 1966, Interpretation of Cumberland Escarpment and Highland Rim, South Central Tennessee and Northeastern Alabama, USGS Professional Paper 524-C, p. 16.

15. Hardeman, W. D., et al, 1966, Geologic Map of Tennessee, Tennessee Division of Geology, Nashville, Tennessee, four sheets.

16. Harris, L. D., 1965, The Clinchport Thrust Fault - A Major Structural Element of the Southern Appalachian Mountains, USGS Professional Paper 525-3, pp. 49-55.

17. 1970, Details of Thin-Skinned Tectonics in Parts of Valley and Ridge and Cumberland Plateau Provinces of the Southern Appalachians, Studies of Appalachian Geology, Central and Southern, John Wiley & Sons, pp. 161-173.

18. Hayes, C. W., 1891, The Overthrust Faults of the Southern Appalachians, Geological Society of America Bulletin, Vol. 2, pp. 141-154.

19. 1892, Report on the Geology of North-Eastern Alabama, and Adjacent Portions of Georgia and Tennessee, Geological Survey of Alabama, Bulletin 4, p. 85.

20. 1894, Ringgold Quadrangle, USGS Geologic Atlas, Folio No. 2.

21. 1894a, Kingston Quadrangle, USGS Geologic Atlas, Folio No. 4.

22. 1894b, Chattanooga Quadrangle, USGS Geologic Atlas,Folio No. 6.

23. 1895, Stevenson Quadrangle, USGS Geologic Atlas, Folio No. 19.

24. 1895a, Cleveland Quadrangle, USGS Geologic Atlas, Folio No. 20.

25. 1895b, Pikeville Quadrangle, USGS Geologic Atlas, Folio No. 21.

26. 1895c, The Southern Appalachians, National Geographic Society Monograph, Vol. 1, No. 10, pp. 305-336.

27. 1899, Physiography of the Chattanooga District, in Tennessee, Georgia, and Alabama, USGS 19th Annual Report, Pt. 2, pp. 1-58.

28. Hayes, C. W. and Campbell, M. R., 1894, Geomorphology of The Southern Appalachians, National Geographic Magazine, Vol. 6, pp. 63-126.

29. Keith, Arthur, 1895, Knoxville Quadrangle , USGS Geologic Atlas, Folio No. 15.

30. 1896, Some Stages of Appalachian Erosion, Geological Society of American Bulletin, Vol. 7, pp. 519-525.

31. 1896a, Loudon Quadrangle, USGS Geologic Atlas, Folio No. 25.

32. 1896b, Morristown Quadrangle, USGS Geologic Atlas, Folio No. 27.

33. 1896c, Briceville Quadrangle, USGS Geologic Atlas, Folio No. 33.

34. 1901, Maynardville Quadrangle, USGS Geologic Atlas, Folio No. 75.

35. 1902, Topography and Geology of the Southern Appalachians, U.S., 57th Congress, Senate Document No. 84, App. B, pp. 111-122.

36. 1902a, Folded Faults in the Southern Appalachians, Science Vol. 15, pp. 822-823.

37. 1903, Cranberry Quadrangle, USGS Geologic Atlas, Folio No. 90.

38. 1904, Asheville Quadrangle, USGS Geologic Atlas, Folio No. 116.

39. 1905, Greeneville Quadrangle, USGS Geologic Atlas, Folio No. 118.

40. 1905a, Mt. Mitchell Quadrangle, USGS Geologic Atlas, Folio No. 124.

41. 1907, Nantahala Quadrangle, USGS Geologic Atlas, Folio No. 143.

42. 1907a, Roan Mountain Quadrangle, USGS Geologic Atlas, Folio No. 151.

43. 1923, Outlines of Appalachian Structure, Geological Society of America Bulletin, Vol. 34, pp. 304-380.

44. 1927, Great Smoky Overthrust, Geological Society of America Bulletin, Vol. 38, pp. 154- 155.

45. Kelleberg, J. M., and Benziger, C. P., 1953, Preliminary Geologic Investigations for Steam Plant H - Soddy Daisy Site, TVA Report.

46. King, P. B., 1949, The Floor of the Shenandoah Valley, American Journal of Science, Vol. 247, pp. 73-93.

47. 1950, Tectonic Framework of the Southeastern United States, American Association of Petroleum Geologists Bulletin, Vol. 34, pp. 635-671.

48. 1955, A Geologic Section Across the Southern Appalachians, Geological Society of America, 68th Annual Meetings, Guidebook, pp. 332-373.

49. 964, Further Thoughts on Tectonic Framework of Southeastern United States, in Tetonics of the Southern Appalachians, VPI Memoir 1, pp. 5-31.

50. 1964a, Geology of the Great Smoky Mountains, Tennessee, USGS Professional Paper 349-c, p.148

51. 1969, The Tectonics of North America, USGS Professional Paper 628, p. 45.

52. King, P. B. and Ferguson, H. W., 1960, Geology of Northernmost Tennessee, USGS Professional Paper 311, p. 136.

53. King, Phillip B., et al, 1944, Geology and Manganese Deposits Northeastern Tennessee. Tennessee Division of Geology, Bulletin 52, pp. 24-25, 59.

54. Milici, R. C., 1962, The Structural Geology of the Harriman Corner, Roane County, Tennessee, American Journal of Science, Vol. 260, pp. 787-793.

55. 1963, Low-Angle Overthrust Faulting, as Illustrated by the Cumberland Plateau-Sequatchie Valley Fault System, American Journal of Science, Vol. 261, pp. 815-825.

56. 1967, The Physiography of Sequatchie Valley and Adjacent Portions of the Cumberland Plateau, Tennessee Division of Geology Report of Investigations, No. 22.

57. 1968, Mesosoic and Cenozoic Physiographic Development of the Lower Tennessee River - in Terms of the Dynamic Equilibrium Concept, Journal of Geology, Vol. 76, pp. 472-479.

58. 1970, The Allegheny Structural Front in Tennessee and its Regional Tectonic Implications, American Journal of Science, Vol. 268, pp. 127-141.

59. Miller, R. L., 1962, The Pine Mountain Overthrust at the Northeast End of the Powell Valley Anticline, Virginia, USGS Professional Paper 450-D, pp. 69-72.

60. Morrill, B. J., Risavich, F., 1974, Preliminary Report of Maryville, Tennessee, Earthquake of November 30, 1973, Manuscript Report, USGS Seismic Engineering Unit, p. 7.

61. Neuman, R. B. and Nelson, W. H., 1965, Geology of the Western Great Smoky Mountains, Tennessee, USGS Professional Paper 349-D, p. 81.

62. Owens, J. P., 1970, Post-Triassic Tectonic Movements in the Central and Southern Appalachians as Recorded by Sediments of the Atlantic Coastal Plain, Studies of Appalachian Geology, Central and Southern, John Wiley and Sons, pp. 417-427.

63. Rodgers, John, 1948, Geology and Mineral Deposits of Bumpus Cove, Unicoi and Washington Counties, Tennessee. Tennessee Division of Geology, Bulletin 54, pp. 15, 40.

64. 1949, Evolution of Thought on Structure of Middle and Southern Appalachians, American Association of Petroleum Geologists Bulletin, Vol. 33, pp. 1643-1654.

65. 1950, Mechanics of Appalachian Folding as Illustrated by Sequatchie Anticline, Tennessee and Alabama, American Association of Petroleum Geologists Bulletin, Vol. 34, pp. 672-681.

66. 1953, Geologic Map of East Tennessee with Explanatory Text, Tennessee Division of Geology, Bulletin 58, Part II, p. 168.

67. 1953a, The Folds and Faults of the Appalachian Valley and Ridge Province, Kentucky Geological Survey, Series 9, Special Publication 1 pp. 150-166.

68. 1963, Mechanics of Appalachian Foreland Folding in Pennsylvania and West Virginia, American Association of Petroleum Geologists Bulletin, Vol. 47, pp. 1527-1536.

69. 1964, Basement and No-Basement Hypotheses in the Jura and the Appalachian Valley and Ridge, in Tectonics of the Southern Appalachians, VPI Memoir 1, pp. 71-80.

70. 1967, Chronology of Tectonic Movements in the Appalachian Region of Eastern North America, American Journal of Science, Vol. 265, pp. 408-427.

71. 1970, The Tectonics of the Appalachians , Wiley- Interscience, New York, p. 271.

72. Safford, J. M., 1856, A Geological Reconnaissance of the State of Tennessee, First Biennial Report, Nashville, p. 164.

73. 1859, On Some Points in American Geological History, American Journal of Science, 2nd Series, Vol. 27, pp. 140-141.

74. 1869, Geology of Tennessee, Nashville, Tennessee.

75. Stearns, R. G., 1954, The Cumberland Plateau Overthrust and Geology of the Crab Orchard Mountains Area, Tennessee, Tennessee Division of Geology, Bulletin 60, p. 47.

76. 1955, Low-Angle Overthrusting in the Central Cumberland Plateau, Tennessee, Geological Society of America Bulletin, Vol. 66, pp. 615-628.

77. Swingle , G. D., 1961, Structural Geology Along the Eastern Cumberland Escarpment, Tennessee, Tennessee Division of Geology, Report of Investigations 13, p. 46.

78. Troost, Gerrard, 1837, Fourth Geologic Report to the Twenty-First General Assembly of the State of Tennessee, Nashville, Tennessee.

79. 1840, Fifth Geologic Report to the Twenty-First General Assembly of the State of Tennessee, Nashville, Tennessee.

80. 1841, Sixth Geologic Reports to the Twenty-First General Assembly of the State of Tennessee, Nashville, Tennessee.

81. Watkins, J. S., 1964, Regional Geologic Implications of the Gravity and Magnetic Fields of a Part of Eastern Tennessee and Southern Kentucky, USGS Professional Paper 516-A, p. 17.

82. Willis, Bailey, 1893, The Mechanics of Appalachian Structure, USGS 13th Annual Report, Part 2, pp. 211-281.

83. Wilson, C. W., Jr., and Stearns, R. G., 1958, Structure of the Cumberland Plateau, Tennessee, Geological Society of America Bulletin, Vol. 69, pp. 1283-1296.

84. CEB REPORT 97-01, " Geotechnical and Soils Investigations for the Sequoyah Nuclear Plant," RIMS No. B39 970811 001.

Table 2.5.1-1

SUMMARY OF IN SITU UP-HOLE DYNAMIC TESTING
REACTOR FOUNDATION AREA

Station Number	Geophone Elevation	Shot Elevation	Rock Type and Dip	Density lbs/cu ft Calculated	Vp Compressional Velocity ft/sec Measured	Vp Shear Velocity ft/sec Measured	Vp/Vs Ratio	Poisson's Ratio Calculated	Young's Modulus psi, 10^6 Calculated
W26+84 N70+58	677.2	627.2	Limestone with 12% shale, 60°-70°	170	13,550	7,450	1.8	0.28	5.3
W27+50 N69+90	672.9	629.9	Limestone with 20% shale, 45°-55°	170	9,736	4,873	2.0	0.33	2.4
W27+50 N70+58	676.9	635.9	Limestone, scattered shale partings, 50°	170	11,714	5,616	2.1	0.35	3.2
W27+50 N71+23	675.6	630.6	Limestone with 15% shale, 45°-50°	170	11,842	7,258	1.6	0.18	4.8
W27+85 N68+50	664.8	622.8	Limestone with 14% shale, 70°-85°	170	8,400	--	--	--	--
W28+16 N70+58	678.9	627.9	Limestone with 25% shale, 60°-80°	170	12,500	7,083	1.8	0.28	4.5
W28+50 N67+75	642.6	601.6	Limestone with 5% shale, 50°-70°	170	15,185	--	--	--	--
W28+50 N68+40	668.2	628.2	Limestone with 6% shale, 45°-65°	170	10,444	5,437	1.9	0.31	2.8
W28+50 N69+06	674.6	634.6	Limestone with 10% shale, 40°-60°	170	12,903	6,557	2.0	0.31	5.8
W29+15 N68+50	661.0	621.0	Limestone with 5% shale, 5°-90°	170	13,333	6,993	1.9	0.31	4.7

Note: A valid shear velocity measurement could not be established for two stations.

Table 2.5.1-2 (Sheet 1)

SUMMARY OF IN SITU CROSS-HOLE DYNAMIC TESTING
REACTOR FOUNDATION AREA

Sequoyah Nuclear Plant

Geophone Station	Shot Station	Between Hole Elevation	Density lbs/cu ft Calculated	Vp Compressional Velocity ft/sec Measured	Vp Shear Velocity ft/sec Measured	Vp Vs Ratio	Poisson's Ratio Calculated	Young's Modulus psi, 10^6 Calculated	Type Rock
W26+84 N70+58	W27+50 N70+58	665	170	11,470	--	--	--	--	Limestone with inter-bedded shale
W27+50 N69+90	W27+50 N70+58	665	170	18,649	--	--	--	--	Limestone, with inter-bedded shale
W27+50 N71+23	W27+50 N70+50	665	170	18,659	9,697	1.9	0.31	9.3*	Limestone with inter-bedded shale
W27+85 N68+50	W28+50 N69+06	665	170	14,114	7,155	2.0	0.33	4.9	Limestone with inter-bedded shale
W27+85 N68+50	W28+50 N67+75	665	170	12,286	--	--	--	--	Limestone with inter-bedded shale
W28+16 N70+58	W27+50 N70+58	665	170	12,226	--	--	--	--	Limestone with inter-bedded shale
W28+50 N68+40	W27+85 N68+50	665	170	11,799	--	--	--	--	Limestone with inter-bedded shale
W28+50 N68+40	W28+50 N67+75	643	170	15,403	7,143	2.2	0.37	4.9	Limestone with inter-bedded shale

*Note: Young's modulus value 9.3 x 10^6 is considered abnormally high for this type rock, and should be omitted when averaging. The average value is 4.4 x 10^6 psi as shown at the end of section 2.5.1.7.

Table 2.5.1-2 (Sheet 2)
(Continued)

SUMMARY OF IN SITU CROSS-HOLE DYNAMIC TESTING
REACTOR FOUNDATION AREA

Sequoyah Nuclear Plant

Geophone Station	Shot Station	Between Hole Elevation	Density lbs/cu ft Calculated	Vp Compressional Velocity ft/sec Measured	Vp Shear Velocity ft/sec Measured	Vp Vs Ratio	Poisson's Ratio Calculated	Young's Modulus psi, 10^6 Calculated	Type Rock
W28+50 N68+40	W28+50 N69+06	665	170	13,983	--	--	--	--	Limestone with inter-bedded shale
W28+50 N68+40	W29+15 N68+50	661	170	14,255	6,700	2.1	0.35	4.7	Limestone with inter-bedded shale
W28+50 N69+06	W28+50 N67+75	665	170	12,000	5,860	2.0	0.33	3.6	Limestone with inter-bedded shale
W29+15 N68+50	W27+85 N68+50	665	170	13,436	--	--	--	--	Limestone with inter-bedded shale
W29+15 N68+50	W28+50 N67+75	665	170	11,583	6,300	1.8	0.28	3.9	Limestone with inter-bedded shale

Note: A valid shear velocity measurement could not be established for seven stations.

Table 2.5.1-3

EQUATION FOR DYNAMIC MODULUS OF ELASTICITY

$$E = \frac{(V_p)^2 (1+\sigma)(1-2\sigma)}{144\, g\, (1-\sigma)}\ \gamma$$

Where

E = Dynamic modulus of elasticity (psi)

V_p = Compressional wave velocity (ft/sec)

σ = Poisson's Ratio

g = Gravitational constant of 32.2 ft/sec

γ = Unit Weight (lbs/ft^3)

EQUATION FOR POISSON'S RATIO

$$\sigma = \frac{\frac{1}{2}\left(\frac{V_p^2}{V_s^2}\right) - 1}{\left(\frac{V_p^2}{V_s^2}\right) - 1}$$

Where

σ = Poisson's Ratio

V_p = Compressional wave velocity (ft/sec)

V_s = Shear wave velocity (ft/sec)

Table 2.5.1-4

SUMMARY OF GROUTING

First Stage Grouting
(holes drilled 10 feet into rock)

(1) Holes Drilled		(2) Holes with Take	(3) % Holes With Take	(4) Bags of Cement	(5) Unit Take (Bags/Foot of Hole)
Primary	333	38	11.4%	471	1.24
Secondary	71	11	15.1%	105	0.95
Third Series	16	1	6.3%	1	0.10
Total	420	50		577	
Average	---	---	11.9%	---	1.15

Second Stage Grouting
(holes drilled 45 feet into rock)

(1) Holes Drilled		(2) Holes with Take	(3) % Holes with Take	(4) Bags of Cement	(5) Unit Take (Bags/Foot of Hole)
Primary	220	51	23.2%	528	0.23
Secondary	93	35	37.6%	420	0.27
Third Series	109	49	44.9%	448	0.20
Fourth Series	63	21	33.3%	171	0.18
Fifth Series	44	12	27.2%	81	0.15
Total	529	168		1648	
Average	---	---	31.8%	---	0.22

Total bags of cement injected. 2225
Total bags of cement-backfill. 681
Total bags of cement-waste 643

Total bags of cement used 3549

TABLE 2.5.1-5

STATIC AND DYNAMIC ROCK-BEARING CAPACITIES
FOR ROCK SUPPORTED CATEGORY I STRUCTURES([1])

Structure	Static Bearing Allowable (lb/in^2)	Dynamic Bearing Allowable (lb/in^2)
Shield	500	Adequate
Auxiliary-Control	500	Adequate
Additional Equipment	500	Adequate
Intake Pump Station	500	Adequate
Intake Pump Station Retaining Wall	500	Adequate
ERCW Pump Station	500	1500
ERCW Pump Station Access Dike Cells	500	1500

([1]) Base slab on rock.

TABLE 2.5.1-6

SOIL-BEARING CAPACITIES AND FACTORS OF SAFETY FOR SOIL SUPPORTED CATEGORY I STRUCTURES

	Sustained Loads	Dynamic Loads	
	Allowable Soil Bearing(1) lb/ft^2	Factor of Safety	Allowable Soil Bearing(2) lb/ft^2
Diesel Generator Building	2,500		3,000
Refueling Water Storage Tank Foundations	6,000		6,000

1. The factor of safety for the allowable soil bearing capacity for sustained loads is at least 3.0.

2. The factor of safety for the allowable soil bearing capacity for dynamic loads is at least 2.0.

SQN

Table 2.5.1-7 Revised by Amendment 13

SUMMARY OF EARTHFILL TEST DATA - DENSITY

Standard Compaction

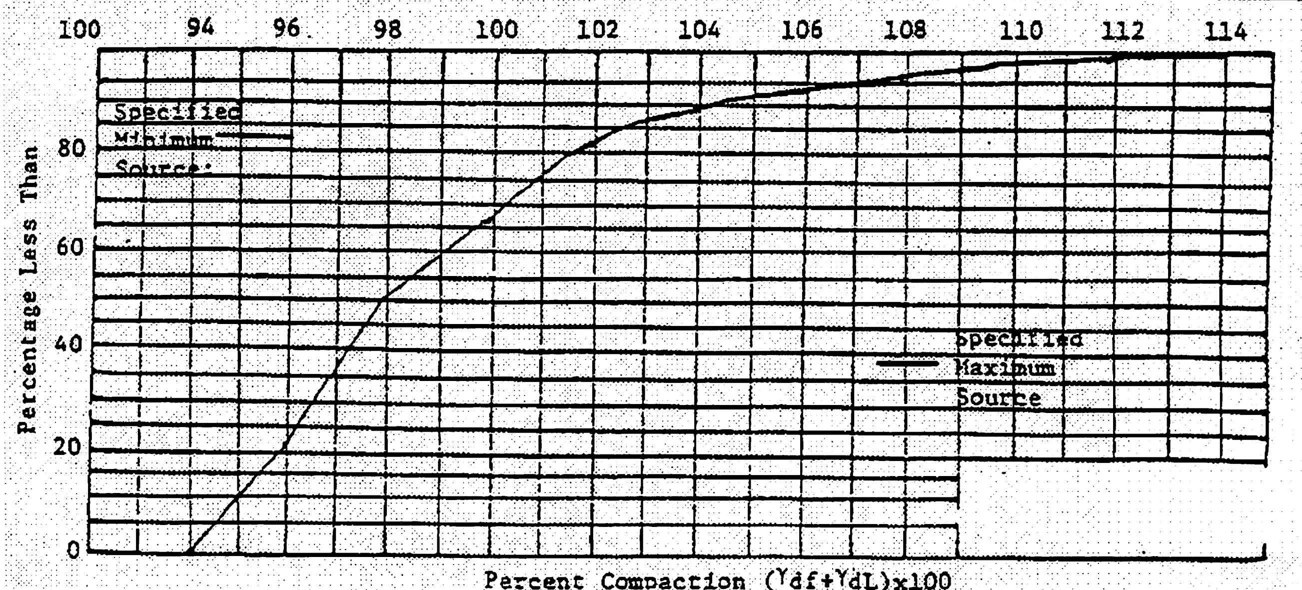
Project Sequoyah Nuclear Plant Feature Type "A" Backfill - Category I

Period 1-19-71 To 5-1-78 Test No.________ To ________ Prepared

Fill Quantity: Period ________ yd^3 To Date ________ by

Percent Compaction (γdf÷γdL)x100	Plot This Col.	Prev. Cum F	This Period: Frequency (F)	This Period: F	This Period: Cum F	This Period: Cum %	To Date: F	To Date: Cum F	To Date: Cum %
94.0	95.9						19	19	22
96.0	97.9						24	43	50
98.0	99.9						14	57	66
100.0	101.9						13	70	81
102.0	103.9						6	76	88
104.0	105.9						3	79	92
106.0	107.9						4	83	96
108.0	109.9						1	84	98
110.0	111.9						1	85	99
112.0	113.9						1	86	100
Totals			--	--		--	--		--

	Prev.	This Period	To Date
Avg. fill dry density, γdf, pcf			98.8
Avg. maximum dry density, γdL, pcf			96.4
Mean variation γdf−γdL, pcf			-2.4
Avg. % plus No. 4 by Dry Weight			



SQN
Table 2.5.1-8

Revised by Amendment 13

SUMMARY OF EARTHFILL TEST DATA - MOISTURE CONTENT

Standard Compaction

Project Sequoyah Nuclear Plant Feature Type "A" Backfill

Period 1-19-71 To 5-1-78 Test No.______ To ______ Prepared
Fill Quantity: Period ______ yd^3 To Date ______ by

(W_f-W_o), Percent		Plot This Col.	Prev. Cum F	This Period: Frequency (F)	This Period: F	This Period: Cum F	This Period: Cum %	To Date: F	To Date: Cum F	To Date: Cum %
W_f above opt.										
	9.0	7.1								
	7.0	5.1						6	6	7
	5.0	3.1						10	16	19
Plot 0	3.0	1.1						22	38	44
	1.0	-1.0						32	70	81
	-1.1	-3.0						11	81	94
ow opt.	-3.1	-5.0						2	83	96
	-5.1	-7.0						2	85	99
	-7.1	-9.0						1	86	100

Table 2.5.1-9

SEQUOYAH NUCLEAR PLANT
SUMMARY OF IN-SITU SOIL DOWN-HOLE DYNAMIC TESTING
DIESEL GENERATOR BUILDING

Location	Station	Zone Depth Elevation	Vp Compressional Velocity ft/sec Measured	Vs Shear Velocity ft/sec Measured	Density lbs/cu ft Assumed	Poisson's Ratio Calculated	Modulus psi, 10^3 Calculated	Modulus psi, 10^3 Calculated
Diesel	760E,129S	733.3-728.3	1471	631	100	0.39	8.6	23.8
Generator		728.3-728.3	2500	1,235	100	0.34	32.9	88.1
Building		708.3-673.3	6242	955	100	0.49	19.7	58.6

Note: 1.All holes were drilled by a truck-mounted auger.
2.State 760E, 129S was not augered to refusal.

SEQUOYAH NUCLEAR PLANT
SEISMIC REFRACTION SURVEY
IN-SITU ELASTIC PROPERTIES

Zones *	Vp Compressional Velocity ft/sec Measured	Vs Shear Velocity ft/sec Calculated	Density lbs/cu ft Assumed	Poisson's Ratio Assumed	Shear Modulus psi 10^3 Calculated
1	1400	672	100	0.35	9.7
	1400	571	100	0.4	7.0
	1400	422	100	0.45	3.8
2	2900	1393	100	0.35	41.9
	2900	1183	100	0.4	30.2
	2900	874	100	0.45	16.5
3	7987	3836	100	0.35	317.5
	7987	3260	100	0.4	229.3
	7987	2408	100	0.45	125.0

* For zone locations see Figure 2.5.1-10

Calculation Reference 841861022007

Table 2.5.1-10

SEQUOYAH NUCLEAR PLANT

ONSITE STORAGE FACILITY

DYNAMIC SOIL TEST ARRAY SD-1

Summary of Cross-Hole Data (preferred arrival times)

Elevation (feet)	V_p Range	Vp Average	Poisson's Vs Range	Poisson's Ratio Average	Ratio Range	Average
740	2880 - 3420	3060	1120 - 1160	1120	.40 - .44	.42
735	2820 - 3000	2910	920 - 1010	960	.43 - .45	.44
730	3680 - 4040	3910	780 - 900	850	.47 - .48	.48
725	3940 - 4360	4140	830 - 900	880	.47 - .48	.48
720	4000 - 4220	4140	880 - 1020	960	.46 - .48	.47
715	3660 - 4000	3870	810 - 1260	1090	.43 - .48	.46
710	N/A	3280	N/A	840	N/A	.46

Summary of Downhole Data

Elevation (feet)	V_p fps	V_s fps	Poisson's Ratio
745.8-736.0	2040	760	.42
736.0-710.0	5240	760	.49

Calculation Reference: B41861022011

Table 2.5.1-11 (Sheet 1)

SEQUOYAH NUCLEAR PLANT
ONSITE STORAGE FACILITY
DYNAMIC SOIL TEST ARRAY SD-3

Crosshole Survey

Elevation Source and Receiver	Source and Receiver Depth	Average Compressional Velocity (ft/sec) (measured)	Average Shear Velocity (ft/sec) (measured)	Poisson's Ratio (calculated)	Young's Modulus PSI x 10^4 (calculated)	Shear Modulus PSI x 10^4 (calculated)	Bulk Modulus PSI x 10^5 (calculated)	Density (lb.ft^3)
736	5	1806	843	.36	4.71	1.73	0.56	113
731	10	2314	847	.42	4.97	1.75	1.07	113
726	15	2866	803	.46	4.58	1.57	1.79	113
721	20	3202	790	.47	4.46	1.52	2.30	113
716	25	3390	758	.47	4.13	1.40	2.61	113
711	30	3719	733	.48	3.88	1.31	3.20	113
706	35	3545	842	.47	5.08	1.73	2.83	113
701	40	3486	772	.47	4.28	1.45	2.77	113
696	45	3545	785	.47	4.43	1.50	2.86	113
691	50	3947	834	.48	5.01	1.70	3.57	113
686	55	3110	944	.45	6.29	2.17	2.07	113
681	60	3885	1008	.46	7.25	2.48	3.35	113
676	65	4065	1069	.46	8.15	2.48	3.66	113
672	69		1181					
671	70	4065						
666	75	4950						
661	80	4950						
656	85	4950						
652	89	5657						

Note:

1. Shear Wave velocities could not be obtained below elevation due to the difference in borehole depths.
2. The average compressional and shear wave velocities are calculated by averaging the measured velocities for the 25.4-, 19.8- and 14.6-foot distances.
3. The average compressional wave velocities below elevation 691 are calculated by averaging the measured velocities for the 19.8- and 14.6-foot distances. Hole C was blocked below this elevation, therefore no data could be obtained.
4. The density is a representative value determined from laboratory testing of soil samples taken near the array.

Calculation Reference CEB810515025

Table 2.5.1-11 (Sheet 2)

SEQUOYAH NUCLEAR PLANT
ONSITE STORAGE FACILITY
DYNAMIC SOIL TEST ARRAY SD-3

Downhole Survey

Elevation Receiver	Travel Path Distance	Compressional Velocity (ft/sec) (measured)	Shear Velocity (ft/sec) (measured)	Poisson's Ratio (calculated)	Young's Modulus PSI x 10^4 (calculated)	Shear Modulus PSI x 10^4 (calculated)	Bulk Modulus PSI x 10^5 (calculated)	Density ($lb.ft^3$)
736	11.1	1850	792	.39	4.24	1.53	0.63	113
731	14.1	2014	783	.41	4.22	1.49	0.79	113
726	18.0	2571	818	.44	4.71	1.63	1.39	113
721	22.3	2787	825	.45	4.82	1.66	1.67	113
716	26.9	2988	815	.46	4.73	1.62	1.96	113
711	31.5	3511	810	.47	4.71	1.60	2.79	113
706	36.4	3309	808	.47	4.67	1.59	2.46	113
701	41.2	3169	777	.47	4.32	1.47	2.25	113
696	46.0	3285	807	.47	4.66	1.59	2.42	113
691	50.9	3393	783	.47	4.40	1.49	2.61	113
686	55.9	3493	810	.47	4.71	1.60	2.76	113
681	60.8	3377	844	.47	5.09	1.74	2.55	113
676	65.7	3457	864	.47	5.34	1.82	2.67	113
671	70.7	3927	906	.47	5.89	2.00	3.49	113
666	75.6	3780	910	.47	5.93	2.02	3.21	113
661	80.6	3838	937	.47	6.28	2.14	3.30	113
656	85.5	3886	909	.47	5.92	2.01	3.41	113
651	90.5	3934	932	.47	6.22	2.12	3.49	113

Zones	Compressional Velocity	Shear Velocity	Poisson's Ratio	Young's Modulus	Shear Modulus	Bulk Modulus	Density
741-736	1850	783	.39	4.16	1.49	0.64	113
736-691	4480	783	.48	4.44	1.49	4.69	113
691-651	4480	1275	.46	11.54	3.96	4.36	113

Note:
1. The density is a representative value determined from laboratory testing of soil samples taken near the array.

Calculation Reference CEB810515025

Table 2.5.1-12

SEQUOYAH NUCLEAR PLANT

ERCW PIPELINE

IN-SITU DOWN-HOLE SOIL DYNAMICS

UNSATURATED SOIL

	Compressional Velocity Ft./Sec. Measured	Shear Velocity Ft./Sec. Calculated	Dynamic Shear Modulus PSI x 10^3 Calculated	Dynamic Young's Modulus PSI x 10^3 Calculated
Average	3173	1523	49.2	132.8
Minimum	1585	761	12.5	33.8
Maximum	3888	1867	75.2	203.10

SATURATED SOIL

	4005	1207	31.4	91.2

Calculated Reference B41861022009

Table 2.5.1-13 (Sheet 1)

SEQUOYAH NUCLEAR PLANT
ADDITIONAL DIESEL GENERATOR BUILDING

Summary of Cross-Hole Data for 19.6- and 24.4-foot Travel Paths

Elevation (feet)	V_p Range	V_P Average	V_s Range	V_s Average	Poisson's Ratio Range	Poisson's Ratio Average
715	1970	1970	890 -	930	0.33 -0.37	0.36
710	1880 - 1960	1930	920 - 1060	990	.27 - .36	.32
705	1850	1870	920 - 1120	1035	.21 - .34	.28
700	1920 - 2220	2070	905 - 1080	990	.27 - .40	.35
695	2180 - 2220	2215	1030 - 1085	1095	.33 - .36	.34
690	2880	2900	1100 - 1210	1165	.39 - .41	.40
685	3015 - 3470	3350	1350 - 1420	1435	.36 - .41	.39
680	4445 - 4900	4830	1510 - 1690	1635	.42 - .45	.44
675	4665 - 5315	5035	1720 - 1780	1790	.42 - .44	.43
670	5600 - 6110	5825	1835 - 2035	1945	.42 - .45	.44
665	5435 - 5765	5605	1880 - 1920	1870	.43 - .44	.44
660	5600 - 5695	5895	1745 - 1920	1890	.43 - .45	.44
655	5600 - 5695	5895	1920 - 1985	2055	.43 - .44	.43
650	5555 - 5600	5640	1920 - 2070	2060	.42 - .43	.42
648	N/A	5960	N/A	2070	N/A	.43

Notes:
1. Averages calculated from all velocities (minimum, preferred, and maximum) at each elevation. These averages were used to calculate the Poisson's Ratio average.
2. The ranges are from preferred arrival times at each elevation.

Calculation Reference 41861022012

Table 2.5.1-13 (Sheet 2)

SEQUOYAH NUCLEAR PLANT

ADDITIONAL DIESEL GENERATOR Building

Summary of Cross-Hole Data for 15.2 Foot Travel

Distance (preferred arrival times)

Elevation (feet)	V_p (fps)	V_s (fps)	Poisson's Ratio
715.0	1925	975	0.33
710.0	2350	1040	.38
705.0	2550	1230	.35
700.0	2925	1600	.29
695.0	3800	2200	.25
690.0	4110	2340	.26
685.0	3800	2110	.28
680.0	5040	2550	.33
675.0	6050	3050	.33
670.0	6040	2440	.40
655.0	6040	2560	.39
660.0	6050	2540	.39
655.0	6050	2500	.40
650.0	6000	2440	.40
646.5	5000	2330	.36

Summary of Downhole Data

Elevation (feet)	Vp (fps)	Vs (fps)	Poisson's Ratio
720-700	2375	940	0.41
700-640	5350	2075	.41

Calculation Reference B41861022012

TABLE 2.5.1-14

SEQUOYAH NUCLEAR PLANT

PRIMARY REFUELING WATER TANKS

SEISMIC REFRACTION SURVEY

IN-SITU ELASTIC PROPERTIES

*Zones	Vp Compressional Velocity ft/sec Measured	Vs Shear Velocity ft/sec Calculated	Density lbs/cu ft Assumed	Poisson's Ratio Assumed	Shear Modulus psi (10^3) Calculated
One	2150	1033	110	0.35	25.3
	2150	878	110	0.4	18.3
	2150	648	110	0.45	9.9
Two	3250	1561	110	0.35	57.8
	3250	1326	110	0.4	41.8
	3250	980	110	0.45	22.8

*
Zone one - Between elevations 705.0 and 696.9

Zone two - Between elevations 696.5 and 679.1.

Surface elevation 705.0

Top of rock 679.1, as computed from the refraction survey.

Calculation Reference B41861022008

Table 2.5.2-1 (Sheet 1)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
1.	1776	Nov	5	IV	Jackson Co.,NC	35.4	83.2
2.	1817	Dec	11	IV	SC-GA	0.0	0.0
3.	1817	Dec	12	<IV	KY	0.0	0.0
4.	1825	Mar	19		Columiba,TN	35.6	87.0
5.	1828	Mar	10	IV	Southwestern VA	0.0	0.0
6.	1829			<IV	Andrews,NC	35.2	83.8
7.	1843	Aug	9	IV	Columbia,TN	35.6	87.0
8.	1844	Jun		<IV	Jackson Co.,NC	35.2	83.1
9.	1844	Nov	28	VI	Knoxville,TN	36.0	83.9
10.	1848			<IV	McDowell Co.,NC	35.7	82.0
11.	1851	Aug	11	V	Asheville,NC	35.6	82.6
12.	1852	Oct	12	<IV	Clinton,GA	33.0	83.5
13.	1852	Oct	23	<IV	Clinton,GA	33.0	83.5
14.	1854	Feb	13	<IV	Manchester,KY	37.2	83.8
15.	1860	Jan	20		NC-SC-GA	0.0	0.0
16.	1872	Jun	17	IV	Milledgeville,GA	33.1	83.2
17.	1874	Feb	22	V	McDowell Co.,NC	35.7	82.1
18.	1875	Jul	29	<IV	Milledgeville,GA	33.1	83.2
19.	1875	Nov	2	IV	Washington, GA	33.7	82.7
20.	1875	Nov	12	<IV	Knoxville,TN	36.0	83.9
21.	1876	Jan	23	<IV	McDowell Co.,NC	35.7	82.0
22.	1877	Apr	26	<IV	Franklin,NC	35.2	83.4
23.	1877	May	25	<IV	Knoxville,TN	36.0	83.9
24.	1877	Jun	3	<IV	Stanford,KY	37.5	84.7
25.	1877	Oct	9	<IV	Hendersonville,NC	35.3	82.5
26.	1877	Nov	16	IV	Knoxville,TN	36.0	83.9
27.	1878	Nov	23	<IV	Murphy,NC	35.1	84.0
28.	1880	Jan	28	<IV	McDowell Co.,NC	35.7	82.0
29.	1882	Oct	15	<IV	Murphy,NC	35.1	84.0
30.	1883	Jan	1	IV	Ashwood,TN	35.6	87.1
31.	1884	Jan		<IV	McDowell Co.,NC	35.7	82.0
32.	1884	Mar	31	<IV	Milledgeville,GA	33.1	83.2
33.	1884	Apr	30	<IV	Ogreeta,NC	35.2	84.2
34.	1884			<IV	Elk Mt.,NC	35.7	82.5
35.	1884	Aug	25	IV	Knoxville,TN	36.0	83.9
36.	1886	Feb	5	IV	Valley Head,AL	34.6	85.6
37.	1888	Mar	17	<IV	Jonesboro,TN	36.3	82.5
38.	1889	Jun	7	IV	Benton Co.,TN	35.9	88.1
39.	1889	Sep	28	<IV	Parksville,TN	35.1	84.6
40.	1892	Dec	2	V	Chattanooga,TN	35.0	85.3
41.	1895	Jul	27		Savannah,TN	35.2	88.3
42.	1898	Mar	30	<IV	Mt. Hermon,KY	36.8	85.8
43.	1898	Jun	6	<IV	Richmond,KY	37.8	84.3
44.	1902	May	29	IV	Chattanooga,TN	35.0	85.3
45.	1902	Oct	18	V	Chattanooga,TN	35.0	85.3
46.	1904	Mar	5	<IV	Maryville,TN	35.8	84.0
47.	1909	Oct	8	<IV	Dalton,GA	34.8	85.0
48.	1911	Apr	22	<IV	Hendersonville,NC	35.3	82.5
49	1912	Oct	23	<IV	Macon,GA	32.8	83.6
50.	1912	Dec	7	<IV	West Springs,SC	34.8	81.8
51.	1913	Jan	1	VII	West Springs,SC	34.8	81.8
52.	1913	Mar	13	<IV	Calhoun,GA	34.5	85.0

Table 2.5.2-1 (Sheet 2)
(Continued)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
53.	1913	Mar	28	VI	Knoxville,TN	36.0	83.9
54.	1913	Apr	17	V	Madisonville,TN	35.5	84.4
55.	1913	May	2	<IV	Madisonville,TN	35.5	84.4
56.	1913	Aug	3	IV	Knoxville,TN	36.0	83.9
57.	1914	Jan	24	IV	Sweetwater,TN	35.6	84.5
58.	1914	Mar	5	IV	Central GA	33.5	84.0
59.	1915	Jan	14	IV	Briston,TN	36.6	82.2
60.	1915	Oct	29	IV	Marshall,NC	35.8	82.7
61.	1916	Feb	21	VII	Waynesville,NC	35.5	83.0
62.	1916	Mar	2	IV	Anderson,SC	34.5	82.7
63.	1916	Oct	18	VII	Irondale,AL	33.5	86.7
64.	1916	Nov	4	IV	Birmingham,AL	33.5	86.8
65.	1917	Jan	2	IV	McMillan,TN	36.6	83.9
66.	1917	Jan	25		Jefferson City,TN	36.1	83.5
67.	1917	Mar	5		Knoxville,TN	36.0	83.9
68.	1917	Mar	27	V	Jefferson City,TN	36.1	83.5
69	1917	Apr	19	<IV	southwestern VA	0.0	0.0
70.	1918	Jan	17	IV	Knoxville,TN	36.0	83.9
71.	1918	Jun	22	IV	Lenoir City,TN	35.8	84.3
72.	1920	Apr	7	II		36.3	88.2
73.	1920	Dec	24	IV	Glen Alice,TN	35.8	84.7
74.	1921	Jul	15	V	Mendota,VA	36.7	82.3
75.	1921	Sep	2	IV	Statesville,TN	36.0	86.1
76.	1921	Dec	15	IV	Glen Alice,TN	35.0	84.7
77.	1922	Mar	30	<IV	Farmington,TN	35.5	86.7
78.	1922	Mar	30	<IV	Arcadia,TN	36.6	82.5
79.	1923	Oct	18	IV	Hendersonville,NC	35.3	82.5
80.	1924	Jan	1	IV	Greenville,SC	34.8	82.4
81.	1924	Oct	20	IV	Pickens,SC	34.9	82.7
82.	1924	Nov	13	V	Bristol,VA	36.6	82.2
83.	1926	Jul	8	VII	McDowell Co.,NC	35.7	82.0
84.	1927	Jun	16	IV	Scottsboro,AL	34.7	86.0
85.	1927	Jul	20	V	Knoxville,TN	36.0	83.9
86.	1927	Oct	8	IV	Chattanooga,TN	35.0	85.3
87.	1928	Mar	7	IV	Columbia,TN	35.6	87.0
88.	1928	Nov	3	VII	Hot Springs,NC	35.9	82.8
89.	1928	Nov	20	IV	Hot Springs,NC	35.9	82.8
90.	1929	Oct	28	IV	Due West,SC	34.3	82.4
91.	1930	Aug	30	V	Kingston,TN	35.9	84.5
92	1930	Oct	16	VI	Knoxville,TN	36.0	83.9
93.	1930	Dec	10		Due West,SC	34.3	82.4
94.	1931	Apr	1		Hopkinsville,KY	36.9	87.5
95.	1931	May	5	VI	Birmingham,AL	33.5	86.8
96.	1931	Nov	27	<IV	Nashville,TN	36.2	86.8
97.	1935	Jan	1	V	GA-NC	35.1	83.6
98.	1936	Jan	1	<IV	Blue Ridge,GA	34.9	84.3
99.	1938	Mar	31	IV	Tapoco,NC	35.5	84.0
100.	1939	May	5	V	Anniston,AL	33.7	85.8
101.	1939	Jun	24	IV	Huntsville,AL	34.7	86.6
102.	1940	Oct	19	IV	Ryall Springs,TN	35.0	85.1
103.	1940	Dec	25	IV	Hot Springs,NC	35.9	82.8
104.	1941	Mar	4	<IV	Rockford,TN	35.9	83.9

Table 2.5.2-1 (Sheet 3)
(Continued)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
105.	1941	May	10	IV	Asheville,NC	35.6	82.6
106.	1941	Sep	8	IV	Lookout Mt.,TN	35.0	85.4
107.	1945	Jun	14	V	Cleveland,TN	35.2	84.9
108.	1946	Apr	7	IV	Cleveland,TN	35.2	84.9
109.	1947	Jun	6	IV	Knoxville,TN	36.0	83.9
110.	1947	Dec	28	IV	Ryall Springs,TN	35.0	85.1
111.	1948	Feb	10	VI	Wells Springs,TN	36.4	84.0
112.	1949	Sep	17	V	Pennington Gap,VA	36.8	83.0
113.	1950	Jun	19	IV	Tapoco,NC	35.5	84.0
114.	1952	Feb	6	V	Birmingham,AL	33.5	86.8
115.	1952	Jun	11	VI	Johnson City,TN	36.3	82.4
116.	1953	Nov	10	IV	Knoxville,TN	36.0	83.9
117.	1953	Dec	5	IV	Knoxville,TN	36.0	83.9
118.	1954	Jan	1	IV	Hazard,KY	37.2	83.2
119.	1954	Jan	2	VI	Hazard,KY	37.2	83.2
120.	1954	Jan	14	IV	Knoxville,TN	36.0	83.9
121.	1954	Jan	23	IV	Etowah,TN	35.3	84.5
122.	1955	Jan	6	IV	Bristol,TN	36.6	82.2
123.	1955	Jan	12	IV	Maryville,TN	35.8	84.0
124.	1955	Jan	25	IV	Knoxville,TN	36.0	83.9
125.	1956	Jan	5	IV	Due West,SC	34.3	82.4
126.	1956	May	19	IV	Due West,SC	34.3	82.4
127.	1956	May	27	IV	Due West,SC	34.3	82.4
128.	1956	Sep	7	VI	Maynardville,TN	36.2	83.8
129.	1956	Sep	9	IV	College Grove,TN	35.8	86.7
130.	1957	Jan	25	IV	Middlesboro,KY	36.6	83.7
131.	1957	Apr	23	VI	Birmingham,AL	33.5	86.8
132.	1957	May	13	VI	McDowell Co.,NC	35.7	82.0
133.	1957	Jun	23	IV	Dixie Lee Junction,TN	35.9	84.2
134.	1957	Jul	2	VI	Asheville,NC	35.6	82.6
135.	1957	Nov	7	<IV	Powell,TN	36.0	84.0
136.	1957	Nov	24	VI	Bryson City,NC	35.4	83.4
137.	1958	May	16	IV	Asheville,NC	35.6	82.6
138.	1958	Oct	20	IV	Anderson,SC	34.5	82.7
139.	1959	Jun	13	IV	Tellico Plains,TN	35.4	84.3
140.	1959	Aug	12	VI	Meridianville,AL	34.8	86.6
141.	1960	Jan	3	IV	Spruce Pine,NC	35.9	82.1
142.	1960	Feb	9	VI	Edneyville,NC	35.4	82.4
143.	1960	Apr	15	IV	Maryville,TN	35.8	84.0
144.	1963	Apr	11	IV	Greenville,SC	34.8	82.4
145.	1963	Nov	14	<IV	Nashville,TN	36.2	86.8
146.	1963	Dec	5	<IV	Beechmont,KY	37.2	87.0
147.	1963	Dec	15	<IV	Beechmont,KY	37.2	87.0
148.	1964	Jan	20	IV	Pensacola,NC	35.8	82.3
149.	1964	Feb	18	V	Mentone,AL	34.6	85.6
150.	1964	Mar	13	IV	Haddock,GA	33.0	83.4
151.	1964	Jul	28	<IV	Inskip,TN	36.0	84.0
152.	1964	Oct	13		Knoxville,TN	36.0	83.9
153.	1965	Apr	7		McCormick,SC	33.9	82.3
154.	1965	Nov	8	<IV	Canton,GA	34.2	84.5
155.	1966	Aug	24	IV	Maryville,TN	35.8	84.0
156.	1969	May	5		GA-SC Border	33.9	82.50

Table 2.5.2-1 (Sheet 4)
(Continued)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
157.	1969	Jul	13	V	Knoxville,TN	36.0	83.9
158.	1969	Jul	24		Knoxville,TN	36.0	83.9
159.	1969	Dec	13	IV	SC-NC Border	35.0	83.0
160.	1971	Jul	13	IV	Kingston,TN	35.9	84.5
161.	1971	Jul	13	VI	Newry,SC	34.7	82.9
162.	1971	Oct	9	V	Gatlinburg,TN	35.7	83.5
163.	1973	Nov	30	VI	Maryville,TN	35.8	84.0
164.	1974	Aug	2	V	McCormick Co., SC	33.9	82.5
165.	1974	Oct	8		Clark Hill Reservoir,SC	34.0	82.3
166.	1974	Nov	5		Clark Hill,SC	33.7	82.2
167.	1974	Dec	3		Mt. Carmel,SC	34.0	82.5
168.	1975	Feb	10		Gatlinburg,TN	35.7	83.5
169.	1975	May	2		Oakdale,TN	36.0	84.6
170.	1975	May	14		Oak Ridge,TN	36.0	84.3
171.	1975	Jun	24	IV	Fayette,AL	33.7	87.8
172.	1975	Aug	29	VI	Palmerdale,AL	33.8	86.6
173.	1975	Oct	18	IV	Jocassee Lake Dam,SC	34.9	83.0
174.	1975	Nov	7		Samantha,AL	33.4	87.6
175.	1975	Nov	25	IV	Salem,SC	34.9	83.0
176.	1976	Jan	19	VI	Knox Co.,KY	36.9	83.8
177.	1976	Feb	4	VI	Conasauga,TN	35.0	84.7
178.	1976	Apr	15	V	Sacramento,KY	37.4	87.3
179.	1977	Jul	27	V	Athens,TN	35.4	84.6
180.	1978	Mar	1	III	near Huntsville,AL	34.4	86.6
181.	1978	Oct	27		near Jasper,AL	33.8	87.5
182.	1979	Jan	19	IV	Newry,SC	34.7	82.9
183.	1979	Aug	13	V	near Cleveland,TN	35.2	84.4
184.	1979	Aug	26	VI	Tamasee,SC	34.9	83.1
185.	1979	Sep	12	V	Maryville,TN	35.8	84.0
186.	1980	Mar	23	IV	Narrows,KY	37.6	86.7
187.	1980	Apr	21		Maryville,TN	35.8	84.0
188.	1980	Jun	25	IV	Maryville,TN	35.8	84.0
189.	1980	Jul	12	III	near Horse Branch,KY	37.3	87.0

Table 2.5.2-1 (Sheet 5)
(Continued)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
87.	1928	Mar	7	IV	Columbia,TN	35.6	87.0
7.							
11.				IV			
92.	1930	Oct	16	VI	Knoxville,TN	36.0	83.9
13.				VI			
26.				<IV			
29.				<IV			
32.				IV			
41.				IV			
59.				VI			
62.				IV			
73.							
76.				IV			
92.				V			
116.				IV			
123.				IV			
124.				IV			
127.				IV			
131.				IV			
159.							
164.				V			
165.							
83.	1926	Jul	8	VII	McDowell Co.,NC	35.7	82.0
15.				<IV			
27.				<IV			
34.				<IV			
37.				<IV			
139.				VI			
134.	1957	Jul	2	VI	Asheville,NC	35.6	82.6
16.				V			
112.				IV			
144.				IV			
13.	1852	Oct	23	<IV	Clinton,GA	33.0	83.5
17.				<IV			
16.	1872	Jun	17	IV	Milledgeville,GA	33.1	83.2
24.				<IV			
38.				<IV			
79.	1923	Oct	18	IV	Hendersonville,NC	35.3	82.5
31.				<IV			
54.				<IV			
29.	1882	Oct	15	<IV	Murphy,NC	35.1	84.0
33.				<IV			
149.	1964	Feb	18	V	Mentone,AL	34.6	85.6
42.				IV			
45.	1902	Oct	18	V	Chattanooga,TN	35.0	85.3
46.				V			
50.				IV			
93.				IV			
163.	1973	Nov	30	VI	Maryville,TN	35.8	84.0
52.				<IV			
130.				IV			
150.				IV			

Table 2.5.2-1 (Sheet 6)
(Continued)

SEQUOYAH PLANT
HISTORICAL EARTHQUAKE LISTING
200 MILE RADIUS AROUND 85.1 W LON 35.2 N LAT

	YEAR	MONTH	DAY	INTENSITY	LOCATION	NLAT	WLON
162.				IV			
192.				V			
194.							
195.				IV			
51.	1913	Jan	1	VII	West Springs,SC	34.8	81.8
56.				<IV			
54.	1913	Apr	17	V	Madisonville,TN	35.5	84.4
61.				<IV			
82.	1924	Nov	13	V	Bristol,VA	36.6	82.2
65.				IV			
129.				IV			
138.	1958	Oct	20	IV	Anderson,SC	34.5	82.7
68.				IV			
131.	1957	Apr	23	VI	Birmingham,AL	33.5	86.8
70.				IV			
102.				VI			
121.				V			
68.	1917	Mar	27	V	Jefferson City,TN	36.1	83.5
72.							
177.	1976	Feb	4	VI	Conasauga,TN	35.0	84.7
82.				IV			
144.	1963	Apr	11	IV	Greenville,SC	34.8	82.4
87.				IV			
88.	1928	Nov	3	VII	Hot Springs,NC	35.9	82.8
96.				IV			
110.				IV			
127.	1956	May	27	IV	Due West,SC	34.3	82.4
97.				IV			
100.							
132.				IV			
133.				IV			
91.	1930	Aug	30	V	Kingston,TN	35.9	84.5
167.				IV			
145.	1963	Nov	14	<IV	Nashville,TN	36.2	86.8
103.				<IV			
113.	1950	Jun	19	IV	Tapoco,NC	35.5	84.0
106.				IV			
110.	1947	Dec	28	IV	Ryall Springs,TN	35.0	85.1
109.				IV			
107.	1945	Jun	14	V	Cleveland,TN	35.2	84.9
115.				IV			
119.	1954	Jan	2	VI	Hazard,KY	37.2	83.2
125.				IV			
151.	1964	Jul	28	<IV	Inskip,TN	36.0	84.0
142.				<IV			
147.	1963	Dec	15	<IV	Beechmont,KY	37.2	87.0
153.				<IV			
164.	1974	Aug	2	V	McCormick Co.,SC	33.9	82.5
163.							
161.	1971	Jul	13	VI	Newry,SC	34.7	82.9
189.				IV			
162.	1971	Oct	9	V	Gatlinburg,TN	35.7	83.5
175.	1975	Nov	25	IV	Salem,SC	34.9	83.0
180.				IV			

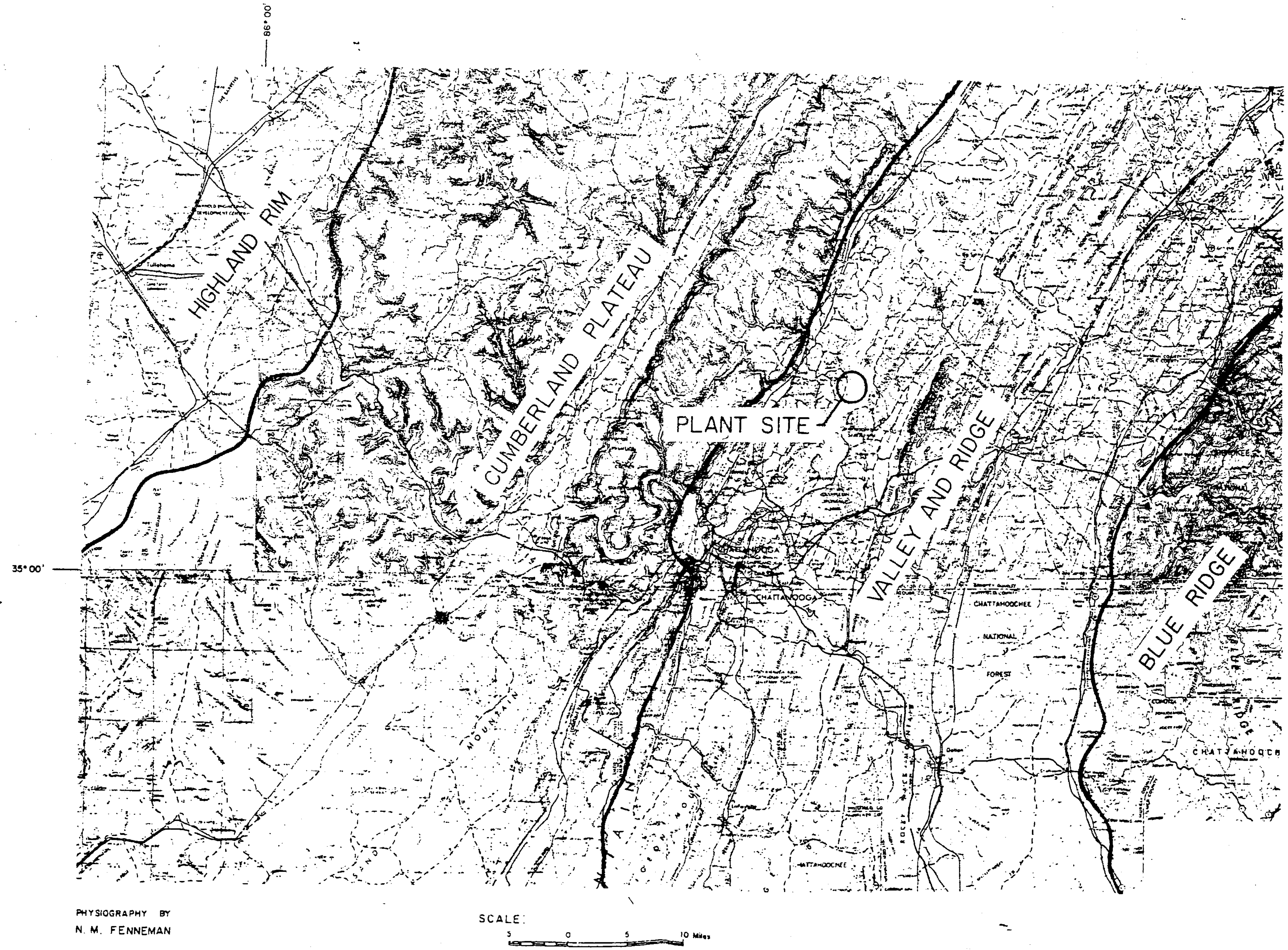


Figure 2.5.1-1 Physiographic Map of Plant Area (464K33)

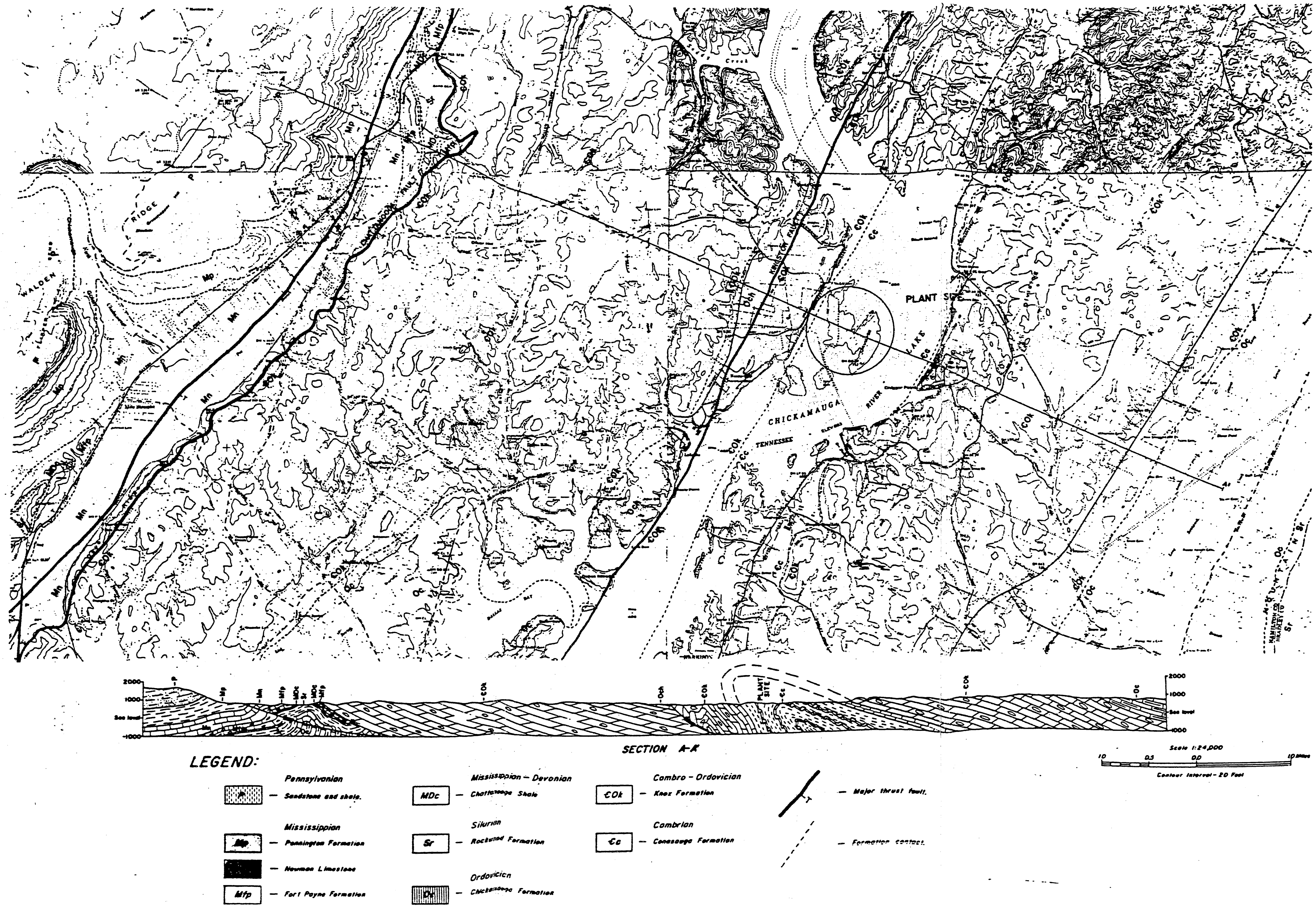
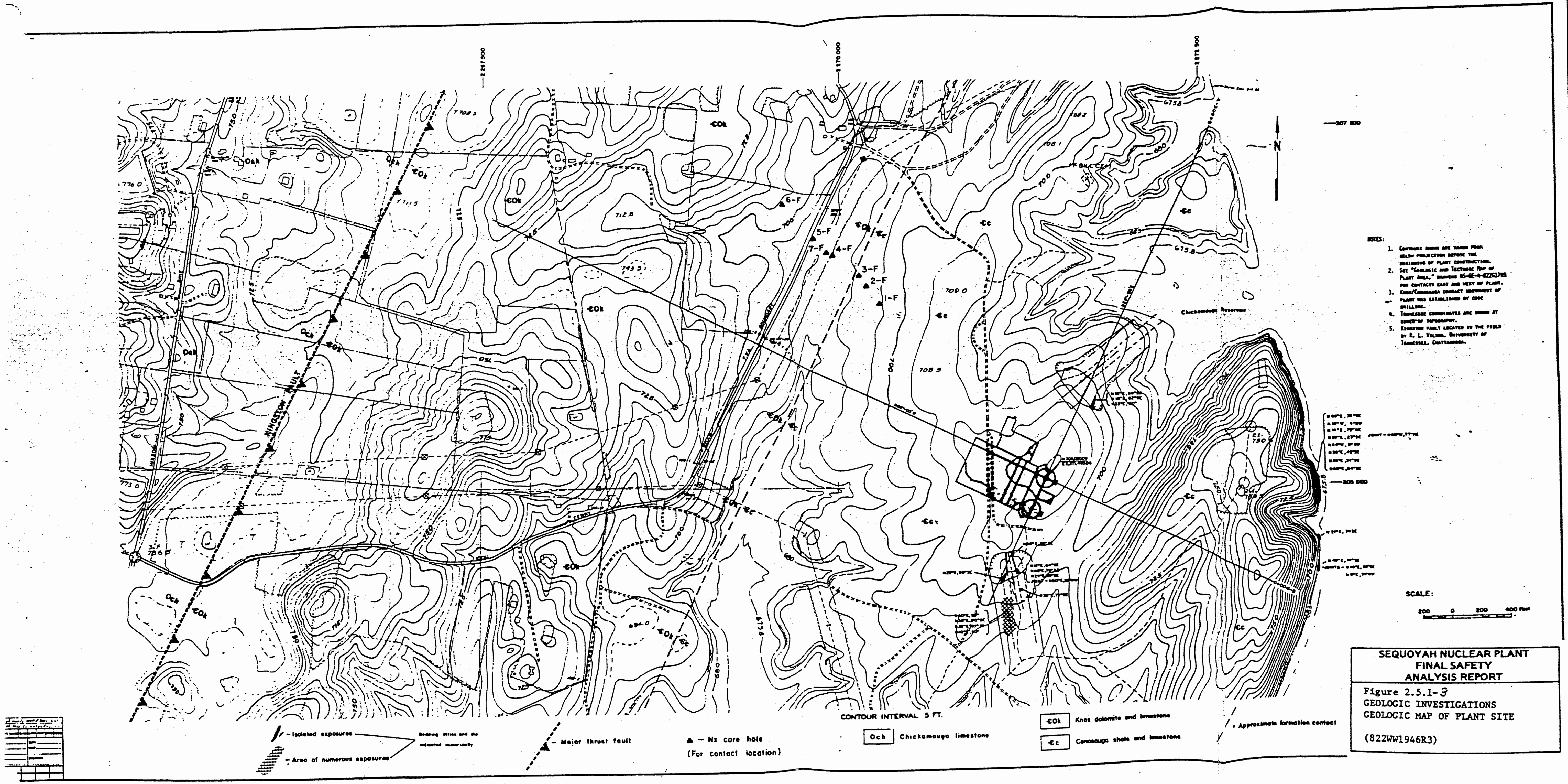


FIGURE 2.5.1-2 Geologic and Tectonic Map of Plant Area



SEQUOYAH NUCLEAR PLANT
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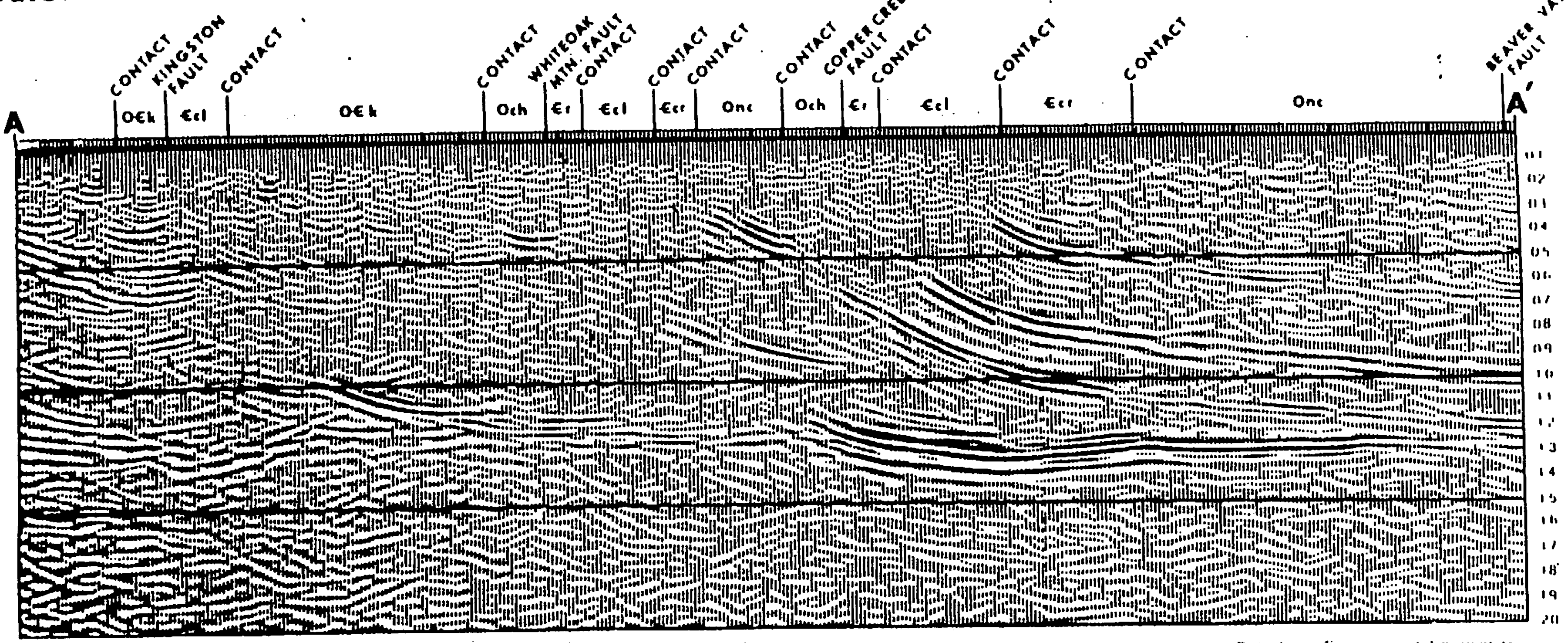
ANALYSIS REPORT

Figure 2.5.1-3
GEOLOGIC INVESTIGATIONS
GEOLOGIC MAP OF PLANT SITE

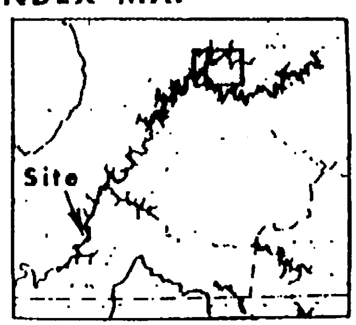
(822WW1946R3)

SEISMIC PROFILE

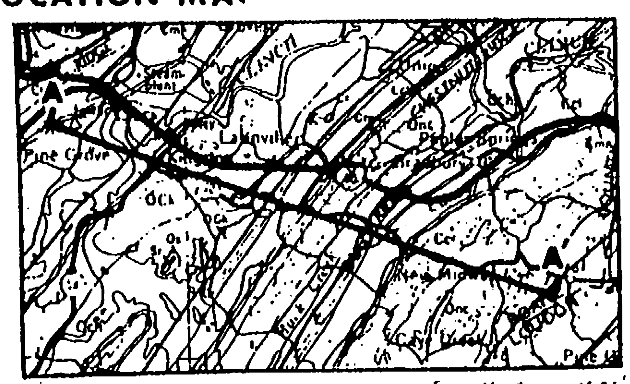


Data from Geophysical Services Inc

INDEX MAP



LOCATION MAP



From Hardeman 1966

SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

Figure 2.5.1-4
VALLEY AND RIDGE PROVINCE
SEISMIC REFLECTION PROFILE
(822A2128)

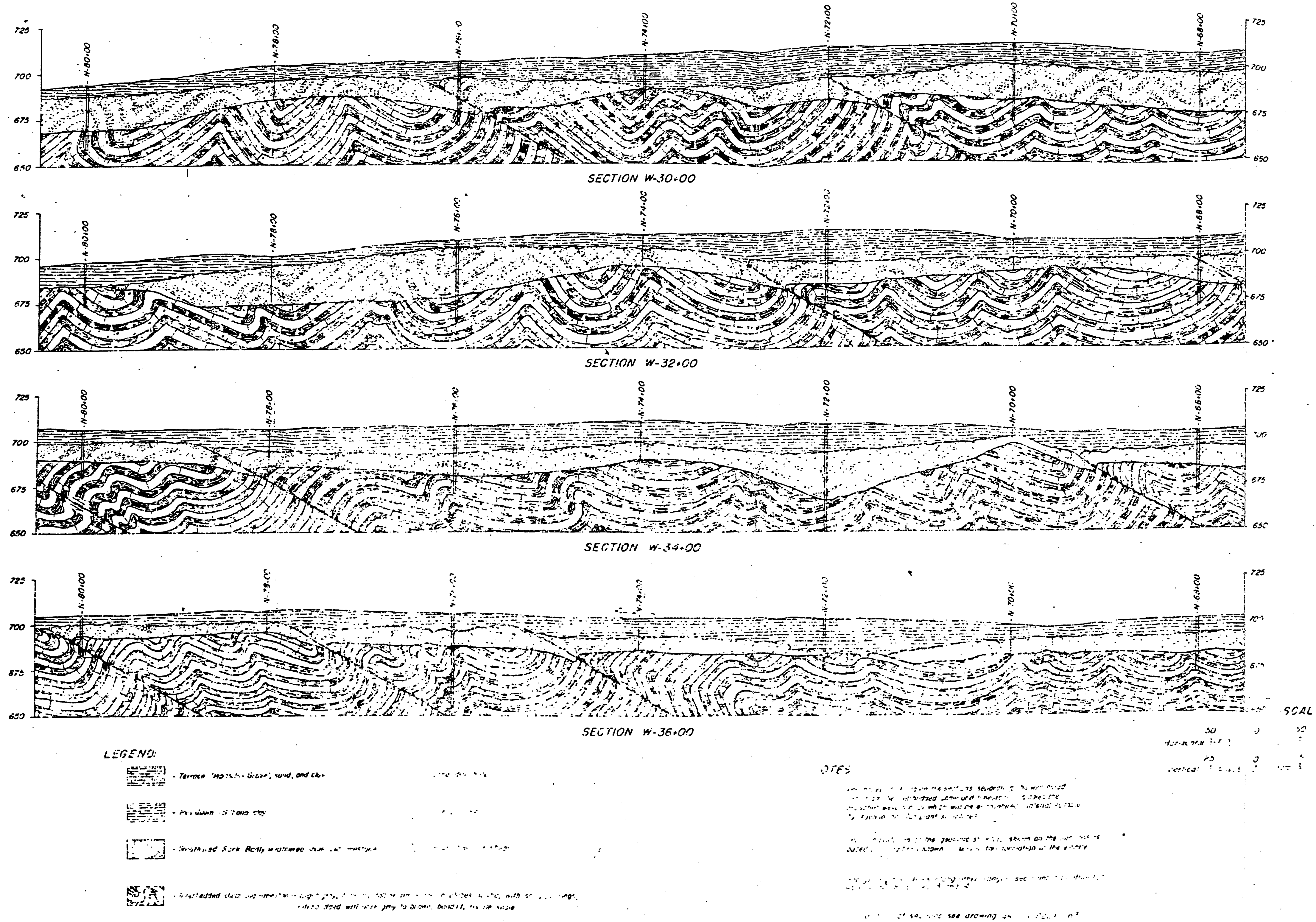
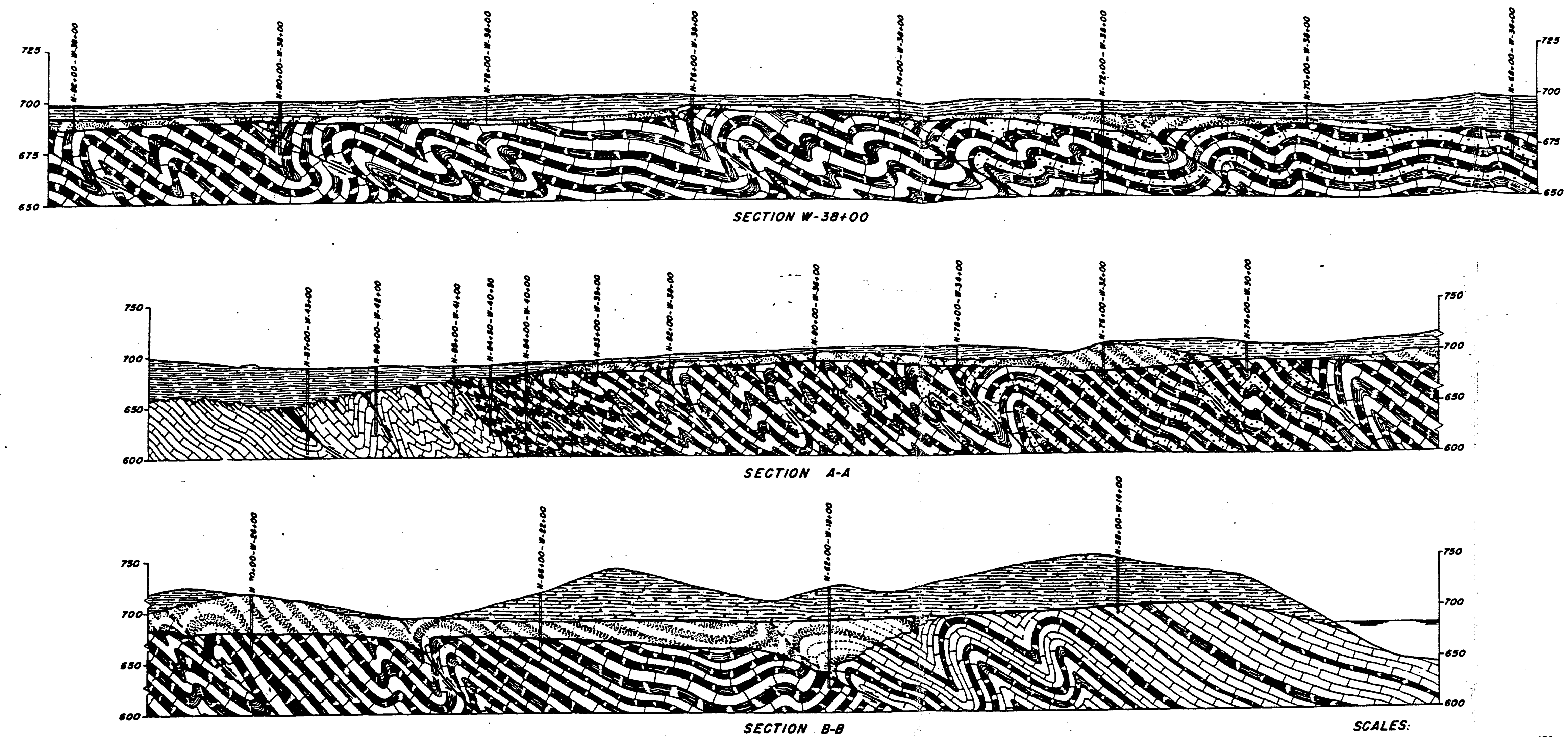


Figure 2.5.1-5 Geologic Sections W-30+00 through W-36+100 (822K1180-1)



LEGEND:

- Terrace Deposits - Gravel, sand, and clay.
- Residuum - Silt and clay.
- Weathered Rock - Badly weathered shale and limestone.
- Interbedded shale and limestone - Light gray, fine crystalline limestone, in places oolitic, with shaly partings interbedded with dark gray to brown, banded, fissile shale.
- Limestone - Light gray, dense to fine crystalline limestone with shaly partings, usually brecciated and contorted.
- Core drill hole.
- Fishtail hole.
- Thrust fault or shear

NOTES:

The heavy solid line on the sections separating the weathered rock from the interbedded shale and limestone indicates the expected elevation at which will be encountered material suitable for foundations for plant structures.

The interpretation of the geologic structure shown on the sections is based on conditions known to exist in these formations in the vicinity.

For geologic sections along other ranges see companion drawings 45 CE 1 822 K1180-1, -3, and -4

For location of sections see drawing 45 PP1 822 K 1183

SCALES:

50 0 50 100
Horizontal
25 0 25 50
Vertical
Section W-38+00

100 0 100 200
Horizontal
50 0 50 100
Vertical
Sections A-A & B-B

SEQUOYAH NUCLEAR PLANT
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FIGURE 2.5.1-6
GELOGIC SECTIONS W-38+00, AA, AND B-B
(822K1180-2)

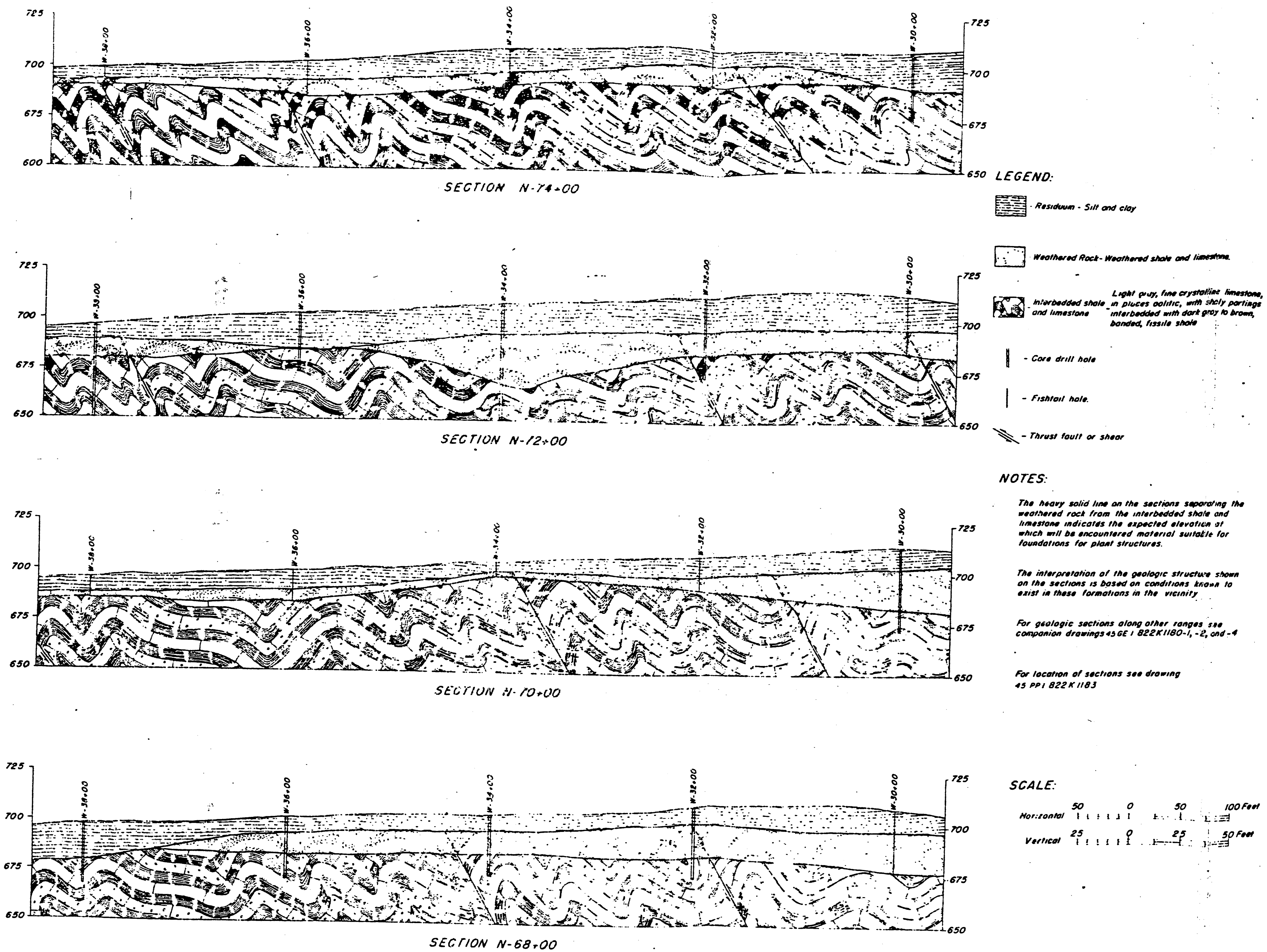
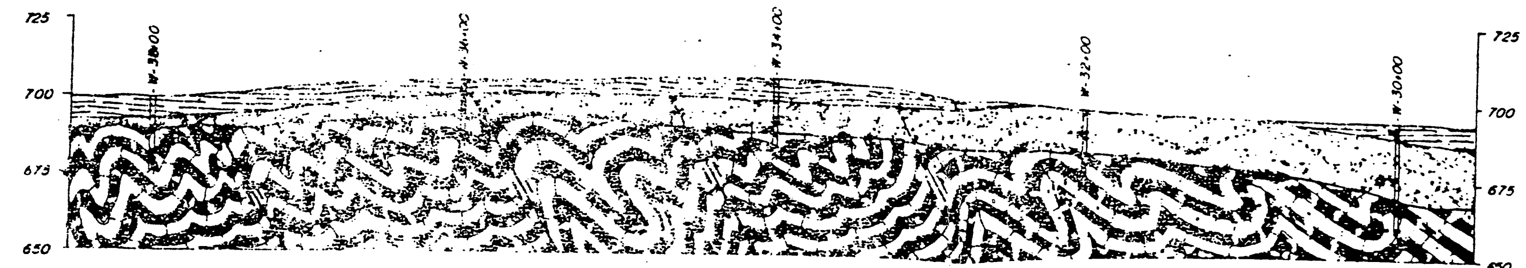
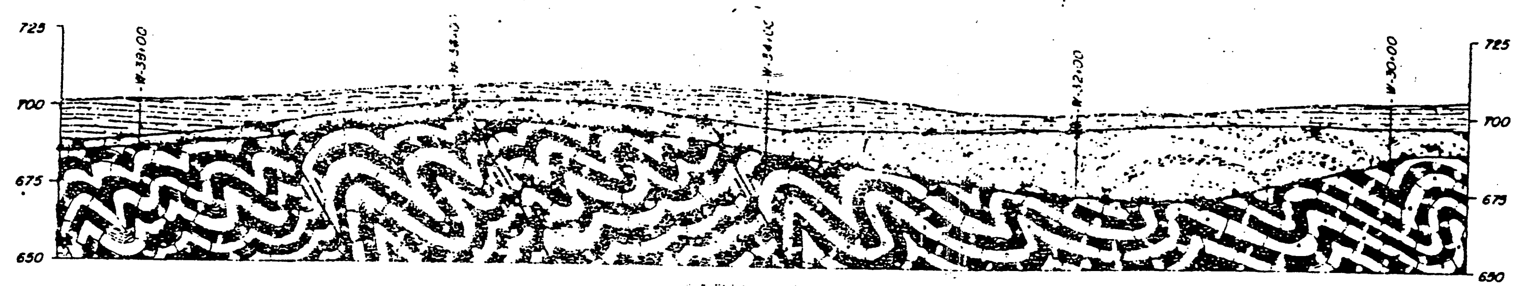


Figure 2.5.1-7 Geologic Sections N-68+00 through N-74+00 (822K1180-3)



SECTION N-80+00



SECTION N-78+00

SECTION N-76+00

LEGEND

Residuum

Interbedded shale and limestone

Thrust fault

NOTES

The heavy solid line on the section separating the weathered rock from the interbedded shale and limestone indicates the expected elevation at which will be encountered material suitable for foundations for plant structures

The interpretation of the geologic structure shown on the sections is based on conditions known to exist in this formation in the vicinity

For geologic sections along other ranges see companion drawings 822 K 1180-1, -2, and 3

For location of sections see drawing 822 K 1183

SCALE

Horizontal 50 0 50 100 Feet

Vertical 25 0 25 50 Feet

Figure 2.5.1-8 Geologic Sections N-76+00 through N-80+00 (822K1180-4)

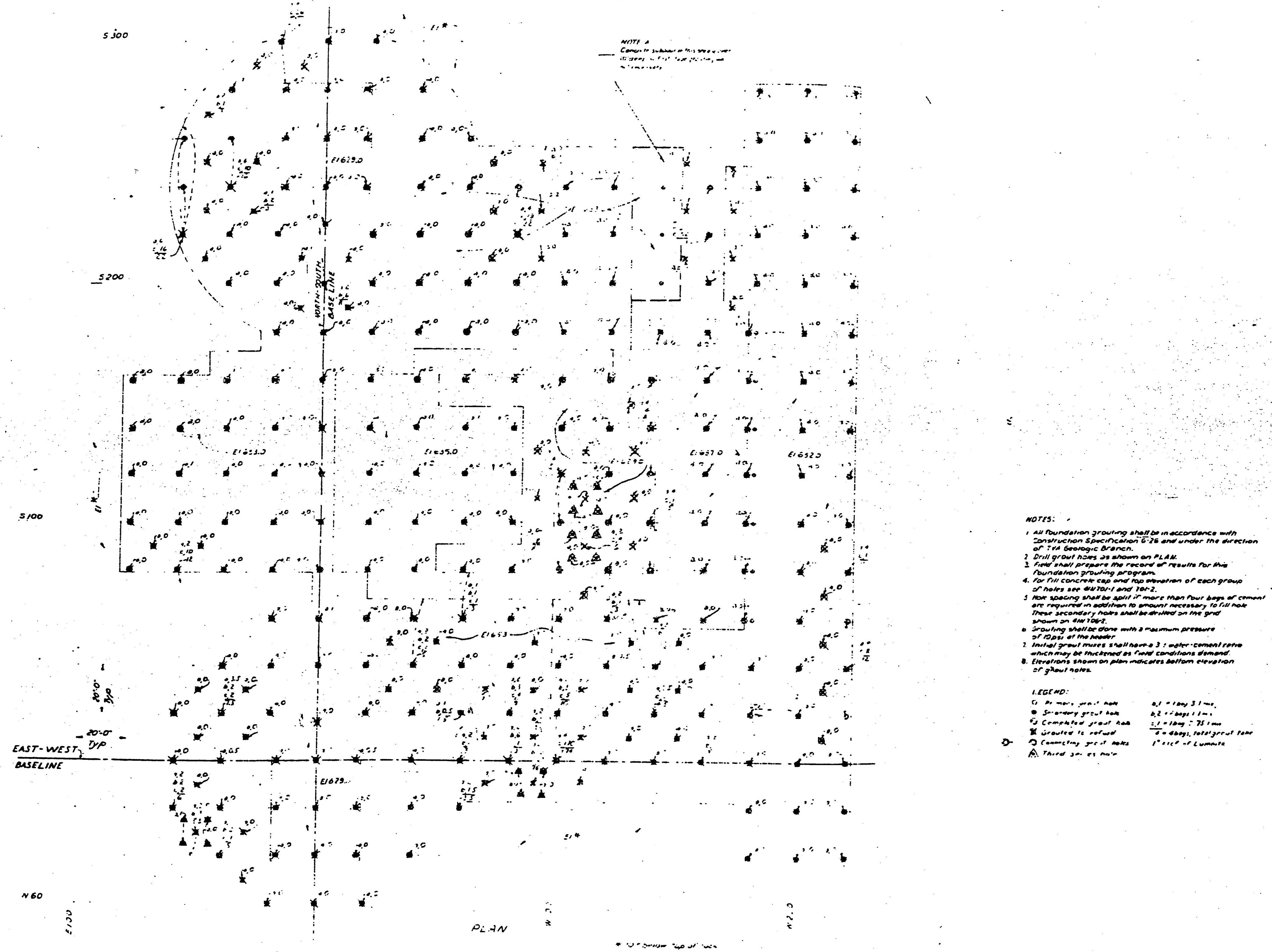


Figure 2.5.1-9 Foundation Treatment
First Stage Grouting
(41N10701)

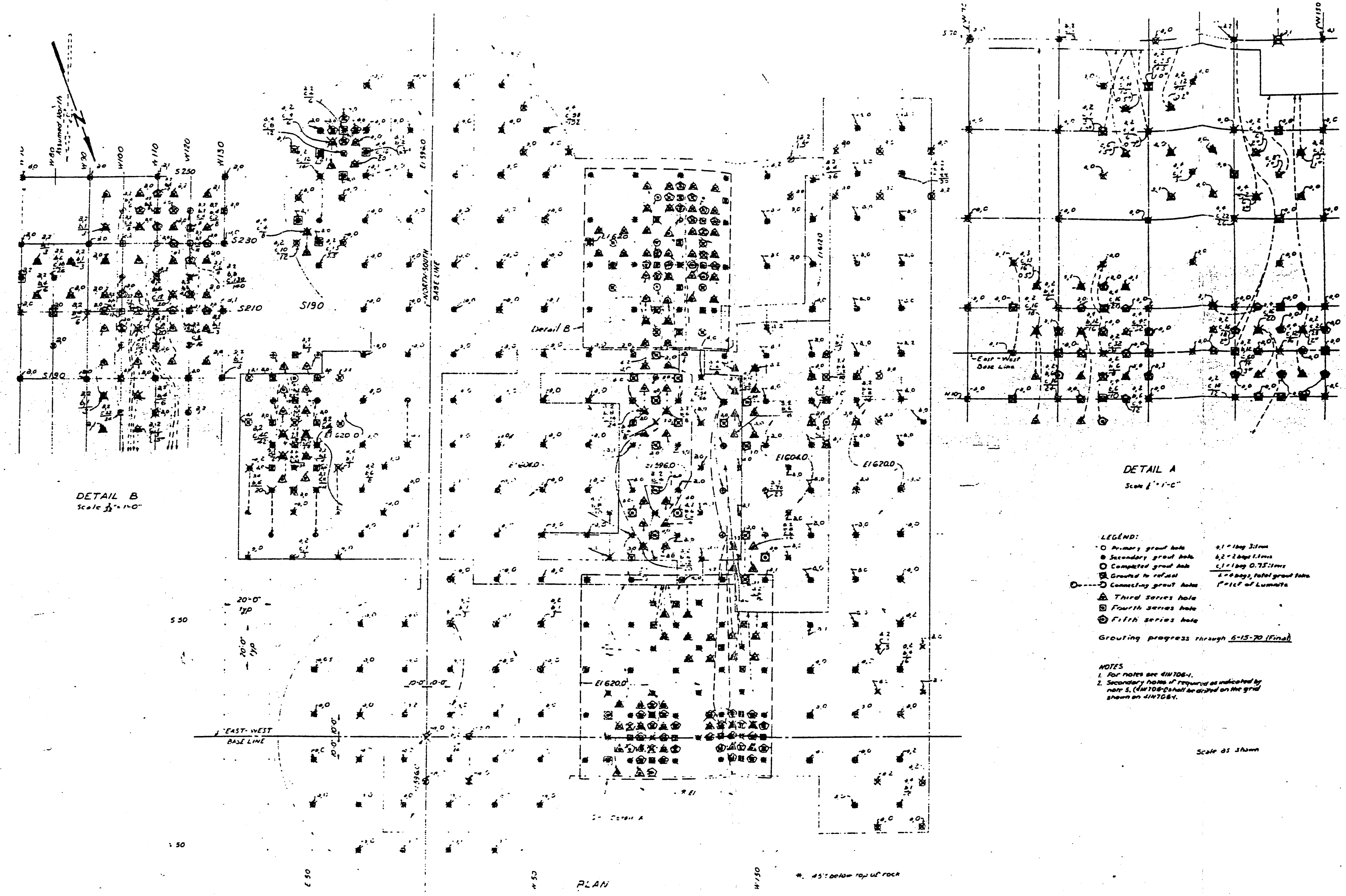
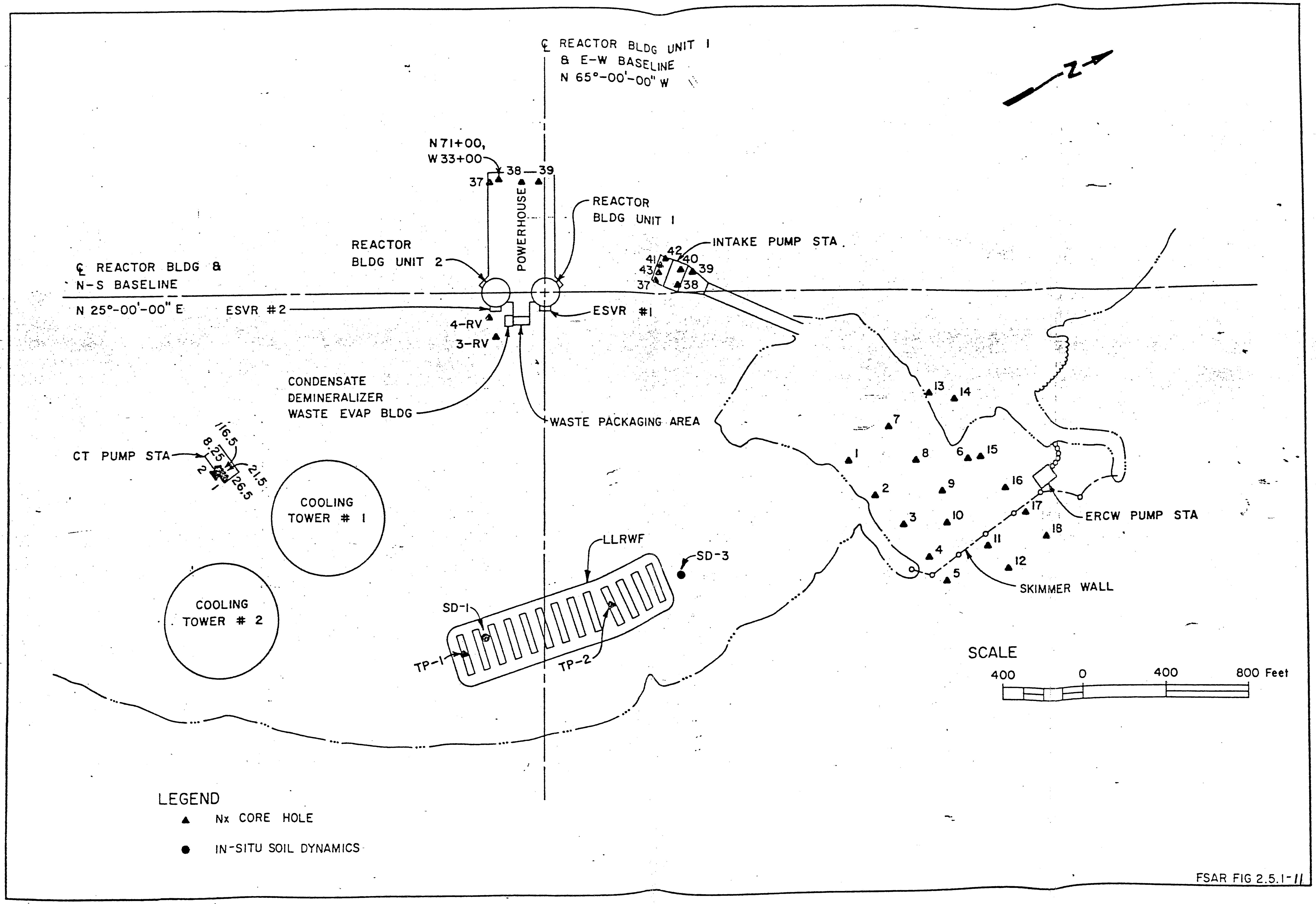
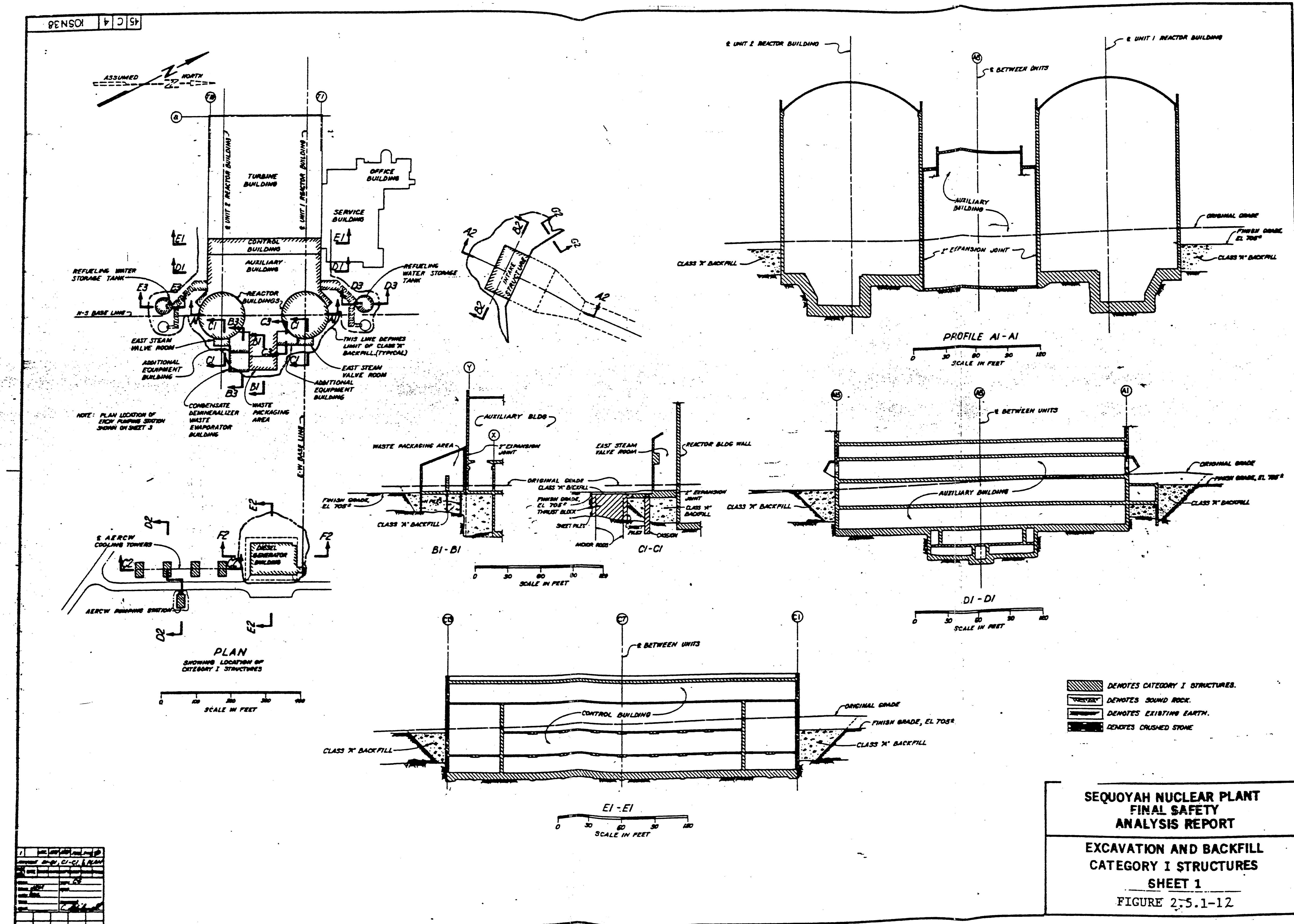


Figure 2.5.1-10 Foundation Treatment Second Stage Grouting (41N10702)



FSAR FIG 2.5.1-11



SEQUOYAH NUCLEAR PLANT
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EXCAVATION AND BACKFILL
CATEGORY I STRUCTURES
SHEET 1

FIGURE 2.5.1-12

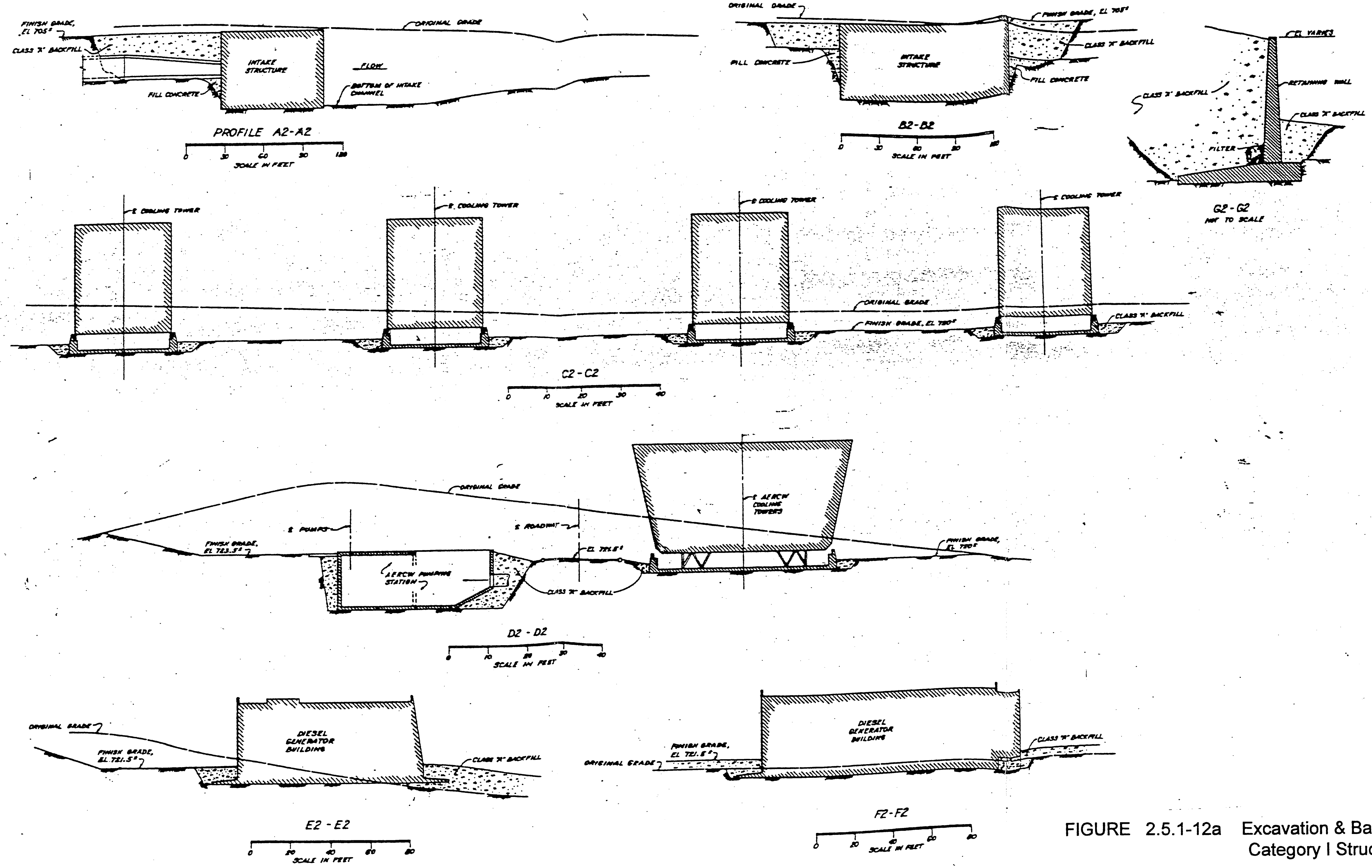
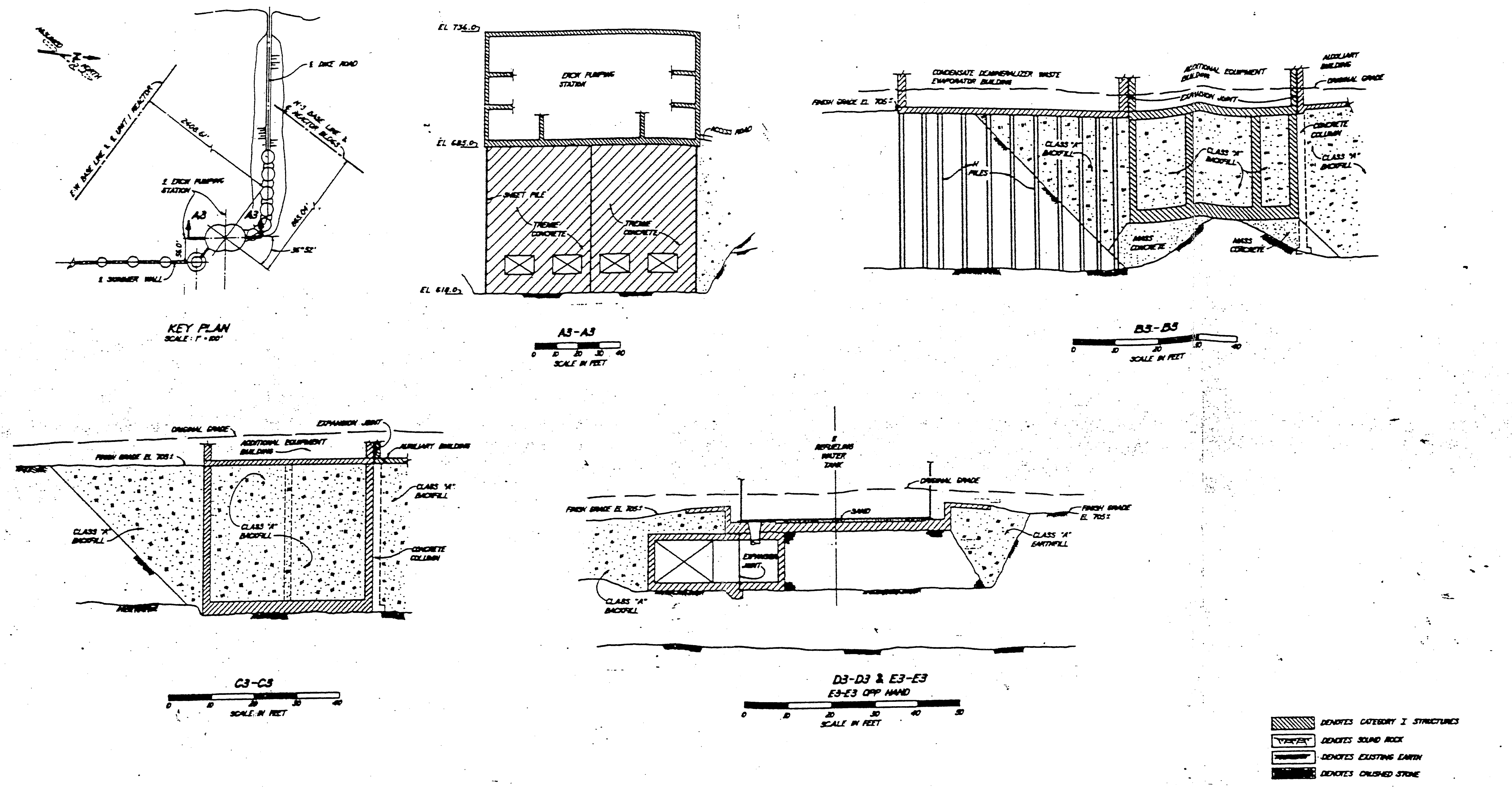


FIGURE 2.5.1-12a Excavation & Backfill Category I Structures

Revised by Amendment 13



SEQUOYAH NUCLEAR PLANT
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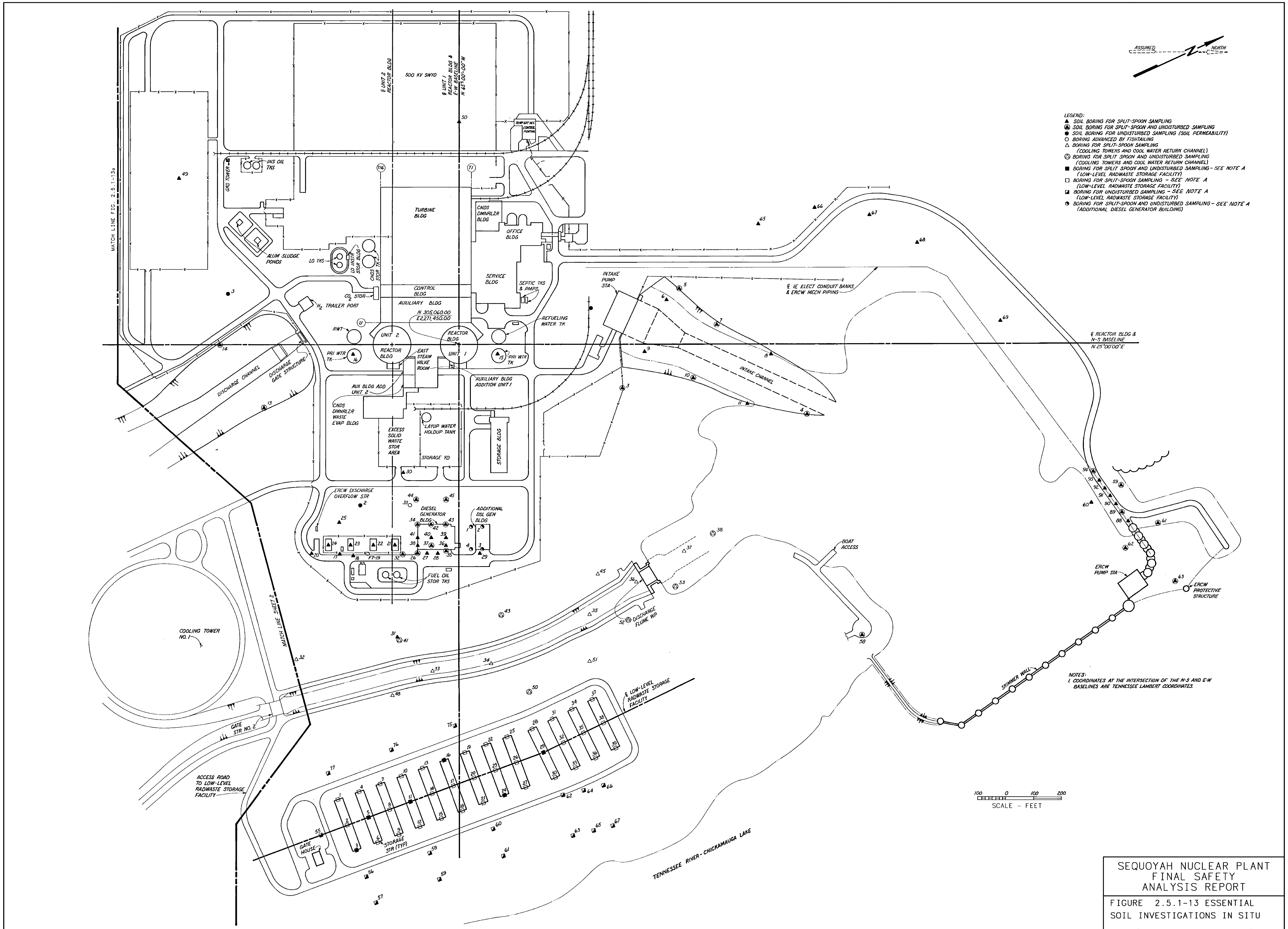
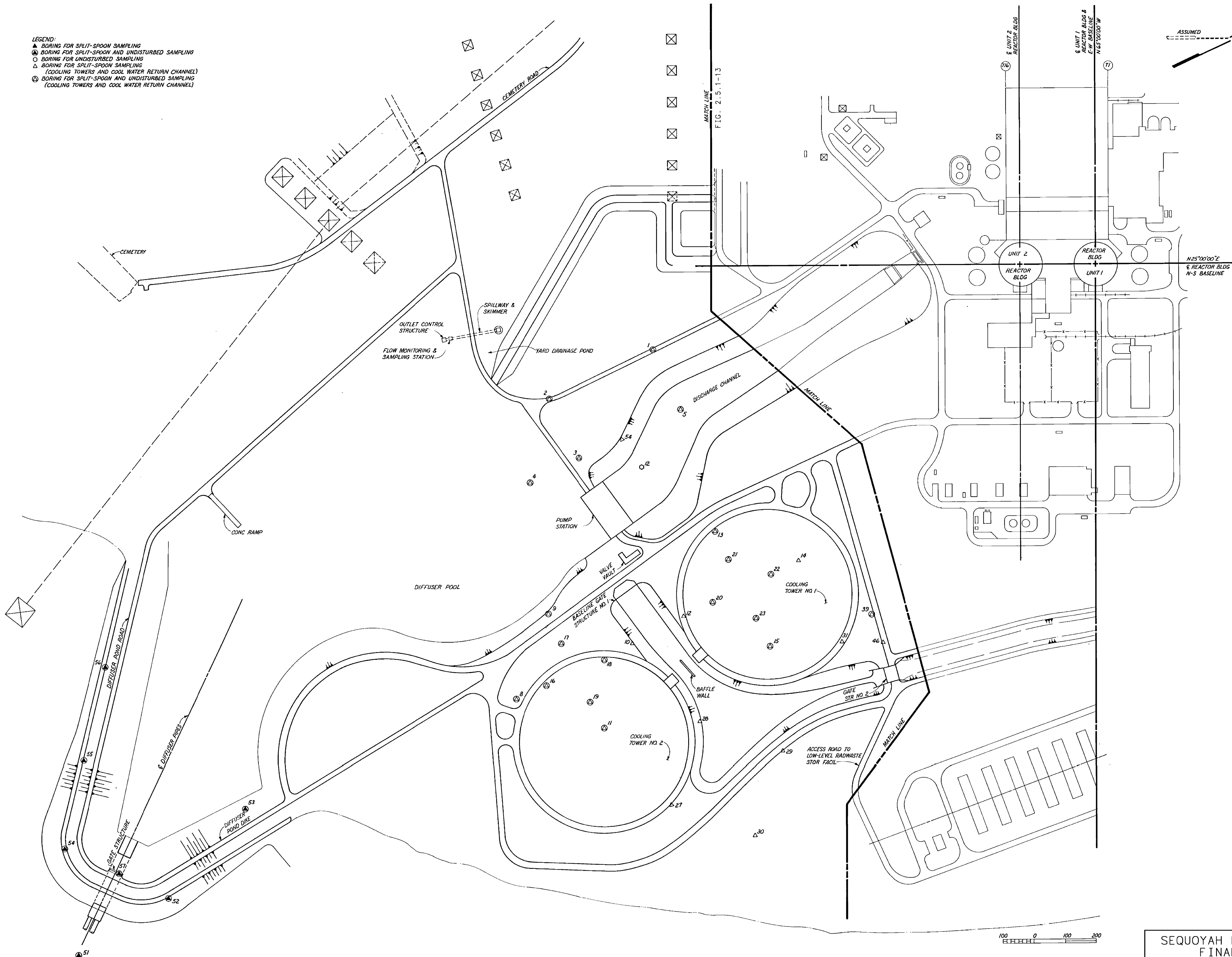
EXCAVATION AND BACKFILL
CATEGORY I STRUCTURES
SHEET 3
FIGURE 2.5.1-12b



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 2.5.1-13 ESSENTIAL SOIL INVESTIGATIONS IN SITU

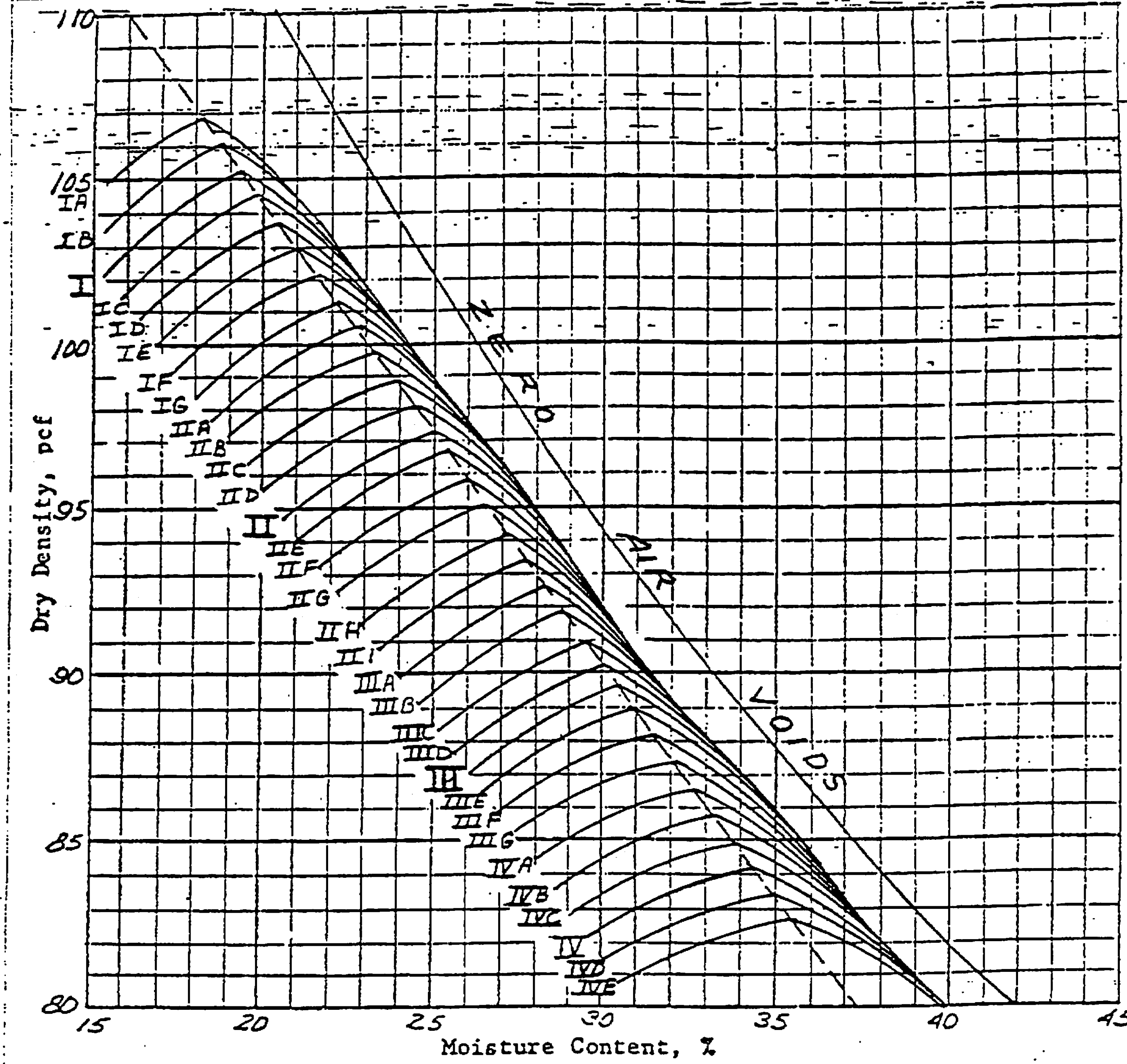
(REVISED BY AMENDMENT 13)



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 2.5.1-13a ESSENTIAL SOIL INVESTIGATIONS IN SITU

(REVISED BY AMENDMENT 13)



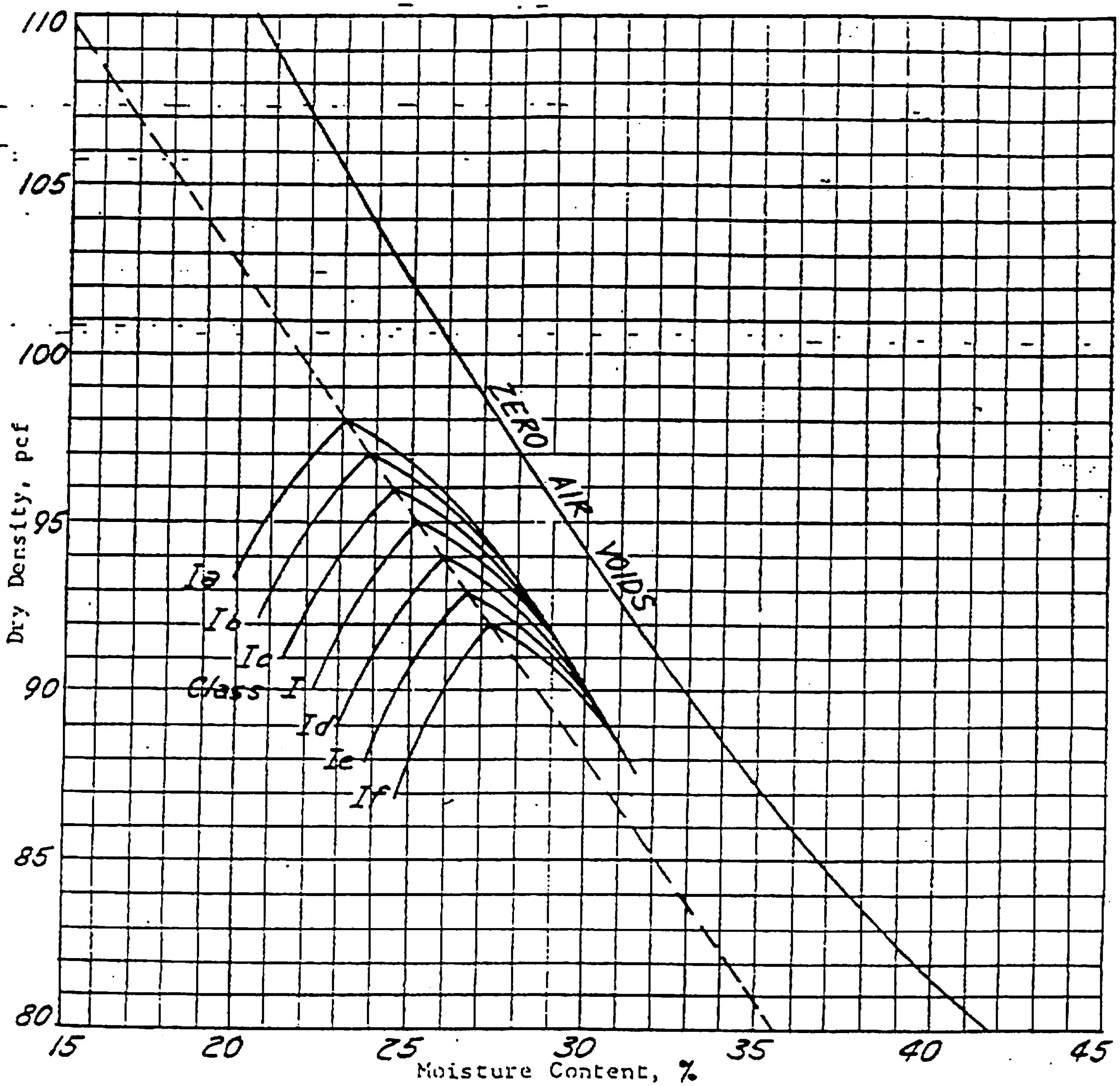
Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-ML	0	43	18	41	2.75	43.8	16.7	19.3	105.2
II-MH	0	18	31	51	2.74	52.7	22.8	25.0	97.2
III CH	0	8	31	61	2.78	69.6	37.1	30.4	89.5
IV-MH	0	14	17	69	2.77	60.5	22.8	34.3	84.1

Plus No. 4 Specific Gravity, SSD	
Plus No. 4 Absorption, %	

Remarks:

Figure 2.5.1-14

Standard Proctor Compaction
Borrow Area



Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-ML	0	17	27	56	2.75	48.2	14.4	25.0	95.0

Plus No. 4 Specific Gravity, SSD	
Plus No. 4 Absorption, %	

Remarks: Sample from east of Igou Cemetery

Figure 2.5.1-15

Standard Proctor Compaction
Borrow Area

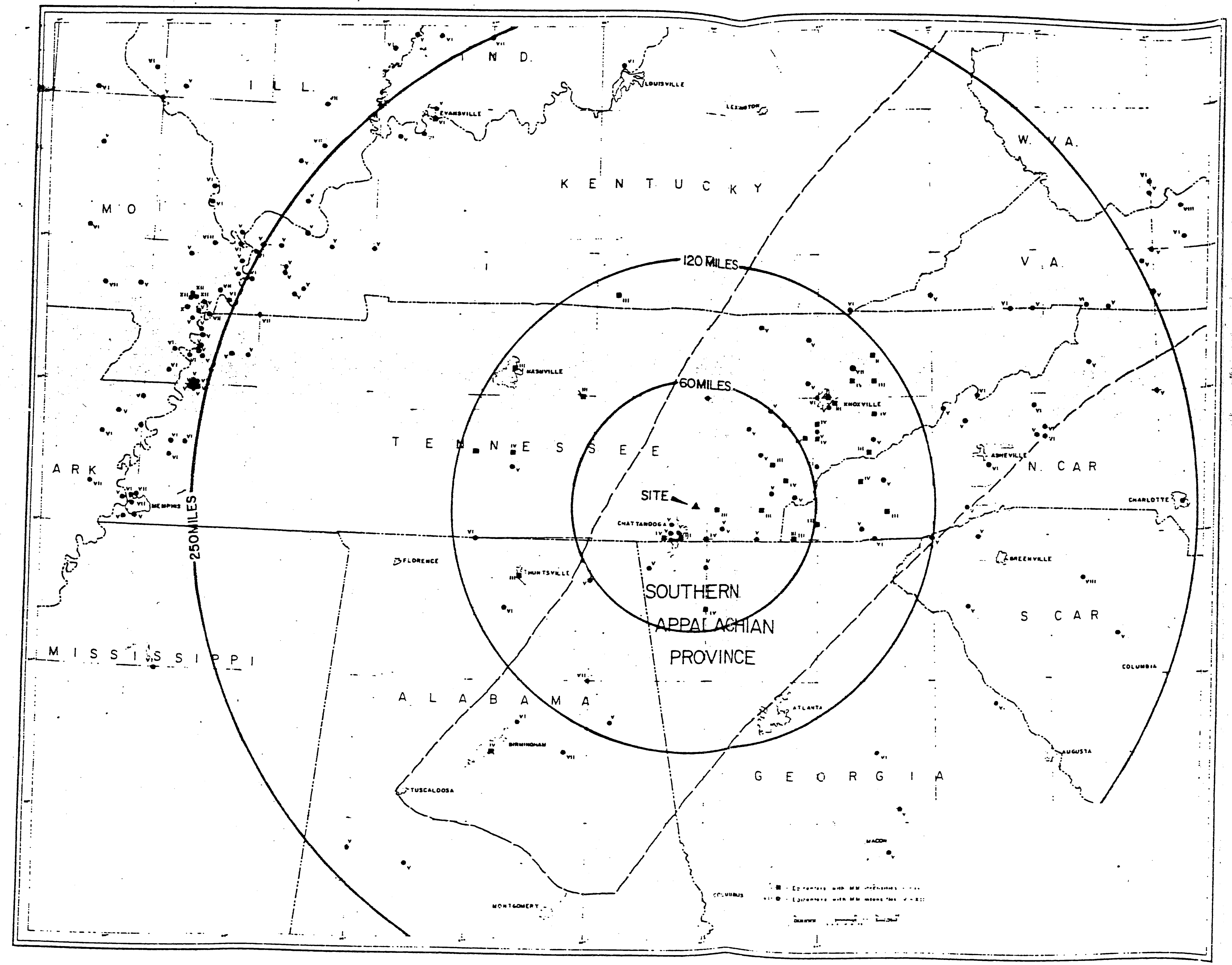


Figure 2.5.2-1 Location of Earthquake Epicenters

Figure 2.5.2-2 Map Showing the Extent of Earthquake Disturbances in the New Madrid Area in 1811-12

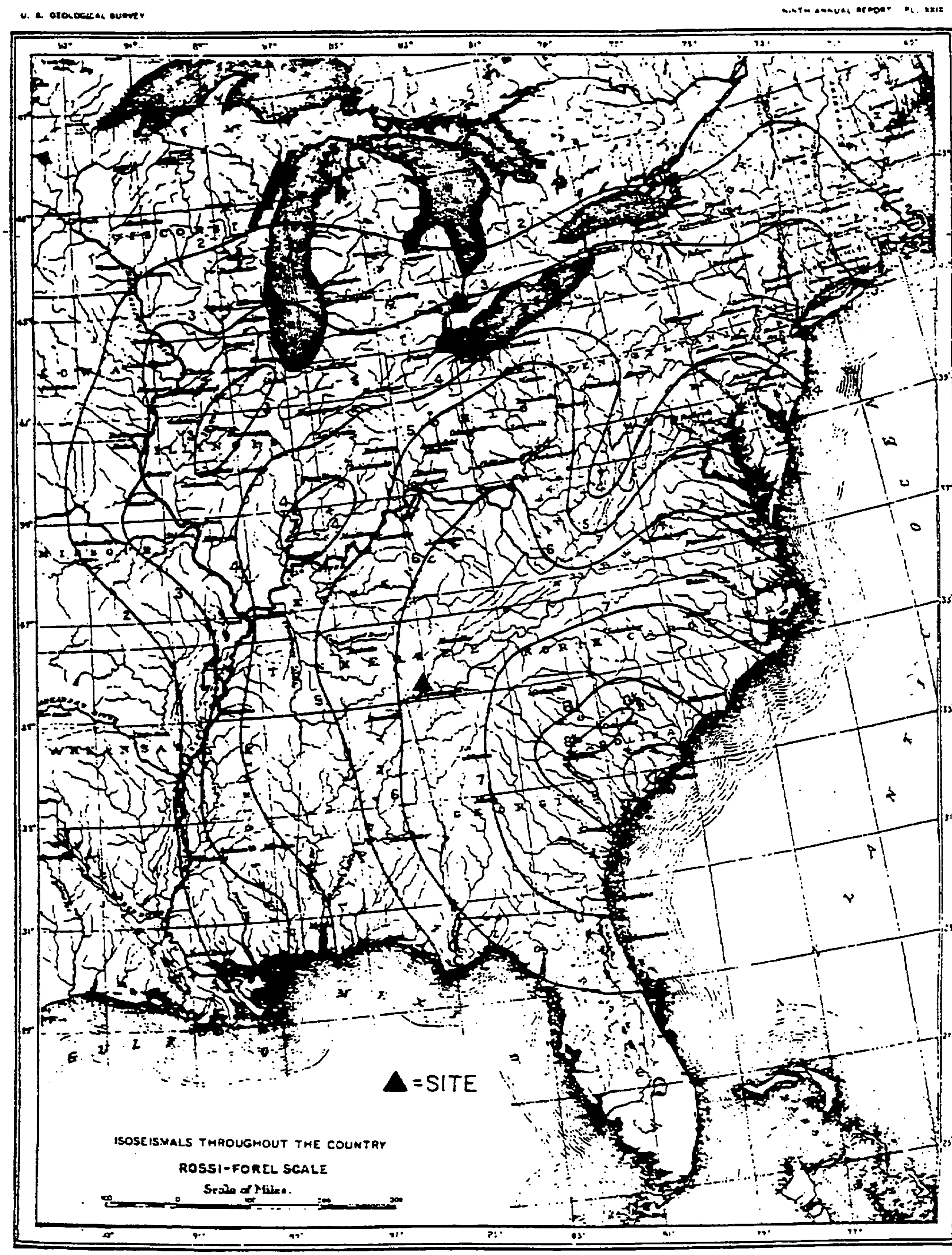


Figure 2.5.2-3 Isoseismals of the Charleston Earthquake

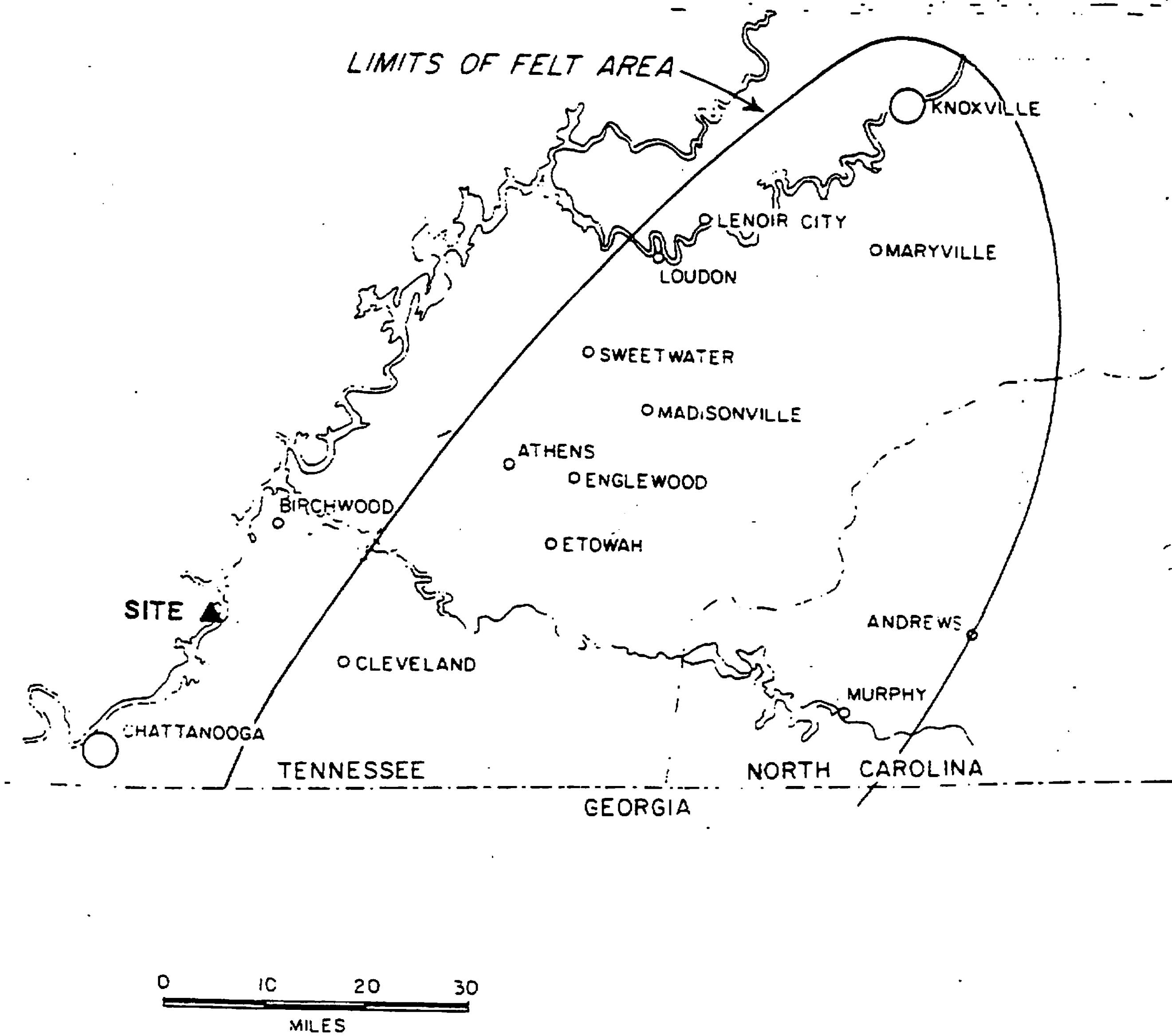


Figure 2.5.2-4 East Tennessee Earthquake of April 17, 1913

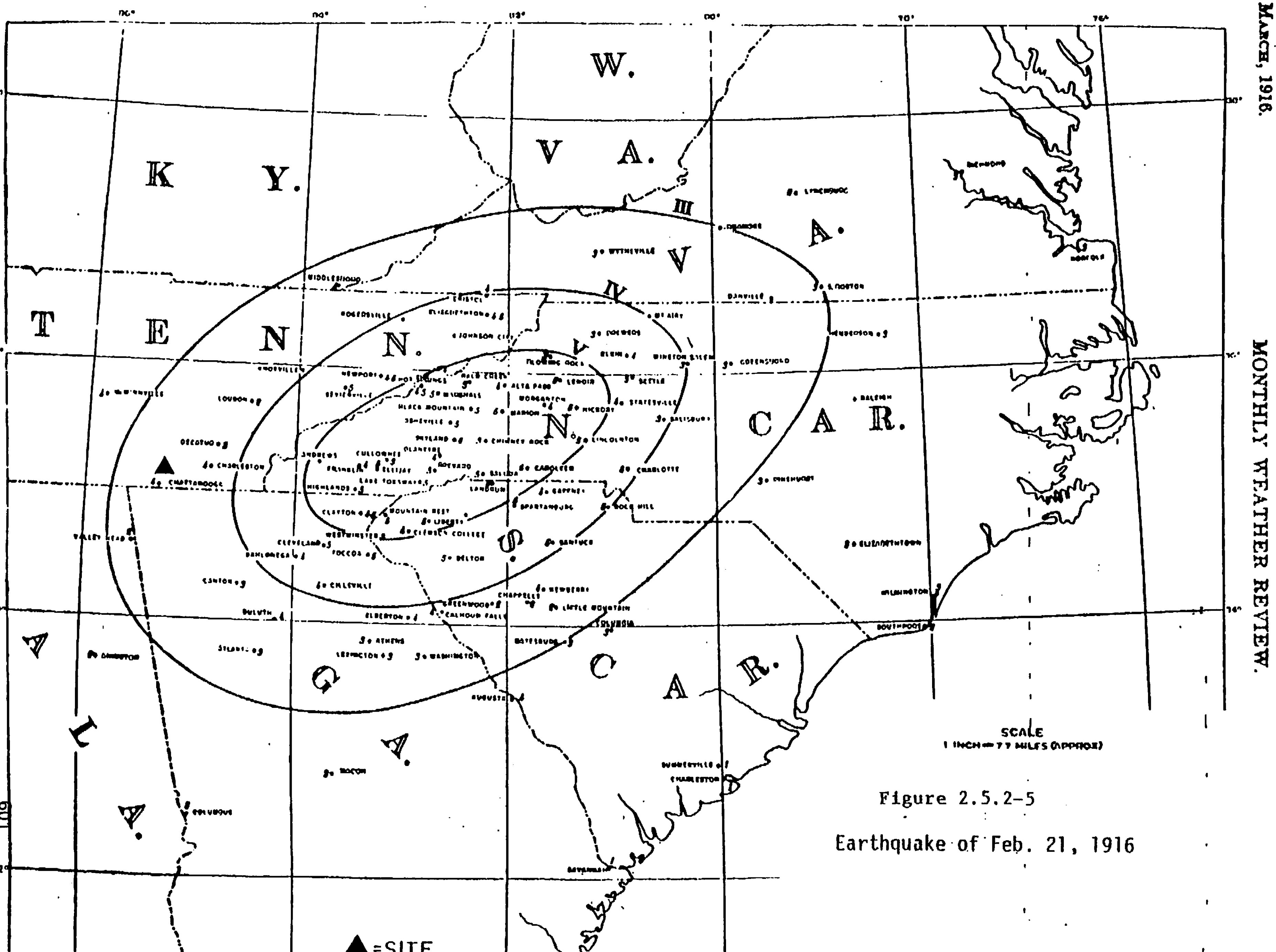
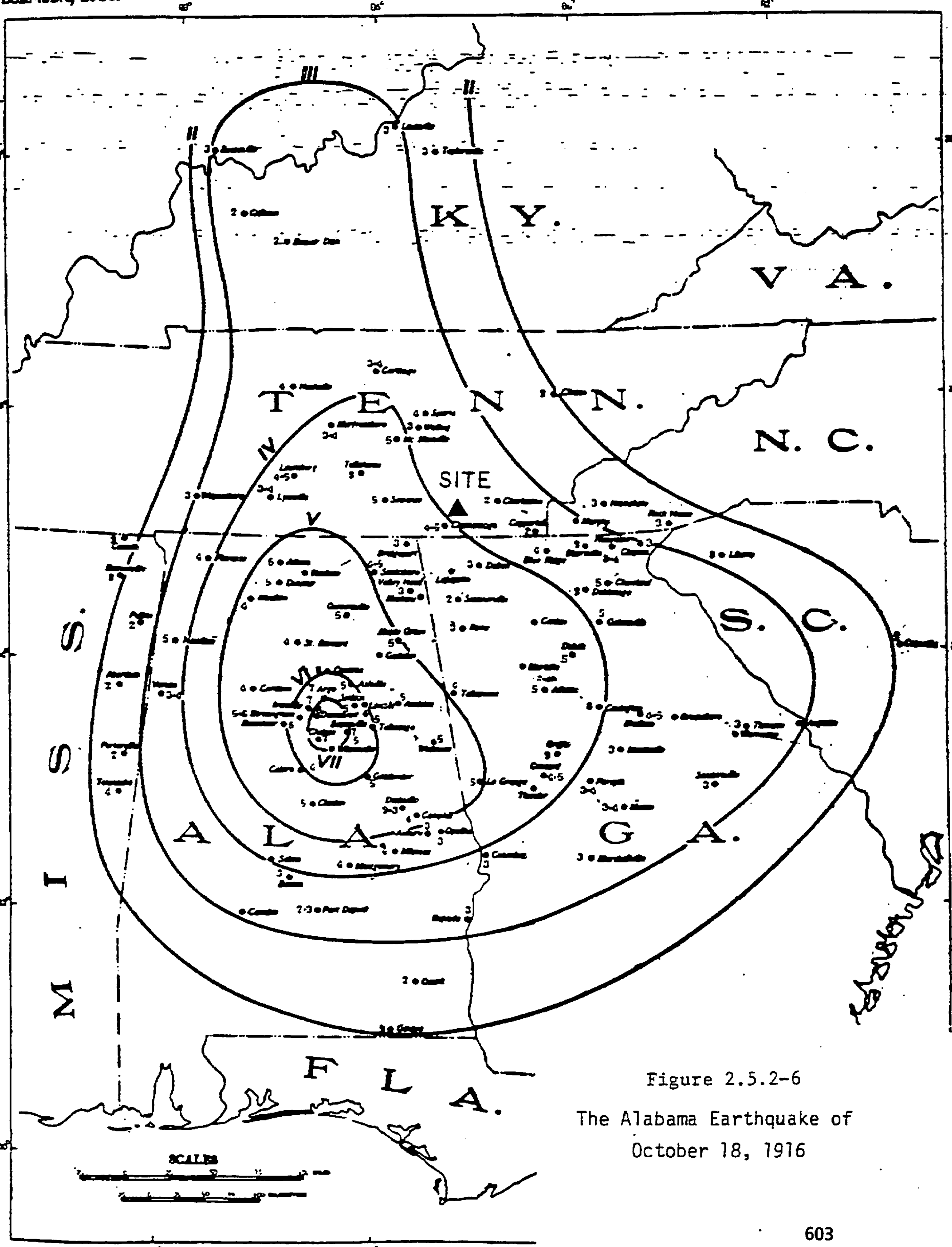


Figure 2.5.2-5

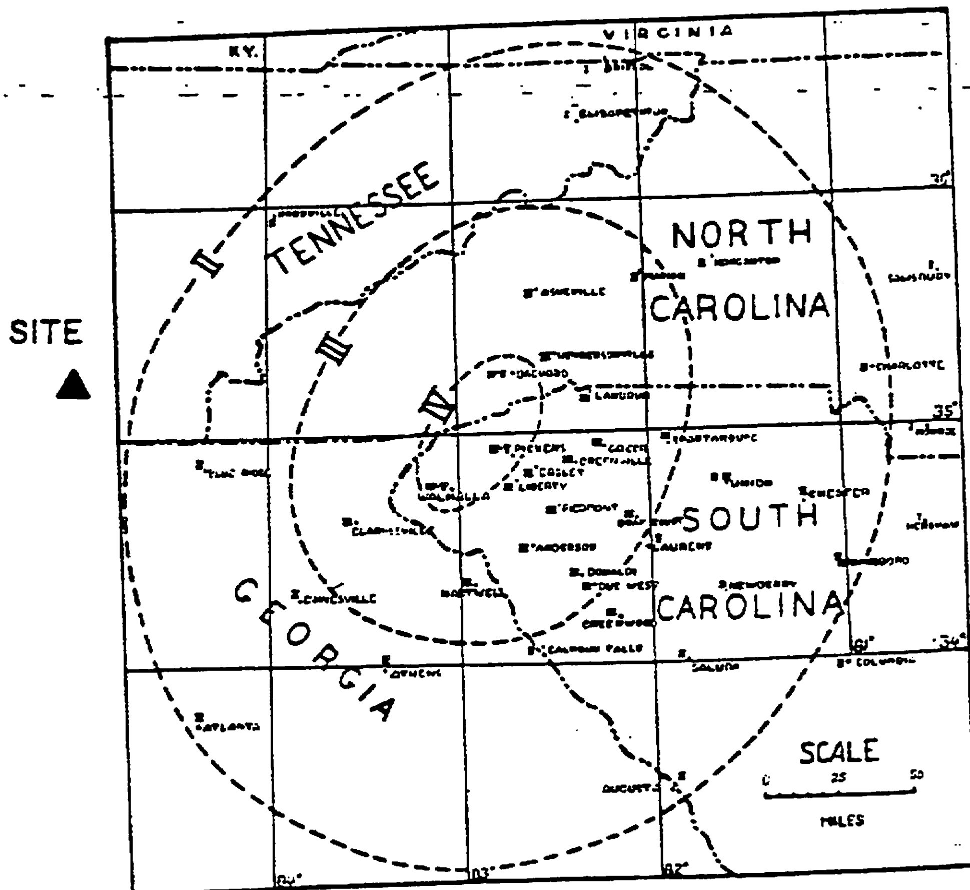
Earthquake of Feb. 21, 1916



Isoseismals of the Alabama earthquake of October 18, 1916.

Figure 2.5.2-6

The Alabama Earthquake of October 18, 1916



Isoseismals of the Southern Appalachian earthquake of October 20, 1924. Rossi-Forel scale

Figure 2.5.2-7 Southern Appalachian Earthquake of October 1924

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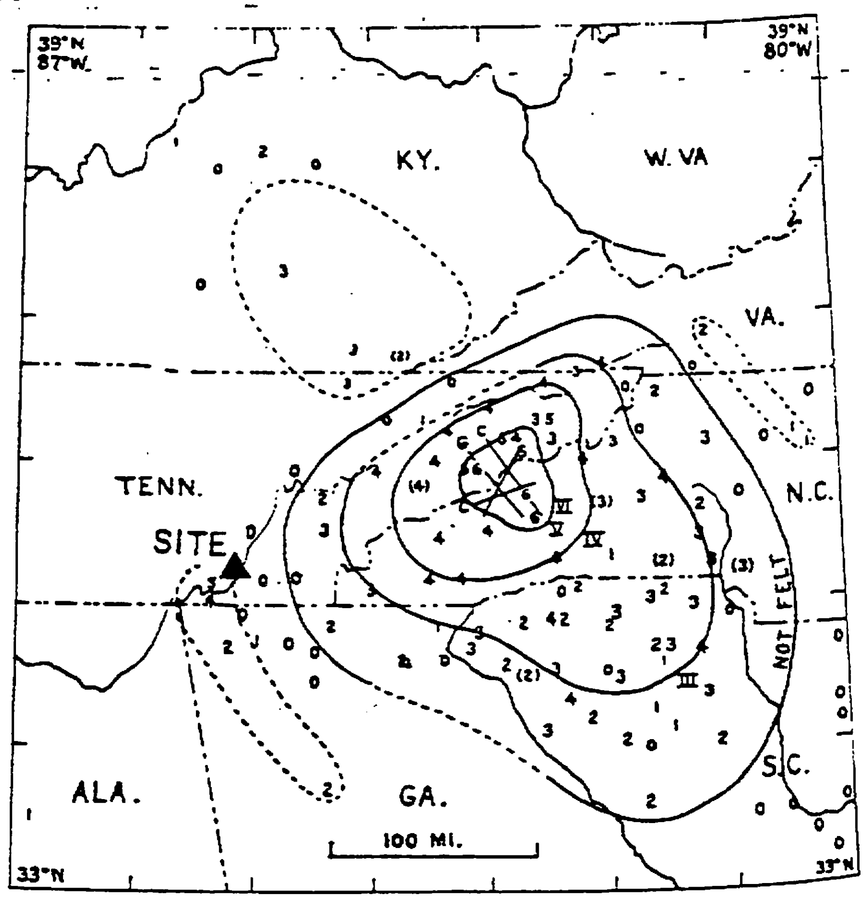


Isoseismal map for the southern Appalachian earthquake of November 2, 1928

Figure 2.5.2-8 Appalachian Earthquake of November 2, 1928

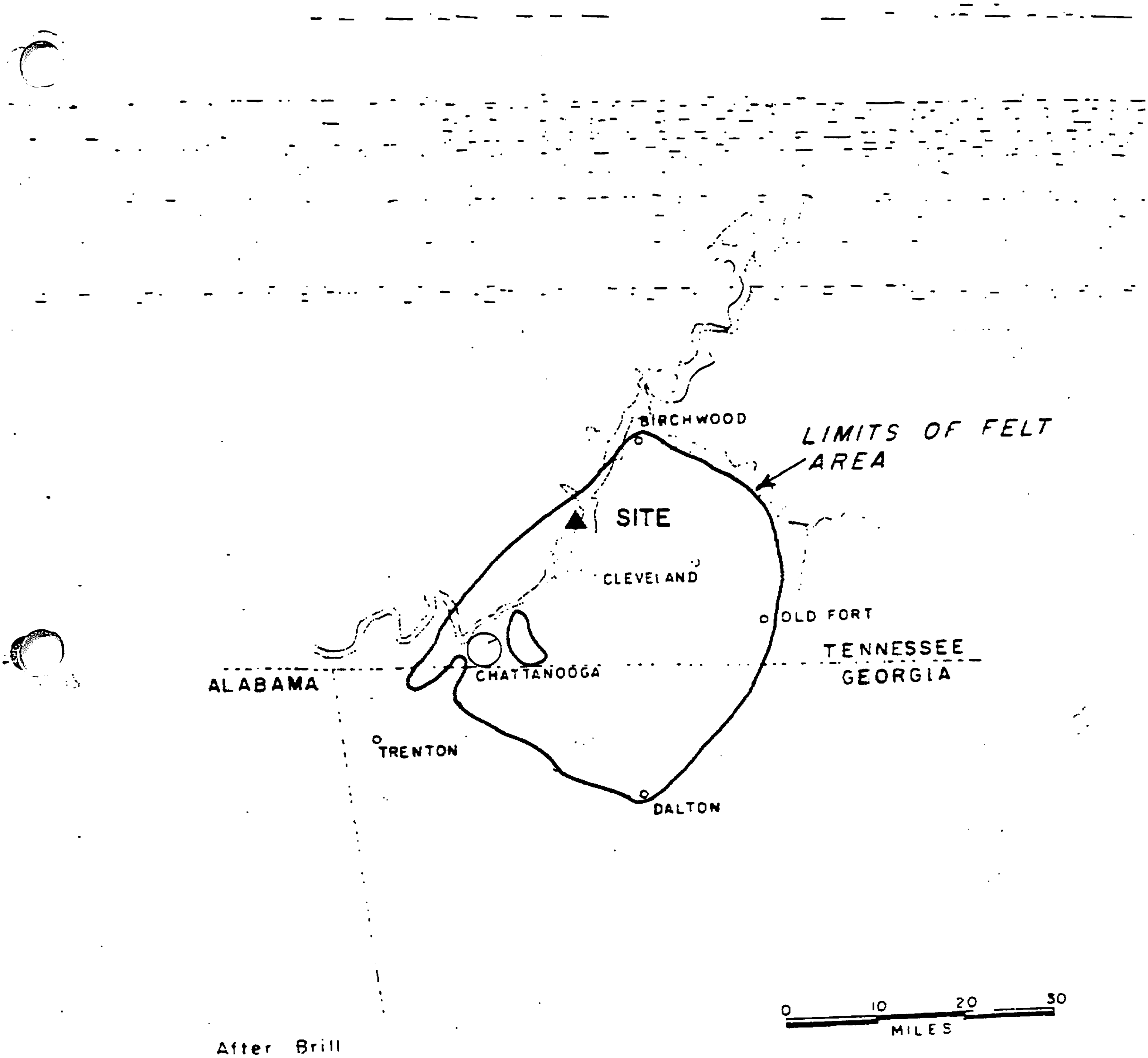


Figure 2.5.2-9 Chattanooga Earthquake October 19, 1940

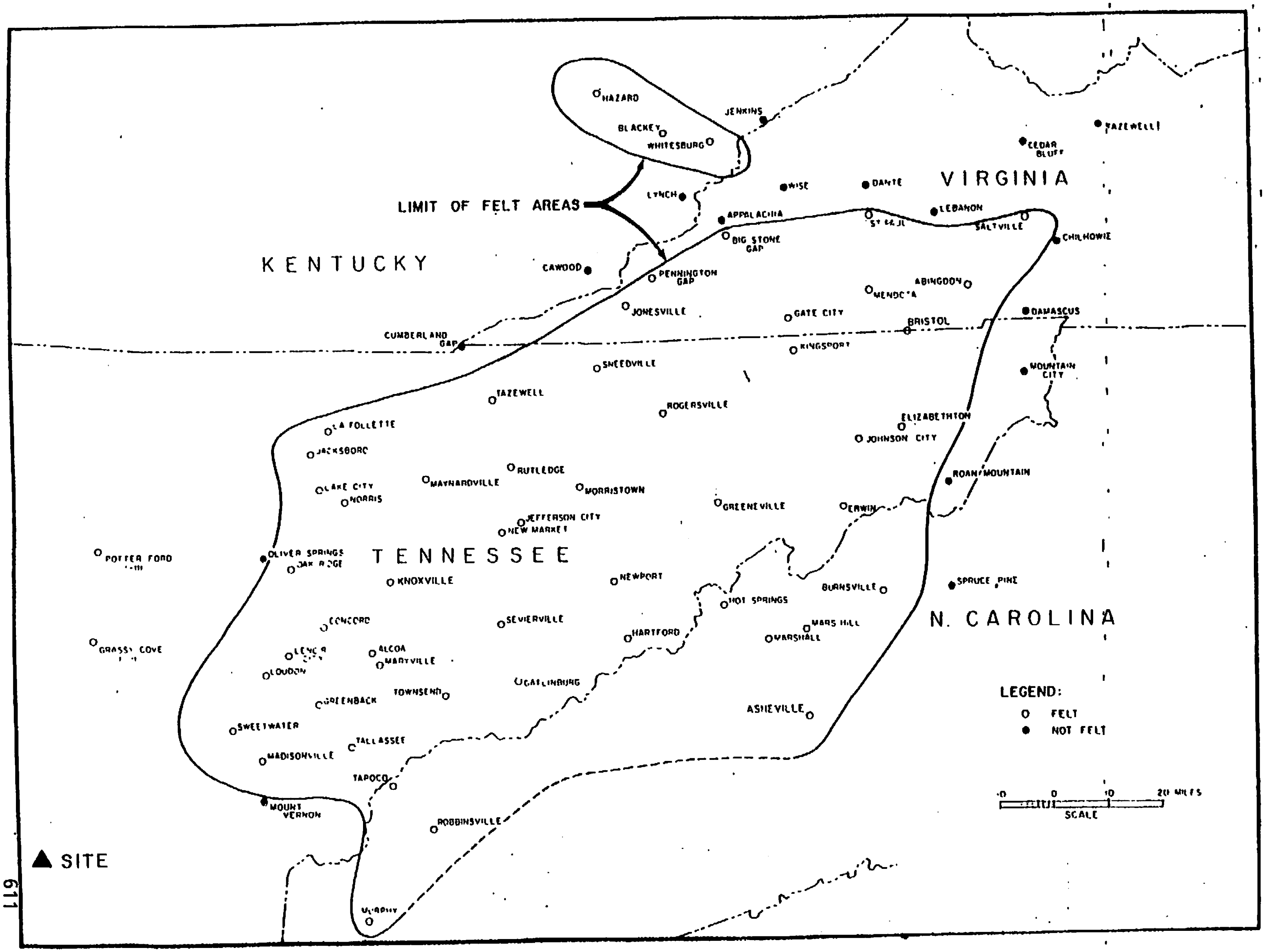


Figure 2.5.2-10 East Tennessee Earthquake of July 13, 1969

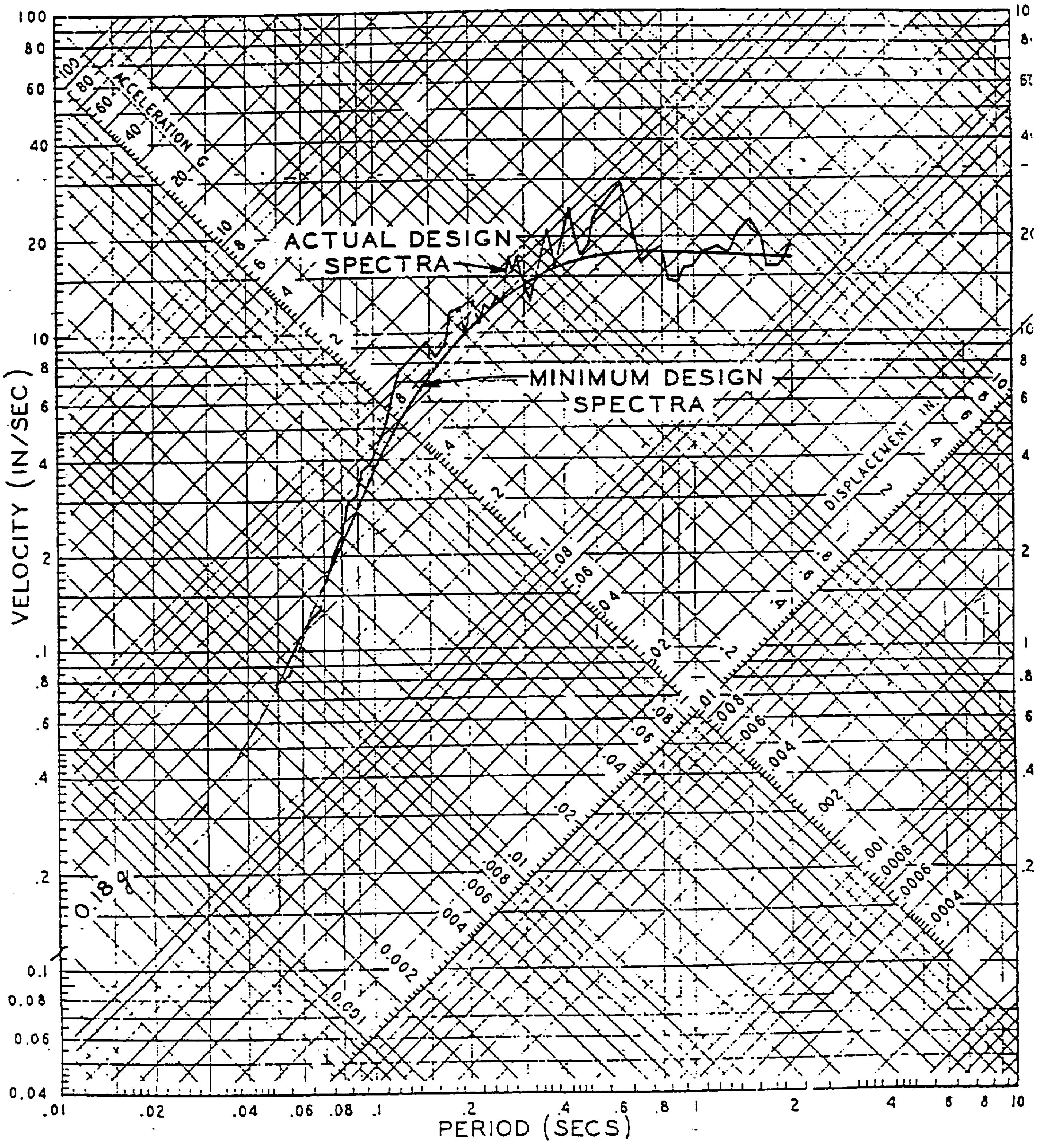


Figure 2.5.2-11 Comparison of Response Spectra for Safe Shutdown Earthquake, 1/2% Damping

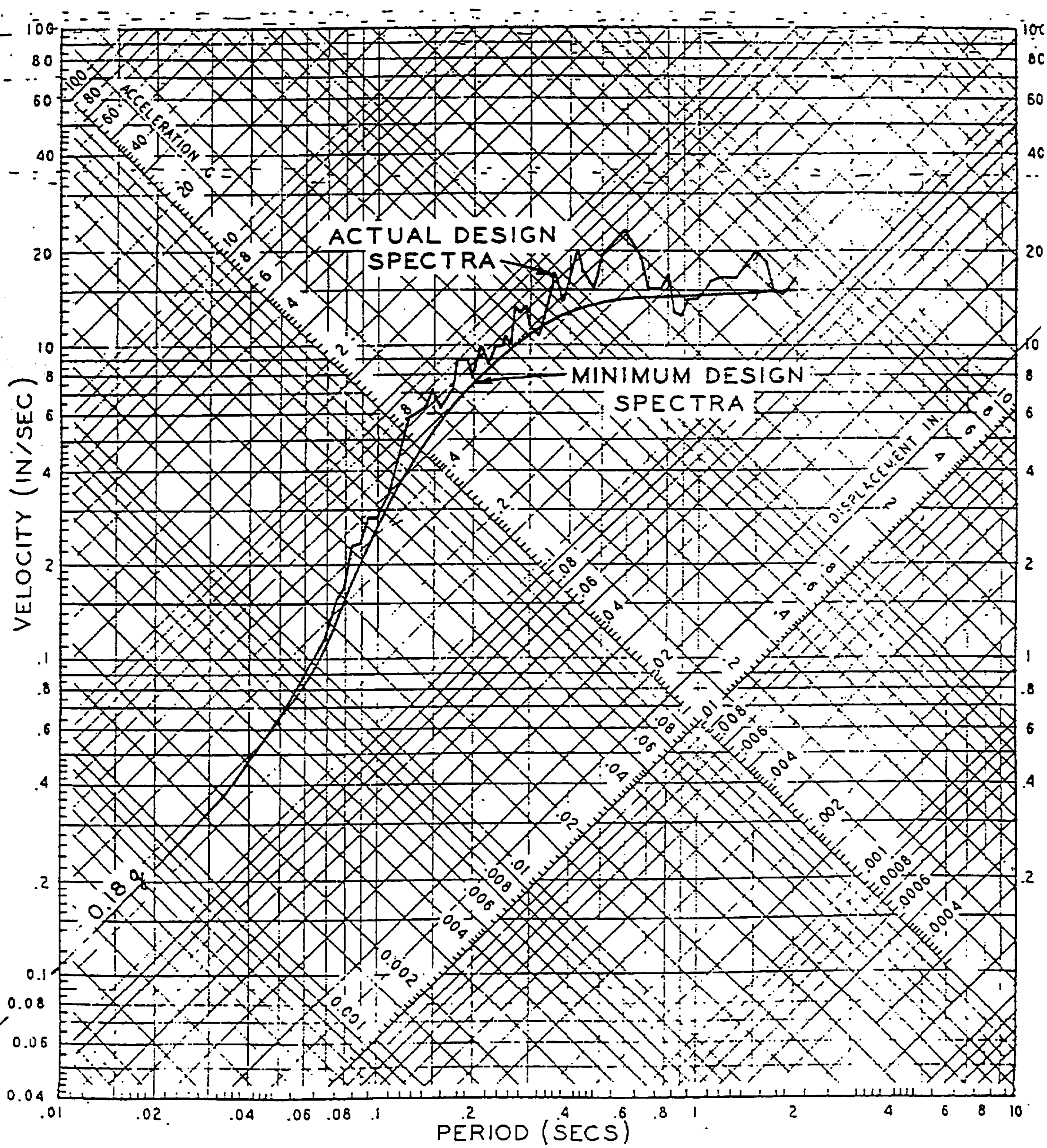


Figure 2.5.2-12 Comparison of Response Spectra for Safe Shutdown Earthquake, 1% Damping

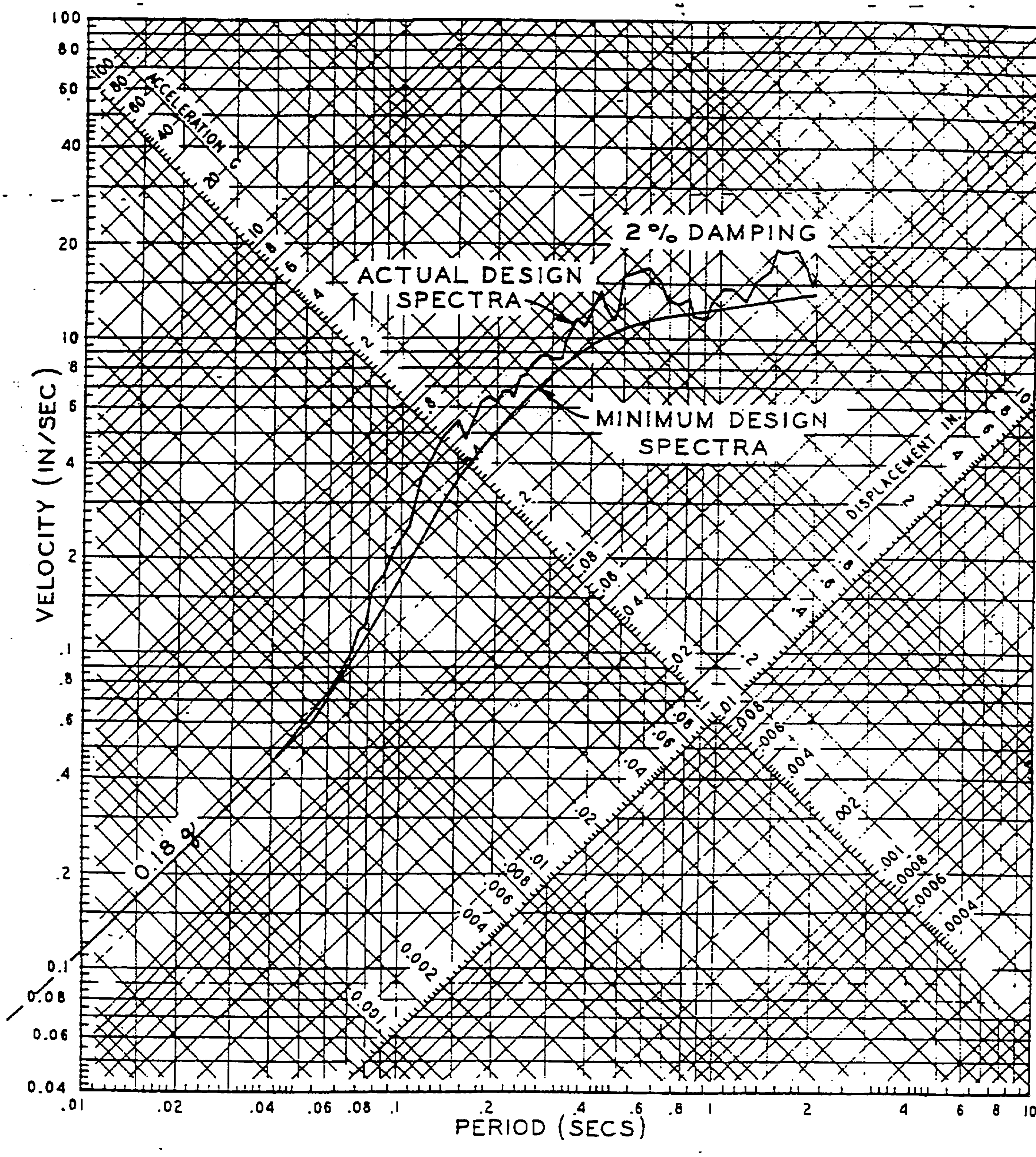


Figure 2.5.2-13 Comparison of Response Spectra for Safe Shutdown Earthquake, 2% Damping

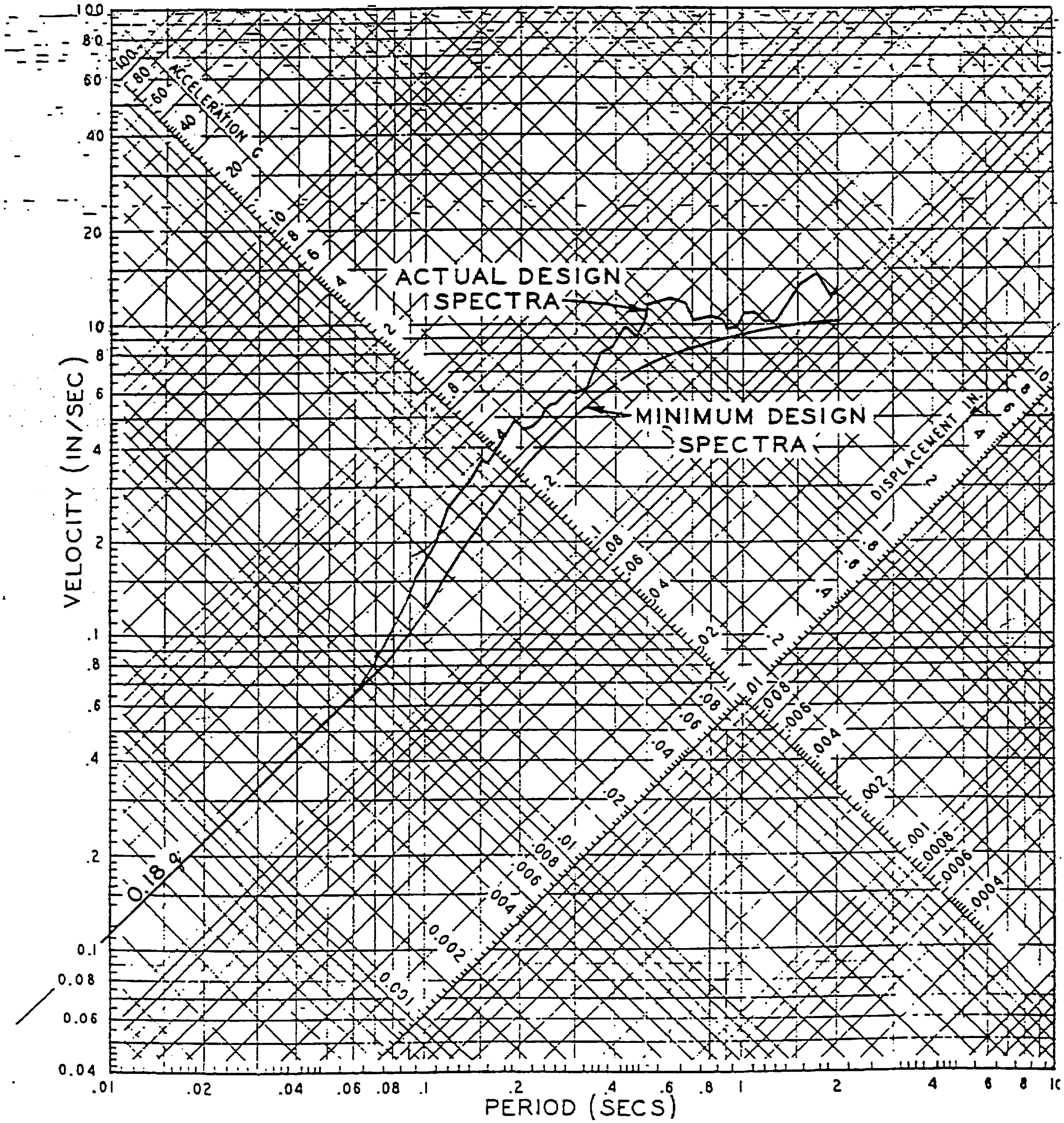
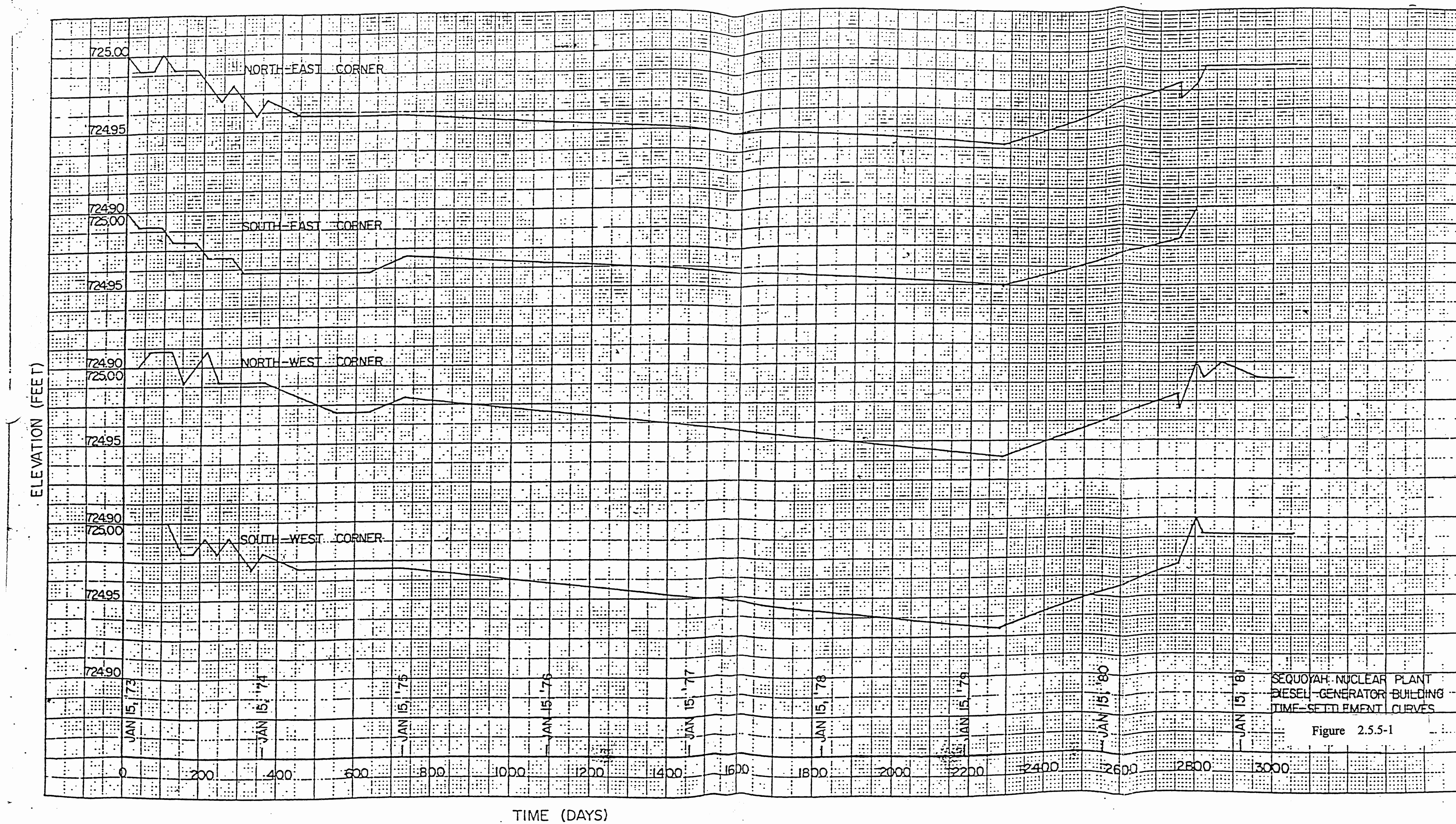


Figure 2.5.2-14 Comparison of Response Spectra for Safe Shutdown Earthquake, 5% Damping



SEQUOYAH NUCLEAR PLANT
DIESEL GENERATOR BUILDING
TIME-SETTLEMENT CURVES
NORTH-EAST CORNER
SOUTH-EAST CORNER
NORTH-WEST CORNER
SOUTH-WEST CORNER
725.00
724.95
724.90
ELEVATION (FEET)
TIME (DAYS)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
JAN 15, '73
JAN 15, '74
JAN 15, '75
JAN 15, '76
JAN 15, '77
JAN 15, '78
JAN 15, '79
JAN 15, '80
JAN 15, '81

Figure 2.5.5-1

Critical Slip Circle
Design Case: DBE

SOIL PROPERTIES (R-TEST)

Zone	φ	C (PSF)	γ (PCF)
①	15°	740	113
②	15°	740	114
③	15°	800	115

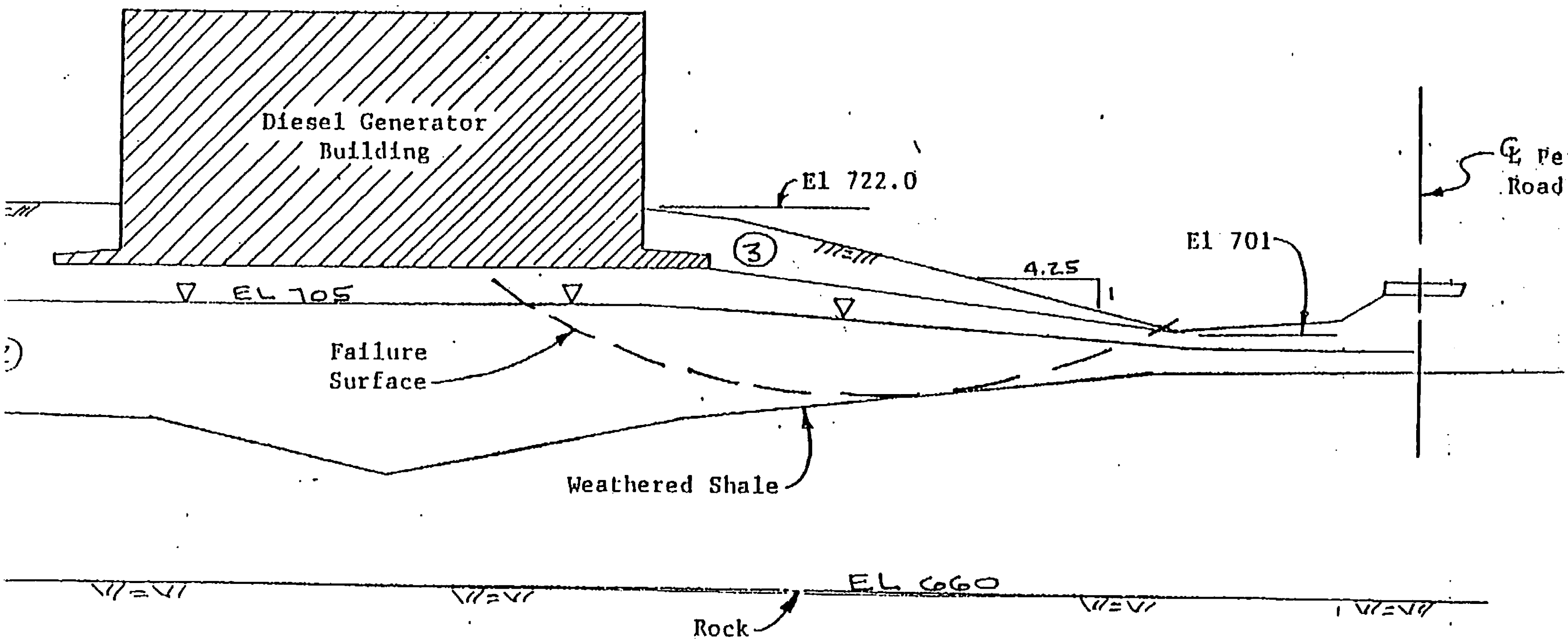


Figure 2.5.6-1

Diesel Generator Bldg.
Sequoyah Nuclear Plant
Scale; 1" -30'

Revised by Amendment 6

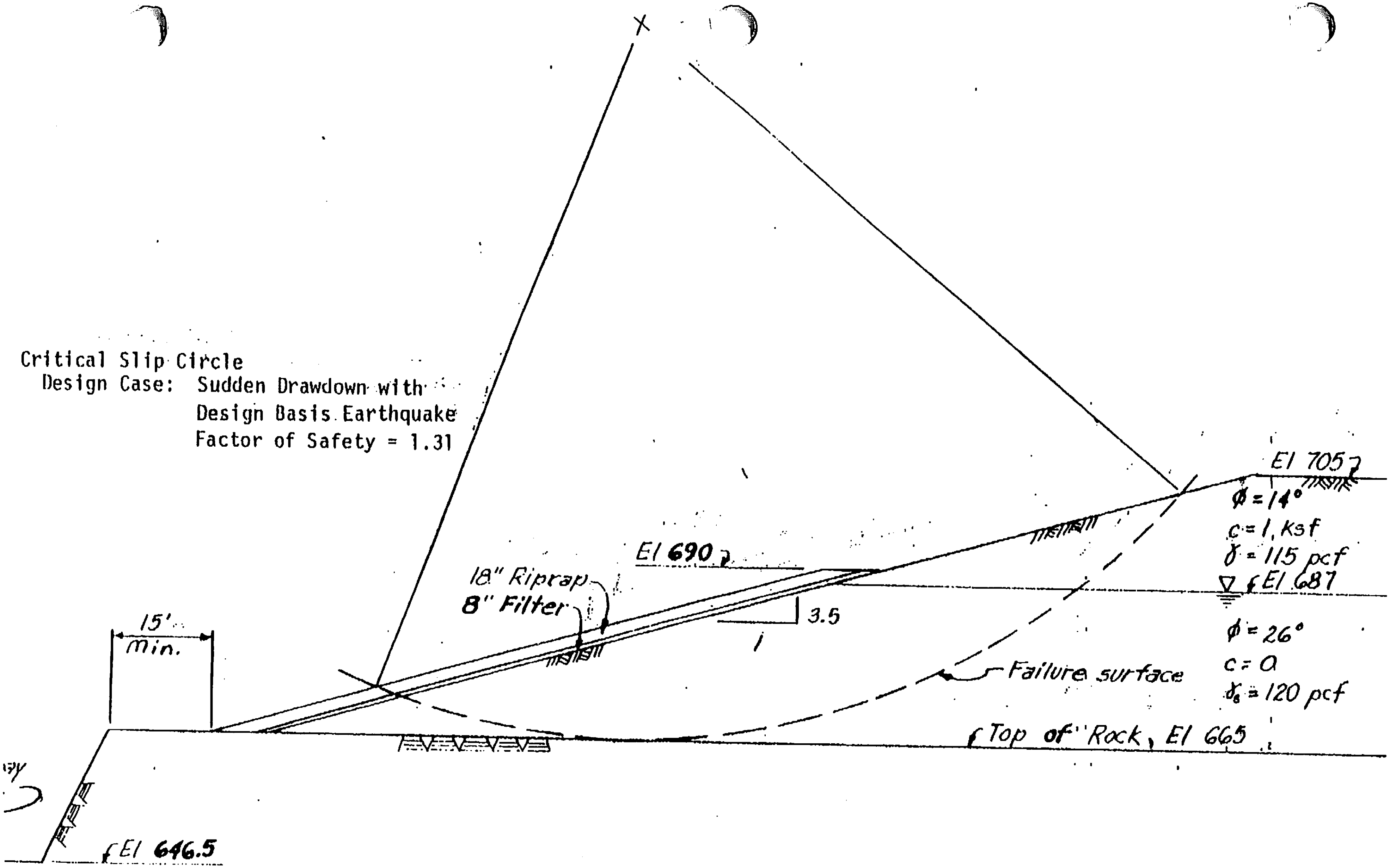


Figure 2.5.6-2 Section of Forebay and Intake Slope Sequoyah Nuclear Plant Pumping Station